Connecting to Compete

2018

Trade Logistics in the Global Economy

The Logistics Performance Index and Its Indicators

LPI score, 2012–18
(1 is the lowest score;
5 is the highest score)

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The report was designed, edited, and typeset by Communications Development Incorporated, Washington, DC.

Foreword

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We are happy to present the sixth edition of *Connecting to Compete* and the 2018 edition of the Logistics Performance Index (LPI). This interdisciplinary World Bank project was launched just over 10 years ago. The ambition was to develop simple comparators of how efficiently supply chains connect firms to markets, or logistics performance.

Since 2007, most of the countries the World Bank Group works with are well aware of the importance of logistics performance for growth and integration. The cross-cutting nature of logistics as a policy area is widely recognized: logistics is not just about connecting infrastructure but encompasses regulation of services, sustainability, and resilience, or trade facilitation.

We see that this regular publication has had a significant impact in helping countries frame their own policies and motivate consistent approaches to interventions and reforms at the national level. In some cases, the World Bank has been asked to provide support, which we did by bringing expertise and tools that address the country-specific supply chain constraints more deeply than the rough indications from the LPI can. The LPI remains unique in providing a common referential across countries.

The exercise may seem a bit repetitive. The list of best performers does not change very much over the course of two years. We invite the reader to look beyond country rankings and look at the nexus of themes and policies. The logistics sector is changing fast, in terms of the nature of demand (for example, e-commerce), players, use of technology, new risks (cybersecurity), and policy concerns. Professionals and countries are increasingly concerned with the environmental footprint and resilience of supply chains.

We hope this work will appeal to a broad and diverse audience: policy makers, practitioners, and researchers. We are confident readers will find this report and its data useful.

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Foreword

Young Tae Kim, Secretary-General, International Transport Forum at the Organisation for Economic Co-operation and Development

Logistics is an elevated priority for many member countries of the International Transport Forum. Because facilitating trade and transport is at the core of stimulating economic development, several countries have developed comprehensive national logistics strategies. Well-functioning domestic and international logistics is a precondition of national competitiveness. And fact-based metrics can provide reliable benchmarks, assess policy impacts, and compare global advances in logistics.

The World Bank Logistics Performance Index (LPI) is a unique benchmarking tool, providing the same measure for more than 160 countries. At the International Transport Forum, we use the LPI as the most important starting point of dialogue with our member countries on the drivers of logistics performance. The six components of the LPI—customs, infrastructure, ease of arranging shipments, quality of logistics services, timeliness, and tracking and tracing—point to policy actions that can support the improvement of each individual element. International Transport Forum studies have examined the drivers of logistics performance and assessed the development of national logistics observatories in Chile, Mexico, Turkey, and more recently Vietnam.

The LPI is a crucial part of global efforts to better understand logistics performance in the context of increasingly complex supply chains. I am sure the 2018 edition of the LPI will be used extensively by governments, international organizations, private firms, and academia in efforts to improve logistics—the backbone of the global economy.

Young Tae Kim
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Acknowledgements

This report was prepared by the World Bank's Global Trade and Regional Integration Team in the Macroeconomics, Trade and Investment Global Practice, under the guidance of Carlos Felipe Jaramillo (Senior Director), Caroline Freund (Director), and Jose Guilherme Reis (Practice Manager). The project leaders were Jean-François Arvis (jarvis1@worldbank.org) and Christina Wiederer (cwiederer@worldbank.org). The other authors included Professor Lauri Ojala (Turku School of Economics, University of Turku; lauri.ojala@utu.fi), Ben Shepherd (Principal, Developing Trade Consultants; ben@developing-trade.com), Anasuya Raj (anasuya.raj14@gmail.com), Karlygash Dairabayeva (kdairabayeva@worldbank.org), and Tuomas Kiiski (tmmkii@utu.fi).

The authors thank Michele Ruta and Luis Blancas, the peer reviewers of the report, and other colleagues at the World Bank who provided guidance and inputs to the 2018 edition, including Cordula Rastogi, Daniel Saslavsky, Fannie Delavelle, Stéphane Hallegatte, Andrew Burns, and Inès Zabalbeitia Mugica. As in previous years, a team at Communications Development—led by Bruce Ross-Larson—designed, edited, and typeset the report.

The Logistics Performance Index (LPI) survey would not have been possible without the support and participation of the International Federation of Freight Forwarders Associations (www.fiata.com), especially of Marco Sorgetti, FIATA's former Director General, as well as Hans Günther Kersten, FIATA's current Director General. National freight forwarding associations and a large group of small, medium, and large logistics companies worldwide were instrumental in disseminating the survey. The survey was designed with Finland's Turku School of Economics, University of Turku (www.utu.fi/en), which has worked with the World Bank to develop the concept since 2007.

The authors are also grateful to external colleagues for their support and contributions in reaching out to forwarding associations and providing inputs for the report, including Ruth Banomyong (Thammasat University, Thailand), Tapio Naula (Oman Logistics Center), and Cesar Lavalle (ILOS Brazil). Daniel Cramer of BlueTundra.com designed, developed, and maintained the LPI survey and result websites under the guidance of the core team. Scott Johnson from the World Bank Information Solutions Group helped the team distribute the survey.

The authors thank the hundreds of employees of freight forwarding and express carrier companies around the world who responded to the survey. Their participation was central to the quality and credibility of the project, and their continuing feedback will be essential as we develop and refine the survey and the LPI in years to come.

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Aggregate LPI ranking and scores, 2012–18

This year's edition of *Connecting to Compete* features the aggregated 2012–18 results. The methodology is included in appendix 1. The 2018 single-year results can be found in appendix 2.

Economy	Mean rank	Mean LPI score, 2012–18	% of highest performer	Economy	Mean rank	Mean LPI score, 2012–18	% of highest performer	Economy	Mean rank	Mean LPI score, 2012–18	% of highest performer
Germany	1	4.19	100.0	Bulgaria	57	3.00	71.7	Moldova	113	2.52	60.1
Netherlands	2	4.07	97.2	Botswana*	58	2.96	70.7	Comoros	114	2.51	60.1
Sweden	3	4.07	97.2	Kuwait	59	2.96	70.6	Guatemala	115	2.51	59.9
Belgium	4	4.05	96.9	Egypt, Arab Rep.	60	2.95	70.5	Armenia	116	2.51	59.9
Singapore	5	4.05	96.6	Malta	61	2.94	70.3	Uzbekistan	117	2.50	59.7
United Kingdom	6	4.01	95.7	Argentina	62	2.93	70.0	Zambia*	118	2.49	59.4
Japan	7	3.99	95.3	Kenya	63	2.93	69.9	Togo	119	2.48	59.4
Austria	8	3.99	95.2	Philippines	64	2.91	69.6	Lao PDR	120	2.48	59.2
Hong Kong SAR, China	9	3.96	94.6	Rwanda	65	2.90	69.3	Nepal	121	2.45	58.6
United States	10	3.92	93.7	Côte d'Ivoire	66	2.89	69.0	Guyana	122	2.45	58.6
Denmark	11	3.92	93.6	Tanzania*	67	2.88	68.8	Azerbaijan*	123	2.45	58.5
Finland	12	3.92	93.5	Serbia	68	2.83	67.7	Georgia	124	2.45	58.5
Switzerland	13	3.91	93.4	Ukraine	69	2.83	67.5	Cameroon	125	2.43	58.1
United Arab Emirates	14	3.89	92.8	Ecuador	70	2.82	67.4	Djibouti	126	2.43	58.1
France	15	3.86	92.2	Colombia	71	2.81	67.1	Trinidad and Tobago*	127	2.41	57.5
Luxembourg	16	3.84	91.8	Uganda*	72	2.79	66.7	Guinea-Bissau	128	2.40	57.4
Canada	17	3.81	90.9	Brunei Darussalam*	73	2.78	66.5	Mongolia	129	2.40	57.3
Spain	18	3.78	90.3	Peru	74	2.78	66.5	Sudan	130	2.40	57.3
Australia	19	3.77	90.0	Uruguay	75	2.78	66.4	Ethiopia*	131	2.40	57.2
Norway	20	3.74	89.3	Jordan	76	2.78	66.3	Kyrgyz Republic	132	2.38	57.0
Italy	21	3.73	89.2	Kazakhstan	77	2.77	66.2	Congo, Rep.	133	2.38	56.7
New Zealand	22	3.68	88.0	Bosnia and Herzegovina	78	2.76	65.8	Fiji	134	2.37	56.7
Korea, Rep.	23	3.65	87.3	Costa Rica	79	2.74	65.4	Venezuela, RB	135	2.37	56.5
Taiwan, China	24	3.65	87.2	Namibia*	80	2.73	65.1	Bolivia	136	2.36	56.5
Ireland	25	3.63	86.8	Iran, Islamic Rep.*	81	2.71	64.8	Madagascar	137	2.35	56.1
Czech Republic	26	3.62	86.4	Lebanon	82	2.71	64.7	Gambia, The*	138	2.34	56.0
China	27	3.60	86.1	Paraguay	83	2.70	64.6	Myanmar	139	2.34	55.9
Portugal	28	3.56	85.1	Malawi*	84	2.69	64.3	Chad	140	2.34	55.9
South Africa	29	3.51	83.8	Russian Federation	85	2.69	64.2	Senegal	141	2.34	55.8
Qatar	30	3.50	83.7	Dominican Republic	86	2.68	64.1	Turkmenistan*	142	2.34	55.8
Poland	31	3.50	83.5	Morocco*	87	2.67	63.8	Congo, Dem. Rep.	143	2.33	55.6
Hungary	32	3.41	81.5	El Salvador	88	2.66	63.6	Papua New Guinea	144	2.31	55.2
Israel*	33	3.39	81.0	Cambodia	89	2.66	63.5	Guinea	145	2.30	54.9
Thailand	34	3.36	80.2	Bahamas, The	90	2.65	63.3	Liberia	146	2.29	54.7
Malaysia	35	3.34	79.9	Mauritius*	91	2.65	63.3	Tajikistan	147	2.29	54.6
Estonia	36	3.30	78.8	Sri Lanka*	92	2.65	63.2	Niger	148	2.29	54.6
Turkey	37	3.29	78.6	Benin	93	2.65	63.2	Yemen, Rep.*	149	2.27	54.3
Iceland	38	3.29	78.6	Montenegro	94	2.65	63.2	Central African Republic*	150	2.26	54.0
Slovenia	39	3.29	78.5	Pakistan	95	2.64	62.9	Bhutan	151	2.25	53.7
Chile	40	3.28	78.4	Burkina Faso	96	2.63	62.9	Cuba	152	2.23	53.4
Panama	41	3.26	77.8	Maldives	97	2.63	62.8	Lesotho	153	2.22	53.0
India	42	3.22	77.0	Albania*	98	2.62	62.5	Burundi	154	2.22	53.0
Lithuania	43	3.20	76.4	Macedonia, FYR	99	2.62	62.5	Libya	155	2.21	52.9
Greece	44	3.19	76.2	Bangladesh*	100	2.60	62.0	Equatorial Guinea*	156	2.21	52.7
Vietnam	45	3.16	75.5	Ghana	101	2.60	62.0	Mauritania	157	2.20	52.5
Oman	46	3.16	75.5	Mozambique*	102	2.59	61.9	Gabon	158	2.19	52.3
Slovak Republic	47	3.14	75.0	Nigeria	103	2.59	61.8	Iraq	159	2.18	52.2
Croatia	48	3.12	74.4	Tunisia	104	2.59	61.8	Angola	160	2.18	52.1
Cyprus	49	3.10	74.0	São Tomé and Principe	105	2.56	61.3	Zimbabwe	161	2.17	51.8
Romania	50	3.10	74.0	Honduras	106	2.56	61.2	Eritrea	162	2.11	50.4
Indonesia	51	3.08	73.6	Algeria	107	2.56	61.1	Syrian Arab Republic	163	2.10	50.2
Saudi Arabia	52	3.08	73.6	Nicaragua*	108	2.56	61.0	Sierra Leone*	164	2.06	49.3
Mexico	53	3.08	73.6	Mali*	109	2.55	60.9	Afghanistan	165	2.04	48.7
Bahrain	54	3.06	73.2	Belarus	110	2.54	60.6	Haiti	166	2.02	48.3
Latvia	55	3.02	72.3	Jamaica	111	2.52	60.3	Somalia*	167	2.00	47.7
Brazil	56	3.02	72.1	Solomon Islands	112	2.52	60.2				

* Countries with missing values for one or two editions. For details, see appendix 1.

Summary and key findings

This sixth edition of *Connecting to Compete,* the Logistics Performance Index (LPI) report, presents the latest worldwide view on trade logistics performance across more than 160 countries as seen by logistics professionals. This biennial information on logistics infrastructure, service provision, cross-border trade facilitation, and other aspects is invaluable for policy makers, traders, and a wide audience of other stakeholders, including researchers and teachers.

The LPI survey data provide numerical evidence on how easy or difficult it is in these countries to transport general merchandise—typically manufactured products in unitized form. The six main indicators of the international part of the LPI summarize on a five-point scale the assessments of logistics professionals worldwide trading with the country.

The domestic part of the LPI indicates the quality and availability of key logistics services within a country, but due to the small number of responses, these data are more informative in comparisons by region or income group.

Logistics is understood as a network of services that support the physical movement of goods, trade across borders, and commerce within borders. It comprises an array of activities beyond transportation, including warehousing, brokerage, express delivery, terminal operations, and related data and information management.

The global turnover generated by these networks exceeds US$4.3 trillion, so a better understanding of their operation is no trivial issue.[1] For individual countries, logistics performance is key to economic growth and competitiveness. Inefficient logistics raises the cost of doing business and reduces the potential for both international and domestic integration. The toll can be particularly heavy for developing countries trying to compete in the global marketplace.

Logistics performance matters

Not surprisingly, an effective logistics sector is now recognized almost everywhere as one of the core enablers of development. Previous editions of *Connecting to Compete* have highlighted how implementing better policies leads to better logistics performance. Such policies cover, for example, regulating services; providing transportation infrastructure; implementing controls, especially for international goods; and raising the quality of public–private partnerships (PPPs).

The policy focus has evolved since 2007, when the first LPI report was published. Initially, logistics policies tended to concentrate on facilitating trade and removing border bottlenecks. Today, international logistics is increasingly intertwined with domestic logistics. Policy makers and stakeholders deal with a wide range of policies. Growing concerns include spatial planning; skills and resources for training; the environmental, social, and economic sustainability of the supply chain; and the resilience of the supply chain to disruption or disaster (physical or digital).

Gaps in logistics performance persist

Overall, the score profile of the entire set of more than 160 countries has remained similar since the 2007 edition, an indication of the robust nature of underlying data.[2] The modest convergence of scores from 2007 to 2014 was explained in the 2014 edition by a perceived improvement in the trade-supporting infrastructure of low- and middle-income countries and, to less extent, in their logistics services and customs and border management. This

Countries that have traditionally dominated the supply chain industry occupy the top 10 rankings: eight in Europe plus Japan and Singapore

explanation appeared largely valid for most countries being ranked. In 2016, however, the gap seemed to widen between the top and the bottom, with the highest average scores ever for the top 10 countries (4.13 on a scale from 1 to 5) and the lowest scores since 2007 for countries at the bottom (1.91; table S.1).

In 2018, the gap between top and bottom performers narrowed again. The average score for the top 10 countries dropped to 4.03, whereas the bottom 10 countries scored an all-time high of 2.08 (figure S.1).

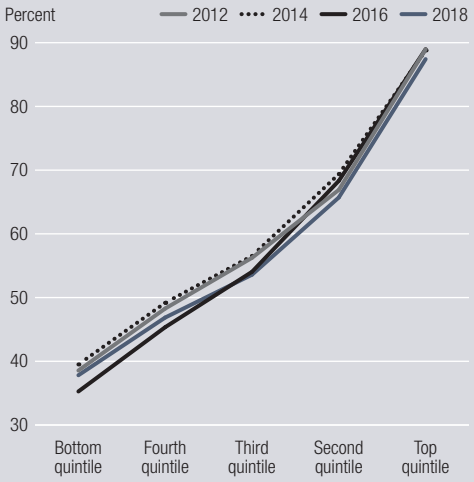
High-income countries occupied the top 10 rankings in 2018,[3] eight in Europe plus Japan and Singapore—countries that have traditionally dominated the supply chain industry. Germany is at the top, scoring 4.20. The scores of the following nine countries are in a tight interval, with Sweden in 2nd with a score of 4.05 and Finland in 10th with a score of 3.97.

The bottom 10 countries are mostly low-income and lower-middle-income countries in Africa or isolated areas. Some are fragile economies affected by armed conflict, natural disasters, and political unrest. Others are landlocked countries naturally challenged by geography or economies of scale in connecting to global supply chains. Afghanistan ranks 160th with a score 1.95, preceded by Angola (2.05), Burundi (2.06), and Niger (2.07).

Among the lower-middle-income countries, large economies such as India (44th with a score of 3.18) and Indonesia (46th with a score of 3.15) and emerging economies such as Vietnam (39th with a score of 3.27) and Côte d'Ivoire (50th with a score of 3.08) stand out as top performers. Most of these countries either have access to sea or are located close to major transportation hubs.

The composition of the top-performing upper-middle-income economies has changed marginally, with China (26th with a score of 3.61), Thailand (32nd with a score of 3.41), and South Africa (33rd with a score of 3.38) leading the group. Romania, Croatia, and Bulgaria also improved their rankings. Among low-income countries, those in East and West Africa lead in this year's edition.

Figure S.1 LPI score as a percentage of the highest score by quintile average, 2012, 2014, 2016, and 2018



Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

Supply chain reliability and service quality are strongly associated with logistics performance

Supply chain reliability is key to logistics performance. In a global environment, consignees require a high degree of certainty as to when and how deliveries will take place. Reliability is typically much more important than speed, and many shippers are willing to pay a premium. In other words, supply chain predictability is a matter not just of time and cost, but also a component of shipment quality (figure S.2).

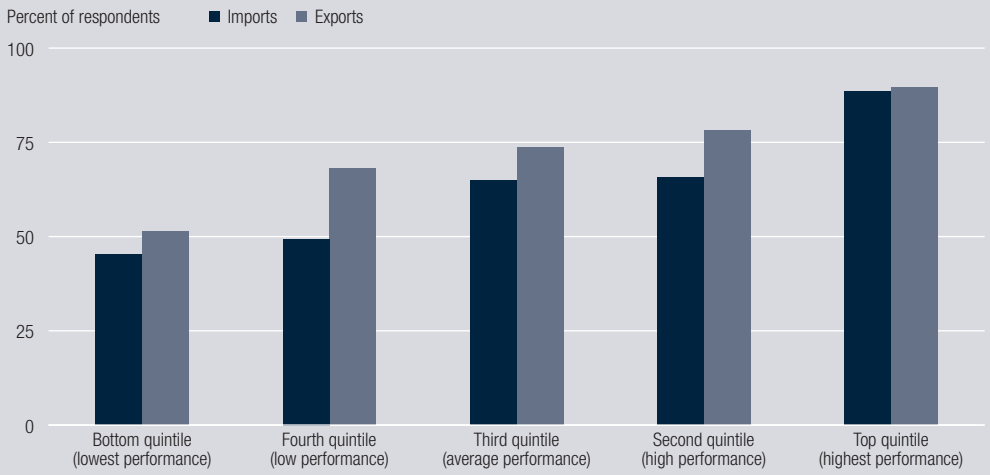
Table S.1 Top 10 average and lowest 10 average LPI scores, 2007–18

1=lowest; 5=highest

	2007	2010	2012	2014	2016	2018
Top 10 average	4.06	4.01	4.01	3.99	4.13	4.03
Lowest 10 average	1.84	2.06	2.00	2.06	1.91	2.08

Source: Logistics Performance Index 2007, 2010, 2012, 2014, and 2016.

Figure S.2 **Respondents reporting that shipments are "often" or "nearly always" cleared and delivered as scheduled, by LPI quintile**



Source: Logistics Performance Index 2018.

For the first time, the perceived improvement in infrastructure quality is higher in the bottom quintile than in the top

In the top LPI quintile, just 13 percent of shipments fail to meet company quality criteria—the same proportion as in 2014 and 2016. By comparison, two to three times as many shipments in the two bottom quintiles fail to meet these criteria, and quality criteria in low-performing countries tend to be less rigid than in high-performing ones. This finding illustrates the persistence of the logistics gap from an overall perspective of supply chain efficiency and reliability.

The differing pace of progress is also seen in the ratings of domestic trade and transport infrastructure, where respondents were asked to assess how much these have improved since 2015.

As in previous surveys, satisfaction with infrastructure quality varies by infrastructure type. For the first time, however, the perceived improvement is higher in the bottom quintile than in the top, although the difference is weaker in the middle of the distribution.

Respondents in all LPI quintiles are highly satisfied with information and communications technology (ICT) infrastructure. The infrastructure gap continues to narrow, particularly between the top and the bottom, where the rate of improvement seems noticeably faster. Improvement in the middle quintiles is on a par with what has been observed previously. In contrast to ICT, rail infrastructure continues to elicit general dissatisfaction.

Similar patterns emerge when the domestic LPI data on infrastructure are disaggregated by World Bank region, excluding high-income countries. ICT is rated at the top or very close to the top in all regions.

Delivering good quality services is key to successful operations, and its importance is growing

The LPI has shown that service quality drives logistics performance in practically all economies. Yet developing advanced services, such as third-party or fourth-party logistics, requires following a complex policy agenda, partly because such services cannot be created from scratch or developed purely domestically. In logistics-friendly countries, manufacturers and traders already outsource much of their basic logistics operations to third-party providers and focus on pursuing their core business while managing more complex supply chains issues. This handoff is reciprocal: the more that such advanced services are available at a reasonable cost, the more shippers will outsource their logistics. But the less that reliable and comprehensive services are available, the more shippers will handle logistics in house.

The 2018 LPI survey confirms that demand for sustainable supply chain management goes hand in hand with logistics performance

Logistics services are provided under very different operational environments globally. In a pattern recurring across years, the quality of the services that logistics firms provide is often perceived as better than the quality of the corresponding infrastructure that they operate. This may be explained partly by who the respondents are—freight forwarders and logistics firms rating their own services.

In a pattern seen across LPI editions, operations that support international trade, such as air and maritime transport and supporting services, tend to receive high scores even when infrastructure bottlenecks exist. Railroads, on the other hand, have low ratings almost everywhere. Low-income countries score poorly on road freight and warehousing.

Service quality can differ substantially at similar levels of perceived infrastructure quality. Even high-quality "hard" infrastructure cannot substitute for operational excellence, based on "soft" infrastructure such as professional skills and smooth business and administrative processes.

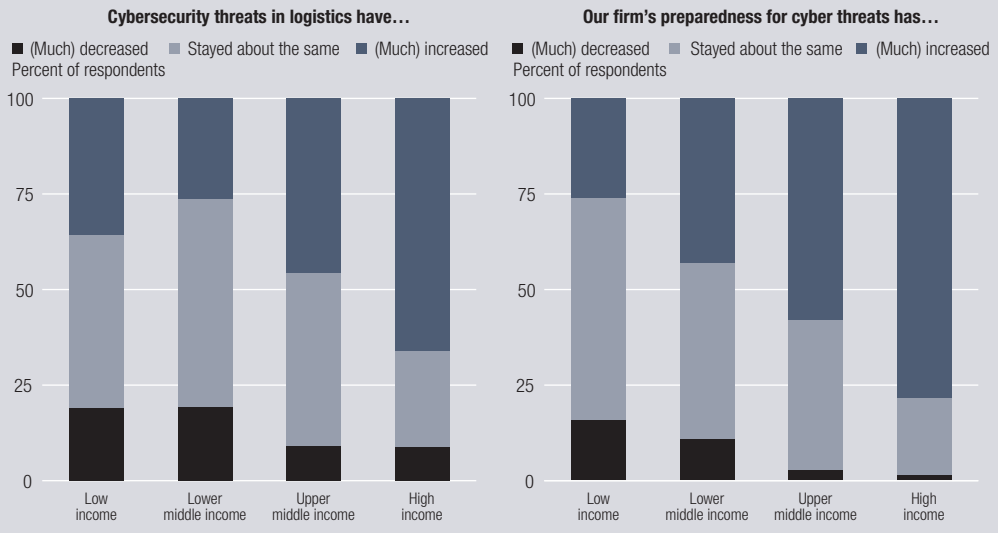
Supply chain resilience and sustainability are emerging concerns

The resilience of international and domestic supply chains has emerged as a growing policy concern worldwide. Resilience is understood as the ability of an organization (or a country) to recover from severe disruptions, whether human caused or natural. For 2018, the LPI survey included a question on cybersecurity resilience. The perceived magnitude of cyberthreats and preparedness to mitigate their effects go hand in hand (figure S.3). Developing countries lag far behind high-income countries in both.

The 2018 LPI survey confirms that demand for sustainable supply chain management goes hand in hand with logistics performance. This is especially true for environmentally sustainable services (green logistics). In the top quintile of LPI performers, 28 percent of respondents indicated that shippers often or nearly always ask for environmentally friendly options. In the second-highest quintile, the share drops to 14 percent, and it falls steadily in the third (9 percent), fourth (7 percent) and fifth (5 percent) quintiles.

This trend is in line with the increasing number of global and national commitments to reduce freight- and logistics-related greenhouse gases, particulate matter, and other harmful emissions. Regulatory changes have been implemented in all transport modes, and the international targets for 2030 and 2050, for example, are ever more challenging.

Figure S.3 **Cybersecurity threats and preparedness by income**



Source: Logistics Performance Index 2018.

Pushing the envelope of implementation

Implementation of effective policies to improve logistics performance is at least as challenging today as in 2007—for two reasons. First, the scope of implementation has widened from the traditional focus on infrastructure and trade facilitation. Sustainability and resilience receive more attention, and not only by developed countries, as do skills development and training, spatial dimensions of logistics, and the specificity of the regulatory and legal framework. In addition to these emerging fields, regulatory reforms of the logistics services sectors are critical but remain challenging to implement in many developing countries. Regulatory improvements aim to improve the quality of service delivery, building on market mechanisms and private sector participation, in the sectors that constitute the core of logistics activities, such as trucking, brokerage, and terminal or warehousing operations. The broad and cross-cutting logistics agenda challenge policy makers to make sense of which policy measures are needed, when, and using what resources.

Second, most reforms involve more than one agency and many stakeholders, slowing implementation, or even reversing it if cooperative mechanisms are not sustainable. This problem is well-known in developing countries for transport (for example, transport corridors) and trade facilitation (for example, single-window trade facilitation).

For consistent and broad reforms and improvements, countries must deal with this complexity. But countries in the middle and lower tiers of performance are deterred by weaker coordination mechanisms and private sector constituencies than countries with modern and innovative logistics sectors. Even though logistics services are provided overwhelmingly by the private sector, public sector actors and institutions play an essential role, without which logistics competitiveness is unlikely to improve.

Administrative reforms can be rapid when countries with a strong political will align their efforts. In some cases, soft reforms in facilitation of trade and transport were implemented with considerable impact even before hard infrastructure projects were completed. The soft reforms provided a higher and quicker return on investment than hard infrastructure. Examples can be found in low- and middle-income countries such as India, Lao PDR, Southern African countries, and Vietnam and in high-income countries such as Oman. Unfortunately, performance may be degraded by governance weaknesses and economic and social turmoil, as for some Arab countries in the 2016 and 2018 LPI reports. Low-performing countries with serious governance challenges (conflict-ridden or postconflict countries and fragile states) are the most in need of attention from their neighbors and the international community.

Ultimately, countries that introduce far-reaching changes appear to be those that treat logistics as integral to the economy. They tend to combine policy perspectives, such as regulatory reform, trade facilitation, and trade and investment planning. Seamless interagency coordination and, above all, strong public–private dialogue characterize the top performers. They offer very positive examples of coordinating and facilitating logistics bodies, some of them public–private institutions such as the most famous one, the Dutch Dinalog.

Countries that introduce far-reaching changes appear to be those that treat logistics as integral to the economy

Influence of the Logistics Performance Index

Since its inception in 2007, the *Connecting to Compete* report providing LPI ratings has moved trade logistics firmly onto the policy agenda, even for countries that had not previously considered them. LPI results have also been used in many policy reports and documents prepared by multilateral organizations or the consultants they have engaged. The findings provide a worldwide general benchmark for the logistics industry and for logistics users.

LPI results have been embraced by the academic community, as evidenced by the widespread use of LPI data in research reports, journal articles, and textbooks. The results have also been used in teaching, and thousands of theses at all levels have cited the LPI.

Using LPI data requires caution, because they are based on a web-based survey aggregating the views of the worldwide logistics and freight-forwarding community. To avoid overly simplistic conclusions, section 1 of *Connecting to Compete* presents detailed instructions on how to use—and how not to use—LPI data for various purposes.

* * *

Logistics performance is based largely on reliable supply chains and predictable service delivery for traders. Global supply chains are becoming more and more complex. Ever more demanding regulatory requirements for traders and operators are motivated by safety, social, environmental, and other reasons. Efficient management and information technology solutions in both the private and public sectors are tools for high-quality logistics. National competitiveness depends on the ability to manage logistics in today's global business environment.

More than ever, comprehensive reforms and long-term commitments are needed from policy makers and private stakeholders. The current LPI data provide a unique and updated reference for better understanding the impediments to trade logistics worldwide and for informing policy making and business decisions.

SECTION 1

The 2018 Logistics Performance Index

This is the sixth edition of *Connecting to Compete,* the biennial Logistics Performance Index (LPI) report. Global logistics is often referred to as the "physical internet," as it was in the initial 2007 LPI report. Logistics is a network of services that support the physical movement of goods, trade across borders, and commerce within borders. Logistics encompasses an array of activities beyond transportation, including warehousing, brokerage, express delivery, and critical infrastructure services such as terminals. Competing international networks of increasingly multiservice logistics providers offer ever more diversified solutions for trade, commerce, and manufacturing. Indeed, the annual turnover generated by these global networks exceeds US$4.3 trillion.[4]

The role of logistics in the global economy is better recognized today than it was 10 years ago. Good logistics services reduce the cost of trade. Logistics performance is about how efficiently supply chains connect firms to domestic and international opportunities. The LPI tries to capture how logistically accessible, or how well connected to the physical internet of global logistics, a country is. It includes several dimensions that will be developed in this report.

Logistics is business to business (B2B): its activities are executed primarily by private companies for private companies. For this reason, the LPI relies directly on the knowledge of logistics professionals worldwide (box 1.1). But the performance of logistics in each economy depends on the public sector's interventions and policies—that was the main message of the initial 2007 LPI report, and it remains true today. Public features include regulation; transportation infrastructure; the implementation of controls, especially for international goods (as in trade facilitation); and the quality of public–private partnership and dialogue. Previous *Connecting to Compete* reports have emphasized that better policies lead to better logistics performance.

Since the LPI was launched, gaps in performance have persisted between low-performing countries and high-performing ones, mostly in Europe and East Asia, where logistics has developed into an important service sector. The importance of logistics-related policies in enhancing performance is more recognized today than in 2007, and the policy focus has evolved. Initially, logistics policies focused on trade facilitation and removal of border bottlenecks. Today, such international logistics issues are difficult to separate from domestic ones. And policy makers and stakeholders deal with a wider range of policies, increasingly with safety and sustainability in mind. Emerging policy concerns include spatial planning, greening the supply chain, and bolstering the resilience of the supply chain to disruption or disasters (physical or digital) (see section 3). And skills and training resources have recently received more attention.

The growing scope of logistics performance and increasing recognition of its contribution to growth and economic integration call for holistic policies. More and more countries, especially emerging economies, see logistics as a sector of the economy requiring consistent policy making that cuts across traditional logistics areas. Previous LPI reports have referred to many countries having set up national strategies or dedicated organizations advancing logistics, such as Canada, China, France, Indonesia, Morocco, the Netherlands, and Thailand. For the 2018 edition, the examples include Oman (see box 3.3 in section 3) and India, which in 2017 set up a dedicated logistics body under a Special Secretary.

Box 1.1 **The six components of the international Logistics Performance Index**

The World Bank's Logistics Performance Index (LPI) analyzes countries through six indicators:

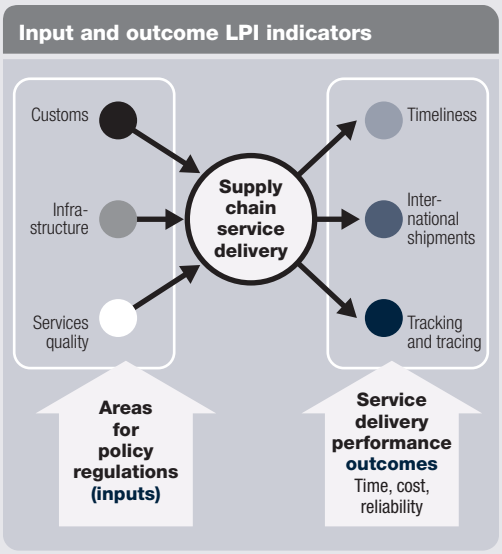
1. The efficiency of customs and border management clearance.
2. The quality of trade- and transport-related infrastructure.
3. The ease of arranging competitively priced international shipments.
4. The competence and quality of logistics services.
5. The ability to track and trace consignments.
6. The frequency with which shipments reach consignees within the scheduled or expected delivery time.

The components were chosen based on theoretical and empirical research and on the practical experience of logistics professionals involved in international freight forwarding. The figure maps the six LPI indicators onto two main categories:

- Areas for policy regulation, indicating main inputs to the supply chain (customs, infrastructure, and services).
- Supply chain performance outcomes (corresponding to LPI indicators of time, cost, and reliability—timeliness, international shipments, and tracking and tracing).

The LPI uses standard statistical techniques to aggregate the data into a single indicator (see appendix 5 for a detailed description of how the LPI is calculated).[a] This single indicator can be used to compare countries, regions, and income groups.

Because operators on the ground can best assess the vital aspects of logistics performance, the LPI relies on an online survey of logistics professionals from the companies responsible for moving goods around the world: multinational freight forwarders and the main express carriers. Freight forwarders and express carriers are best positioned to assess how countries perform. Their views matter because they directly affect the choice of shipping routes and gateways, thereby influencing the decisions of firms to locate production, choose suppliers, and select target markets. Their participation is thus central to the LPI's quality and credibility.



See the 2018 LPI questionnaire at www.worldbank.org/lpi.

a. In all six editions of the LPI (2007, 2010, 2012, 2014, 2016, and 2018), statistical aggregation has produced an overall index close to the simple average of country scores across the six LPI components.

Guidelines on how to use the LPI and how to interpret it

Since 2007, LPI findings have become standard reference material in numerous studies and policy papers on trade logistics. The LPI has been adopted by several countries as a key performance indicator in their national transport or logistics strategies. It is also used as a subset of transport or logistics key performance indicators by the European Union, the Association of Southeast Asian Nations, Asia-Pacific Economic Cooperation, and others. (See more in box 3.1 in section 3). This makes it important to highlight how best to use the LPI and its indicators to avoid possible misinterpretations (box 1.2).

First, LPI data are gathered through a worldwide survey of logistics professionals on how easy or difficult they experience trade logistics along six generic dimensions when dealing with eight preselected countries (see box 1.1 and the LPI methodology in appendix 5). As a survey, the LPI is subject to sampling error, diverging opinions of the respondents, and variation of the respondent base from one LPI report to the next. The number of evaluations received per country may also vary a lot.

So, it is important to check the confidence interval (CI) of a country's LPI scores before making any deeper judgment: the narrower the CI, the more reliable the score. Large traders, such as China, Germany, the United Kingdom, and the United States, tend to have a CI at 0.05 score points or below, which is about 1 percent or less of their scores. By contrast, some smaller traders' CIs are often closer to 0.5 score points, which may be more than 15 percent of their

Box 1.2 **How precise are LPI scores and ranks?**

Although the LPI and its components now offer the most comprehensive and comparable data on country logistics and trade facilitation environments, they have a limited domain of validity because of the limited experience of survey respondents and, for landlocked countries and small island states, the dependence of their logistics on the logistics of other countries.

To account for the sampling error created by the LPI's survey-based dataset, LPI scores are presented with approximate 80 percent confidence intervals (see appendix 5). These intervals yield upper and lower bounds for a country's LPI score and rank. Upper bounds for LPI ranks are calculated by increasing a country's LPI score to its upper bound while maintaining all other country scores constant and then recalculating LPI ranks. An analogous procedure is adopted for lower bounds.

Confidence intervals must be carefully examined to determine whether a change in score or a difference between two scores is statistically significant. An improvement in a country's performance should be considered statistically significant only if the lower bound of its 2018 LPI score exceeds the upper bound of its 2016 score. Because of the LPI's limited domain of validity and the need for confidence intervals to account for sampling error, a country's exact ranking might be less relevant to policy makers than its proximity to others in a wider performance group or its statistically significant improvement. Still, a close examination of the distribution of changes in ranking indicates that they have behaved similarly across all six editions of the index.

To provide a bigger, better-balanced picture of country performance, this report publishes the current 2018 results alongside a composite score of the four latest surveys (2012–18). This approach reduces the noise and random variation from one LPI survey to another and enhances the comparison of aggregate scores for the 167 countries in the 2018 edition. In the aggregate data for the four latest LPI surveys, 41 countries scored 70 percent or more of the top performer's score. For these, the average difference per rank position was 0.023 score points. For the next 61 countries scoring 50–69 percent of the top performer's score and occupying ranks 42–102, the average difference per rank was 0.016 score points. This means that countries at similar performance levels may have substantially different ranks, especially in the middle range.

scores. Changes can be statistically significant only if the CIs for the scores of two consecutive years do not overlap.

Second, the overall LPI score is a more telling indicator than the LPI rank, because scores are more accurate and provide a better basis for comparison over time. Especially for countries ranked in the middle range, scores may differ little even if rank positions can be quite far apart: for example, Egypt, ranked 60th, and Bangladesh, ranked 100th, both fall within 0.36 score points, an interval where the average difference per country is only 0.0088 score points. Thus, the fluctuation in a country's rank from one LPI report to the next may appear much larger than the actual change in its score.

For this reason, the 2018 LPI uses the weighted average LPI score as the primary indicator, taking away much of the oscillation in scores from one LPI to another. The weighted average values of the four most recent LPI surveys were provided in appendix 4 in the 2014 and 2016 LPI reports, too. Using the aggregate values and following their development over time provides a more balanced picture of a country's logistics performance than relying solely on single-year data. For El Salvador, for instance, with aggregate values, the maximum interval of both score (0.18 score points) and rank changes (20 rank positions) are about half of what they are with single-year scores and ranks (0.38 score points and 37 rank positions) in the interval covering the LPI reports in 2012, 2014, 2016, and 2018.

Third, the direction of trade in the international LPI is important to the countries being evaluated. In addition, the traded products covered could be labeled "general merchandise," so the responses provide less information on goods that require specific care, such as pharmaceuticals, food, and those labeled as dangerous. Furthermore, the respondents are freight forwarders, express carriers, and logistics providers (by road, rail, shipping, and air transport).

Consequently, manufactured products transported in unitized form make up the core of trade covered, where freight forwarders are typically used as intermediaries. Trade of large volumes of raw materials and energy products handled in bulk (such as ores, grain, oil, and gas) is not covered well in the LPI. Such large-volume trade uses either direct industry buyer–seller channels or another type of intermediaries, such as commodity traders or shipping brokers.

The LPI is best used as a snapshot of where a country stands on logistics, and it can serve as an entry point to a more comprehensive assessment of a country's logistics performance

Fourth, especially in poor countries, traditional operators often play a larger role in trade arrangements than international freight forwarders. Traditional and international operators may differ in their interactions with government agencies, and in their service levels. In developing countries, international networks tend to serve large companies, which may have significantly different service level criteria for time, cost, and other aspects from traditional trading networks.

Fifth, for most landlocked countries and small island states, the LPI might reflect access problems outside the country assessed, such as transit difficulties. The rating of a landlocked country might not adequately assess its trade facilitation reform efforts, because their success depends on international transit routes through its neighbors.

In summary, individual country data—especially rank positions tracked from one LPI report to the next—should preferably not be used as the sole indicator, but should be considered in combination with scores, while also keeping the size of the CI in mind. Using the weighted aggregate score and rank data that rely on the four latest LPI ratings is also a good idea, as they provide a more balanced picture. Furthermore, very few improvements in a country's operational or regulatory environment immediately affect the global freight forwarding and logistics professionals view on that country. However, some negative developments, such as a devastating natural catastrophe or an outbreak of a serious and wide-spread armed conflict may impact a country's ratings more quickly than any positive changes. Put differently: positive changes tend to take more time, while some (extreme) negative ones might have a more sudden impact.

The LPI has been effective at galvanizing interest in and making the case for reform in several countries. It is best used as a snapshot of where a country stands on logistics, and it can serve as an entry point to a more comprehensive assessment of a country's logistics performance. This can entail, for instance, assessments of the different transport modes (road, rail, air, maritime, and inland shipping), internal logistics, dwell time studies, and an assessment of professional skills and training in the logistics sector.

Features of the 2018 survey

The 2018 LPI survey employed the same methodology as the previous five editions of Connecting to Compete: a standardized questionnaire with two parts, international and domestic. In the international questionnaire, respondents evaluate six indicators of logistics performance in up to eight of their main overseas partner countries (see box 1.1 for the six indicators). In the domestic questionnaire, respondents are asked to provide qualitative and quantitative data for the logistics environment in the country where they work.

In 2018, almost 6,000 country assessments were made by logistics professionals. This edition covers 160 countries in the international LPI and 100 countries in the domestic LPI. The report provides new insights on cybersecurity threats in logistics and the use of electronic trading platforms by shippers.

Given that the LPI captures a broad range of factors affecting performance, the results show clear benefits, particularly for developing countries, in moving forward on a broad range of fronts to improve logistics. Evidence suggests that improvements in logistics performance boost the integration of countries in global trade (box 1.3).

Key findings of the 2018 international Logistics Performance Index

Over the past several years, high-income countries, most of which are in Europe, occupied the top 10 positions in the LPI rankings (table 1.1). Not surprising, since these countries traditionally have been dominant in the supply chain industry.

The composition of the 15 best-performing countries has not significantly changed either. But it is worth highlighting major improvements in the LPI scores of Japan, Denmark, the United Arab Emirates, and New Zealand since 2012.

Box 1.3 **Logistics performance boosts trade integration, but by just how much?**

The LPI has now been available for several years, which makes it possible to estimate a trade model using more than one year of data. The approach controls for unobservable and observable factors that vary by country and time, as well as by country pair, and isolates the impact of logistics performance.

Shepherd (forthcoming) implements such an approach using data for 63 exporters and importers that together account for 93 percent of world GDP and a similar proportion of world trade. Regression results show that a 1 point improvement in a country's LPI score increases trade by 16 percent, before accounting for relative price effects.

He then uses the same model to consider a catch-up scenario, in which all countries narrow the logistics gap between themselves and the leading country by 20 percent, but all other factors remain constant. Total world real GDP (a proxy for economic welfare) would increase by 0.1 percent. Trade effects would be an order of magnitude larger. In relative terms, the largest welfare gains are typically in developing countries such as Cambodia (0.7 percent), Costa Rica (0.4 percent), and Tunisia (0.4 percent). All these welfare impact figures are lower bounds, since they do not take into account intersectoral linkages in production, which are known to produce substantially higher results.

Source: Shepherd forthcoming.

Table 1.1 **Top 10 LPI economies, 2018**

	2018		2016		2014		2012	
Economy	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
Germany	1	4.20	1	4.23	1	4.12	4	4.03
Sweden	2	4.05	3	4.20	6	3.96	13	3.85
Belgium	3	4.04	6	4.11	3	4.04	7	3.98
Austria	4	4.03	7	4.10	22	3.65	11	3.89
Japan	5	4.03	12	3.97	10	3.91	8	3.93
Netherlands	6	4.02	4	4.19	2	4.05	5	4.02
Singapore	7	4.00	5	4.14	5	4.00	1	4.13
Denmark	8	3.99	17	3.82	17	3.78	6	4.02
United Kingdom	9	3.99	8	4.07	4	4.01	10	3.90
Finland	10	3.97	15	3.92	24	3.62	3	4.05

Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

The bottom 10 countries in the ranking are mostly low-income and lower-middle-income countries in Africa or isolated areas (table 1.2). These are either fragile economies affected by armed conflict, natural disasters, and political unrest or landlocked countries naturally challenged by geography or economies of scale in connecting to global supply chains.

The overall group composition among the top-performing upper-middle-income economies has changed marginally, with China, Thailand, and South Africa leading the group, and Croatia and Bulgaria improving in their LPI ranking (table 1.3).

Among lower-middle-income countries, large economies such as India and Indonesia and emerging economies such as Vietnam stand out as top performers. Most either have access to the sea or are located close to major transportation hubs (table 1.4).

Among low-income countries, countries in East and West Africa are leading performers in the 2018 report (table 1.5).

Figure 1.1 displays the cumulative distribution of LPI scores. The vertical lines represent the boundaries of LPI quintiles: five groups containing the same number of countries rated in the LPI. The bottom quintile includes countries with the lowest LPI scores, while the top quintile includes countries with the highest scores. As in past LPI reports, the range of scores in the third and fourth quintiles

Table 1.2 Bottom 10 LPI economies, 2018

	2018		2016		2014		2012	
Economy	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
Afghanistan	160	1.95	150	2.14	158	2.07	135	2.30
Angola	159	2.05	139	2.24	112	2.54	138	2.28
Burundi	158	2.06	107	2.51	107	2.57	155	1.61
Niger	157	2.07	100	2.56	130	2.39	87	2.69
Sierra Leone	156	2.08	155	2.03	na	na	150	2.08
Eritrea	155	2.09	144	2.17	156	2.08	147	2.11
Libya	154	2.11	137	2.26	118	2.50	137	2.28
Haiti	153	2.11	159	1.72	144	2.27	153	2.03
Zimbabwe	152	2.12	151	2.08	137	2.34	103	2.55
Central African Republic	151	2.15	na	na	134	2.36	98	2.57

na is not available.
Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

Table 1.3 Top-performing upper-middle-income economies, 2018

	2018		2016		2014		2012	
Economy	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
China	26	3.61	27	3.66	28	3.53	26	3.52
Thailand	32	3.41	45	3.26	35	3.43	38	3.18
South Africa	33	3.38	20	3.78	34	3.43	23	3.67
Panama	38	3.28	40	3.34	45	3.19	61	2.93
Malaysia	41	3.22	32	3.43	25	3.59	29	3.49
Turkey	47	3.15	34	3.42	30	3.50	27	3.51
Romania	48	3.12	60	2.99	40	3.26	54	3.00
Croatia	49	3.10	51	3.16	55	3.05	42	3.16
Mexico	51	3.05	54	3.11	50	3.13	47	3.06
Bulgaria	52	3.03	72	2.81	47	3.16	36	3.21

Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

Table 1.4 Top-performing lower-middle-income economies, 2018

	2018		2016		2014		2012	
Economy	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
Vietnam	39	3.27	64	2.98	48	3.15	53	3.00
India	44	3.18	35	3.42	54	3.08	46	3.08
Indonesia	46	3.15	63	2.98	53	3.08	59	2.94
Côte d'Ivoire	50	3.08	95	2.60	79	2.76	83	2.73
Philippines	60	2.90	71	2.86	57	3.00	52	3.02
Ukraine	66	2.83	80	2.74	61	2.98	66	2.85
Egypt, Arab Rep.	67	2.82	49	3.18	62	2.97	57	2.98
Kenya	68	2.81	42	3.33	74	2.81	122	2.43
Lao PDR	82	2.70	152	2.07	131	2.39	109	2.50
Jordan	84	2.69	67	2.96	68	2.87	102	2.56

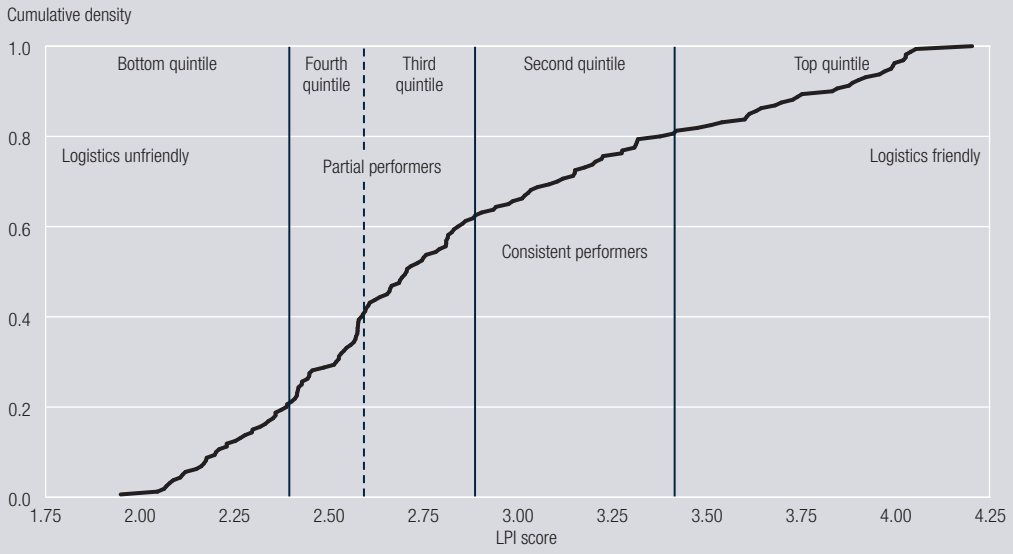
Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

Table 1.5 Top-performing low-income economies, 2018

	2018		2016		2014		2012	
Economy	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**
Rwanda	57	2.97	62	2.99	80	2.76	139	2.27
Benin	76	2.75	115	2.43	109	2.56	67	2.85
Burkina Faso	91	2.62	81	2.73	98	2.64	134	2.32
Mali	96	2.59	109	2.50	119	2.50	na	na
Malawi	97	2.59	na	na	73	2.81	73	2.81
Uganda	102	2.58	58	3.04	na	na	na	na
Comoros	107	2.56	98	2.58	128	2.40	146	2.14
Nepal	114	2.51	124	2.38	105	2.59	151	2.04
Togo	118	2.45	92	2.62	139	2.32	97	2.58
Congo, Dem. Rep.	120	2.43	127	2.38	159	1.88	143	2.21

na is not available.
Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

Figure 1.1 Cumulative distribution of LPI scores, 2018



Source: Logistics Performance Index 2018.

is similar. This means that country LPI scores are closer to each other and that any change in the country's performance (and that of its neighbors) will generate larger changes in the ranking relative to countries in other quintiles (see box 1.2).

As in previous reports, LPI scores are broken down into four categories, consistent with the score quintiles, used in all editions of *Connecting to Compete:*

- *Logistics-unfriendly*: Includes countries with severe logistics constraints, such as the least developed countries (bottom LPI quintile).
- *Partial performers*: Includes countries with a level of logistics constraints most often seen in low- and middle-income countries (third and fourth LPI quintiles).
- *Consistent performers*: Includes countries rated better on logistics performance than most others in their income group (second LPI quintile).

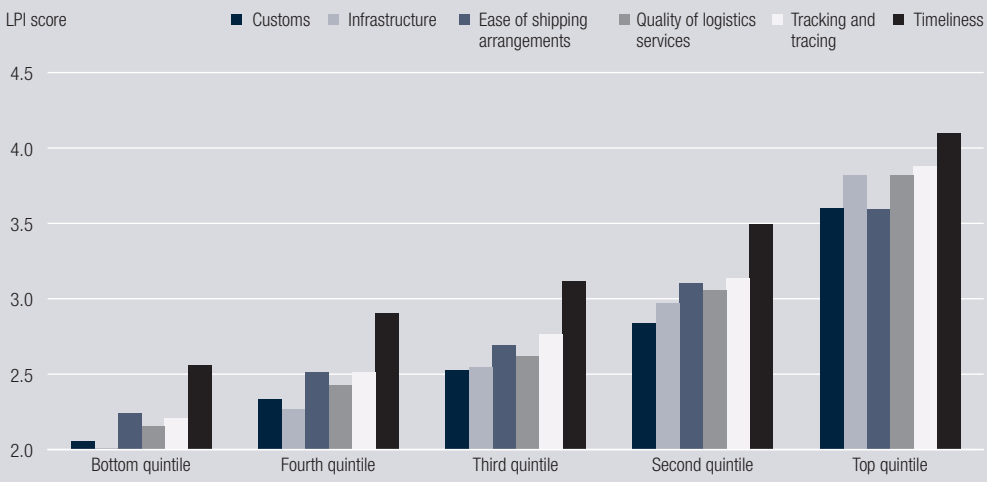
- *Logistics-friendly*: Includes top-performing countries, most of which are in the high-income group (top LPI quintile).

Logistics performance is strongly correlated with the quality of service

Several trends observed in past LPI reports still hold. There are significant differences in LPI performance across LPI components and quintiles (figure 1.2). The timeliness component seems to outperform the other LPI components and is generally viewed as the least problematic. On the other hand, the performance of customs and border agencies, as well as the quality of trade and transport infrastructure, are particularly low in the worst-performing countries, which also have relatively low quality of logistics services.

In addition, table 1.6 shows which of the six LPI components of the international LPI are above or below the overall index. A positive entry indicates that an LPI component score is higher than a group's overall international LPI score, and a negative entry indicates that the component score is lower than the group's overall score. Several observations stand out. Customs and border agencies continue to underperform compared with other LPI components. As in past reports, except for the top quintile, the quality of trade and transport infrastructure score and the quality of logistics services score are below the overall LPI score. Across the three lowest quintiles, the tracking and tracing component is a little below than the overall score, as in past reports.

Figure 1.2 LPI components score, by LPI quintile, 2018



Source: Logistics Performance Index 2018.

Table 1.6 Deviation on each component from the overall LPI score, by quintile

Quintile	Customs	Infrastructure	Ease of shipping arrangements	Quality of logistics services	Tracking and tracing	Timeliness
Bottom quintile	−0.16	−0.19	0.04	−0.05	−0.02	0.34
Fourth quintile	−0.14	−0.19	0.01	−0.09	−0.01	0.39
Third quintile	−0.20	−0.19	0.02	−0.07	−0.01	0.42
Second quintile	−0.24	−0.12	−0.01	−0.07	0.02	0.40
Top quintile	−0.18	0.02	−0.19	0.00	0.07	0.31

Source: Logistics Performance Index 2018.
Note: All calculations are based on the weighted average score for the LPI and its components over 2012–18.

In past reports, average country LPI scores were generally improving. But in 2018, low-income countries experienced a drop in the LPI scores for quality of infrastructure, customs performance, and quality of logistics services, as lower-middle-income countries' scores on these three LPI components improved (figure 1.3).[5] Progress can be also tracked on the environment for logistics since the last LPI edition (table 1.7). Contrary to past reports, respondents report improved scores for the bottom two quintiles in ICT infrastructure and in private logistics services—possibly due to ICT infrastructure improvements in the past decade. For low-income countries, streamlining border clearance procedures and ensuring access to physical trade and transport infrastructure will continue to be priority issues.

Logistics performance is more than income

There is still a noticeable gap in LPI scores between high- and low-income countries. High-income countries, on average, surpass low-income countries by 48 percent in their LPI scores. Among the 30 top-performing countries, 24 are members of the Organization for Economic Co-operation and Development (OECD), a proportion that has not changed much since past LPI reports. Even so, countries such as China, India, Rwanda, Thailand, and Vietnam outperform their income group peers (figure 1.4). That is why income alone cannot explain why performance varies widely among countries in certain income groups. On the other

High-income countries, on average, surpass low-income countries by 48 percent in their LPI scores

Figure 1.3 Change in LPI component score by income group, 2016–18

Source: Logistics Performance Index 2016 and 2018.

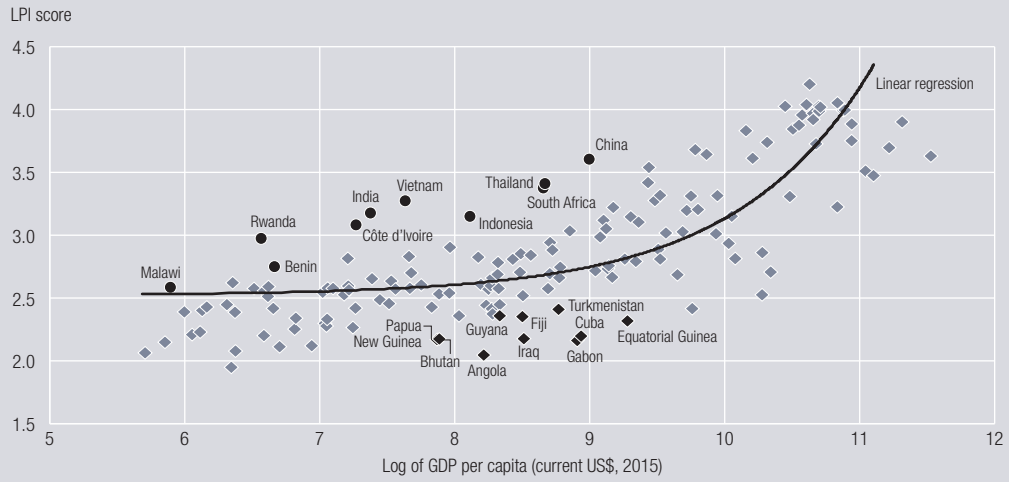
Table 1.7 Respondents reporting an "improved" or "much improved" logistics environment since 2015, by LPI quintile

Percent

Component	Bottom quintile	Fourth quintile	Third quintile	Second quintile	Top quintile
Customs	61	63	44	68	62
Other border procedures	69	43	36	60	49
Trade and transport infrastructure	65	40	45	66	53
ICT infrastructure	54	69	62	69	67
Private logistics services	55	82	61	69	65
Logistics regulation	57	39	36	53	31
Incidence of corruption	39	34	45	56	35

Source: Logistics Performance Index 2018.

Figure 1.4 **LPI overperformers and underperformers**



Source: Logistics Performance Index 2018.
Note: Fitted values are based on an ordinary least squares regression using data for all countries. Underperformers (black diamonds) are the non-high-income countries with the 10 smallest residuals. Overperformers (black circles) are the non-high-income countries with the 10 largest residuals.

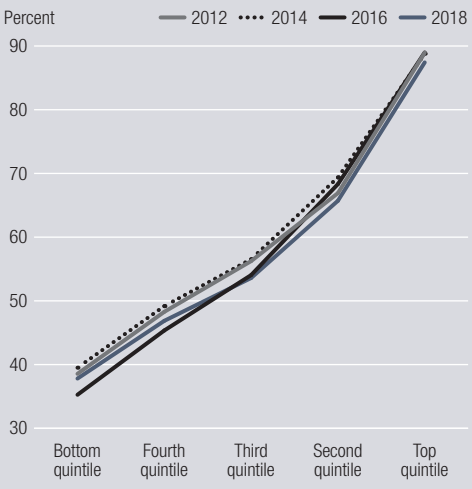
hand, the mostly resource-rich countries—Angola, Gabon, Equatorial Guinea, Iraq, and Turkmenistan—underperform their income group peers.

Trends over the past four reports

The gap in relative LPI scores—the scores as a percentage of the leading country's score—is quite similar to the gap revealed in past editions of *Connecting to Compete*. The average relative score of the three lowest quintiles was higher than in the past three LPI reports (figure 1.5). In 2018, the worst relative performer is Afghanistan, at 29.6 percent of best performer Germany's score. In 2016, the worst performer was the Syrian Arab Republic, at 19 percent. In 2014, the worst was Somalia, at 25 percent.

The correlation between the 2016 and 2018 LPI scores is a bit stronger than those between past reports, with 0.93 in scores and 0.90 in rankings (compared with 0.91 in scores and 0.86 in rankings between 2012 and 2014). Keep in mind that the data are survey-based and thus are prone to sampling errors. Statistically significant changes are revealed only if the confidence intervals for the 2016 and 2018 scores do not overlap.

Figure 1.5 **LPI score as a percentage of the best performer, 2012–18**



Source: Logistics Performance Index 2012, 2014, 2016, and 2018.

Weighted international LPI scores and ranks 2012–18

As in the past two reports, the scores of the six LPI components across the four latest surveys were used to provide a bigger and better-balanced picture of a country's performance. This approach is believed to reduce the noise and random variation across different LPI surveys, and thus enhances the comparison of the 167

countries. In the 2018 report, the four previous scores on each component were weighted as follows: 6.7 percent for 2012, 13.3 percent for 2014, 26.7 percent for 2016, and 53.3 percent for 2018 (so the more recent data carry more weight). This method is identical to the one used in the 2014 and 2016 reports, which used the data for the prior four LPI reports.

The opportunity to use weighted values is important because an individual country's score and, consequently, its rank can oscillate a lot, even though the change might not be statistically significant. That happened to several countries' scores in 2014–16, especially those with a wide confidence interval, indicating disagreement among the respondents. The effect tends to be amplified if the number of observations is low, as is frequent in smaller countries. Large traders, such as China, Germany, the United Kingdom, and the United States had confidence intervals of 0.05 score points or less in 2018, 1 percent or less of their corresponding LPI scores. By contrast, Yemen, with a confidence interval of 0.44, Iceland with 0.42, Niger with 0.41, and Malta with 0.39 had the largest confidence intervals, more than 13 percent of their scores.

In the aggregate 2012–18 LPI, Germany scores highest at 4.19 (4.17 for the aggregate 2010–16 LPI and 4.10 for 2007–14), followed by the Netherlands 4.07 (4.12 for 2010–16 and 4.05 for 2007–14), Sweden 4.07 (4.08 for 2010–16 and 3.95 for 2007–14), Belgium 4.05 (4.06 for 2010–16 and 4.0 for 2007–14), and Singapore 4.05 (4.10 in 2010–16 and 4.06 in 2007–14). Germany and the Netherlands continue to dominate the top three, while Singapore fell from third to fifth. Of the 28 European Union member states, 15 are among the top 30 countries, and of the 34 OECD members, 24 are among the top 30. The non-OECD economies in the top 30 are Singapore (5th) Hong Kong, SAR, China (9th), United Arab Emirates (14th), Taiwan, China (24th), China (27th), South Africa (29th), and Qatar (30th). All but two of the top 30 are high-income countries; the other two, China and South Africa, are upper-middle-income countries.

As in 2010–16, all OECD countries are in the top third. In the previous 2007–14 LPI aggregate, all European Union member states were in the top third. Bulgaria fell narrowly outside this category in the aggregate LPI scores for 2012–18 (3.0, ranked 57th) and 2010–16 (2.96, ranked 62th). Romania, by contrast, rose from a 2010–16 score of 3.05, ranked 56th, to a 2012–18 score of 3.09, ranked 50th.

In the aggregate international LPI for 2012–18, Somalia again scores the lowest at 2.00, ranked 167th (it scored 1.67 in 2010–16 and 1.62 in 2007–14). Despite some convergence since the 2007 LPI, the logistics gap between high- and low-income countries persists. As in the previous surveys, the countries with the weakest performance in 2018 are least developed countries or small island countries, some also conflict-ridden. Haiti occupies the second-lowest rank with a score of 2.02 (it scored 1.96 in 2010–16 and 2.24 in 2007–14). Other countries that score the lowest on logistics include Afghanistan with a score of 2.04 (2.15 in 2010–16 and 2.10 in 2007–14), Sierra Leone with 2.06 (2.04 in 2010–16 and 2.06 in 2007–14), and the Syrian Arab Republic with 2.10 (1.94 in 2010–16 and 2.31 in 2007–14). Broadly speaking, the converging countries —ranking, roughly, from 40th to 120th—have scores separated by only a few decimal points. Thus, some large changes in rank might be witnessed in this middle ground, even though the underlying score changes are marginal.

Despite some convergence since the 2007 LPI, the logistics gap between high- and low-income countries persists

Changes in countries' LPI scores 2016–18

Changes in the LPI score reflect negative or positive private sector perceptions of logistics performance. The LPI score is thus not purely a metric of current performance. It incorporates expectations, trends, and the perceived pace of improvement. This can create a rebound effect from one survey to the next. For example, a country with large positive changes in one survey may be adjusted downward the next time because positive changes were perceived as happening more slowly than anticipated during the preceding survey.

Table 1.8 **Number of countries with positive and negative changes in LPI scores, 2016–18**

Change in LPI score, 2016-18	Low income	Lower middle income	Upper middle income	High income
Positive and statistically significant	1	4	0	0
Positive (not statistically significant)	11	18	23	14
No change	0	0	1	0
Negative (not statistically significant)	10	16	13	32
Negative and statistically significant	1	3	2	5

Source: Logistics Performance Index 2016 and 2018.
Note: The 2018 LPI includes 160 countries, of which 6 were not included in the 2016 edition and are thus not included in this table. Twelve countries had different income classifications in 2018 than in 2016; in all cases the 2018 classification was used. Differences in scores were rounded to two positions after the decimal point.

The LPI score depends primarily on industry perceptions of relative performance. Even a country that is making improvements can see its score affected by the perceived impact or speed of improvements in other countries. Planned improvements to a country's logistics environment can temporarily lower a country's LPI score. For example, even if relocation from an old port to a new one is managed efficiently, it is likely that the logistics industry will expect or experience disruptions in supply chains during the adjustment.

LPI assessments may also be influenced by respondents' own experiences and the types of cargo they handle. Logistics for oil, gas, mining, or industrial projects are likely to be smoother and more homogeneous worldwide than exports of goods for local consumption, which go through traditional logistics and distribution channels. For large countries with sizable domestic markets and associated domestic logistics systems—such as China and India—the LPI is biased toward the performance of the main import gateways. It does not capture the performance of internal logistics and domestic commerce corridors linking economic centers across provincial or state boundaries. And survey respondent demographics can affect a perception-based survey such as the LPI.

Score changes from one edition of the LPI to the next should be interpreted with care. However, negative trends across all years, not just two, may be something to worry about—especially when a country's score changes by more than 20%. Connecting to Compete always includes the statistical confidence interval for each country's International LPI (see appendix 2). Statistically significant changes occur only if the confidence intervals for the 2018 and 2016 scores do not overlap. Table 1.8 gives an overview of the number of countries in the 2018 index whose LPI score changed, either negatively or positively.

While the finding is not statistically significant, it is noteworthy that slightly more low- and middle-income countries had LPI scores rise (34) than fall (30) between 2016 and 2018.

SECTION 2

Unbundling logistics performance

The international Logistics Performance Index (LPI) provides insights into the drivers of overall logistics performance. To unbundle the survey results, it is necessary to refer to the domestic LPI. This section is based on the domestic LPI, where surveyed logistics professionals assess the logistics environments in countries where they work. It contains more detailed information on countries' logistics environments, processes, and institutions and looks at the logistics constraints within countries, not just at gateways such as ports or borders. It analyzes countries by four major determinants of overall logistics performance: infrastructure, services, border procedures, and supply chain reliability. Unless otherwise stated, data are from the 2018 survey rather than aggregate data for 2012–18.

Infrastructure: A shared concern across performance groups

Infrastructure is a major concern across all LPI performance groups except the top performers, but survey respondents signal improvements. The quality of information and communications technology (ICT) is consistently rated higher than physical transportation infrastructure.

Table 2.1 **Respondents rating the quality of each infrastructure type "high" or "very high," by LPI quintile**

Percent of respondents

LPI quintile	Ports	Airports	Roads	Rail	Warehousing and transloading	ICT
Bottom quintile	26	30	17	17	21	34
Fourth quintile	23	13	10	9	23	44
Third quintile	33	39	20	12	27	48
Second quintile	57	41	37	11	37	52
Top quintile	63	67	57	37	62	75

ICT is information and communications technology.
Source: Logistics Performance Index 2018.

Survey respondents in top-quintile countries rated their infrastructure far more highly than those in other quintiles did (table 2.1). Differences among the other four quintiles are less striking, especially for roads and rail. The difference between the top and bottom is smallest in ICT, suggesting that developing countries may have been investing heavily in modern technologies, perhaps even leapfrogging intermediate stages of performance. Of course, ICT cannot replace other hard infrastructure, which requires a renewed focus.

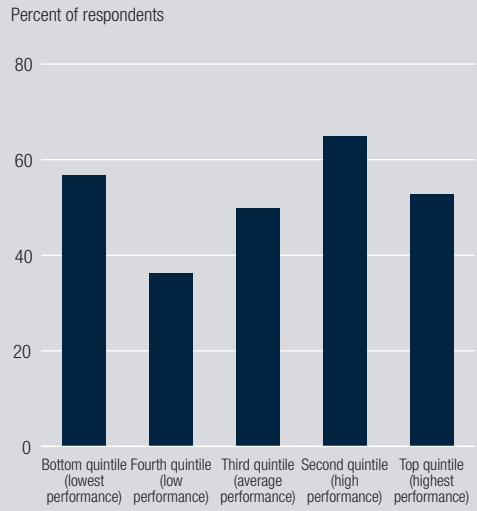
Though still a constraint in developing countries, infrastructure seems to be improving. Since the previous LPI survey, respondents from countries in all performance quintiles generally perceive improvements in trade and transport infrastructure (figure 2.1). For the first time since the survey began, the perception of improvement is higher in the bottom quintile than in the top one, though lower in the middle. If this pattern persists, it would be consistent with some closing of the logistics gap discussed in section 1.

It is also possible to compare respondents' ratings of infrastructure with the ratings in previous LPI reports. Table 2.1 shows clear evidence of increasing satisfaction with port infrastructure, since scores in 2018 are higher than in previous years, as they were in 2016 compared with 2014 in most quintiles. Although for other types of infrastructure the picture is mixed and varies by quintile, these results together with respondents' observations of improvement (see figure 2.1) clearly suggest that governments are aware of the importance of infrastructure quality for logistics performance and are working successfully to improve it.

Satisfaction with infrastructure quality varies by infrastructure type. As in previous years,

ICT is consistently rated higher than physical infrastructure across performance quintiles, and rail infrastructure and services are rated lowest

Figure 2.1 Respondents rating the quality of trade and transport infrastructure as "improved" or "much improved" since 2015, by LPI quintile



Source: Logistics Performance Index 2018.

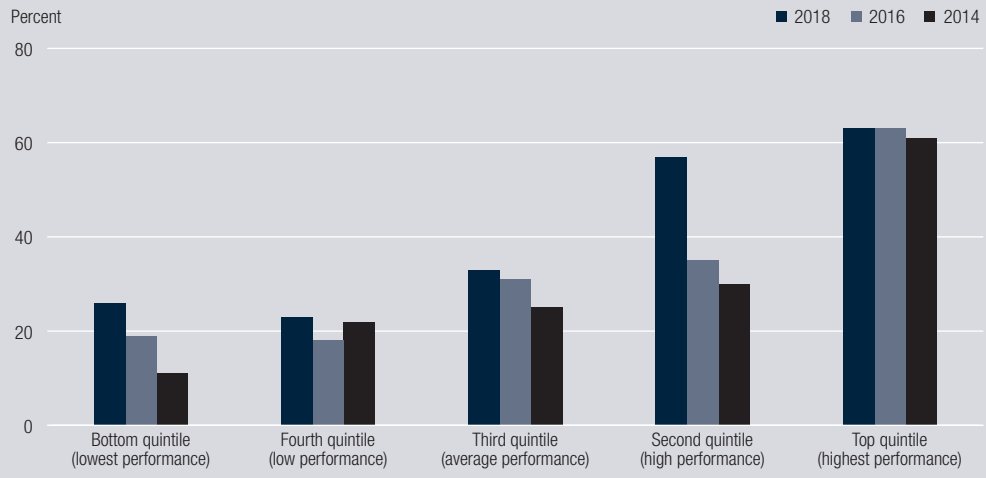
respondents in all LPI quintiles are most satisfied with ICT infrastructure. As in 2016, there is evidence of a narrowing infrastructure gap, particularly between the top quintile and the bottom one, where the rate of improvement in 2018 seems noticeably faster than in 2016; improvement in the middle quintiles is on a par with that in earlier reports. Rail infrastructure, by contrast, but also in line with previous reports, elicits general dissatisfaction. In the bottom quintile, infrastructure of all kinds fails to satisfy—an exception to the pattern in other quintiles of variation by infrastructure type.

Similar patterns emerge when the domestic LPI data on infrastructure are disaggregated by World Bank region, excluding high-income countries (table 2.2). The highest ratings are for ICT in all regions except the Middle East and North Africa, and Latin America and the Caribbean, where ICT ratings are very close to the highest. Ratings for other types of infrastructure vary more widely by region, but two features stand out. First, satisfaction with road and rail infrastructure is especially low in Latin America and the Caribbean, as in previous surveys, and also in South Asia, as in 2016. Second, satisfaction with rail infrastructure is low in all regions, as was the case for all LPI quintiles.

Developing logistics services markets

The quality and competence of core logistics service providers are two other important parts of a country's overall performance. Respondents in all LPI quintiles are nearly always more satisfied with service providers than with infrastructure quality (table 2.3, compared with table 2.1). Just as for infrastructure, for service

Figure 2.2 Respondents rating the quality of each infrastructure type as "high" or "very high" by LPI quintile, 2014–18



Source: Logistics Performance Index 2014, 2016, and 2018.

Table 2.2 Respondents rating the quality of each infrastructure type "high" or "very high," by World Bank developing country region

Percent of respondents

Region	Ports	Airports	Roads	Rail	Warehousing and transloading	ICT
East Asia and Pacific	33	36	33	10	33	43
Europe and Central Asia	14	22	21	20	23	48
Latin America and Caribbean	26	23	9	0	6	26
Middle East and North Africa	70	53	45	12	56	69
South Asia	18	14	7	10	7	37
Sub-Saharan Africa	45	39	17	13	30	47

ICT is information and communications technology.
Source: Logistics Performance Index 2018.

Table 2.3 Respondents rating the quality and competence of each service provider type "high" or "very high," by LPI quintile

Percent of respondents

LPI quintile	Road transport	Rail transport	Air transport	Maritime transport and ports	Warehousing, transloading, and distribution	Freight forwarders	Customs brokers	Trade and transport associations	Consignees or shippers
Bottom quintile	28	19	37	44	33	32	14	24	22
Fourth quintile	30	9	39	46	21	38	26	19	26
Third quintile	36	24	58	40	39	45	45	32	22
Second quintile	38	26	49	53	49	59	36	42	38
Top quintile	78	41	70	71	69	78	68	56	52

Source: Logistics Performance Index 2018.

providers there is a quality gap between the top LPI quintile and the other four quintiles.

For countries in all LPI quintiles, freight forwarders are rated highly, typically at or close to the strongest scores among service providers (see table 2.3).[6] Ratings for the other service provider types vary more widely across all quintiles —though rail transport service provision, like rail infrastructure, consistently receives low ratings (see table 2.3). Rail transport aside, in the top-performing countries, service providers of all types are rated as being of high quality and competence, though the scores for consignees or shippers and for trade and transport associations are lower than for most other types.

A ratings gap between services and infrastructure appears generally across World Bank regions (table 2.4). It is particularly stark for air transport in Europe and Central Asia and Latin America and the Caribbean, for road transport in Latin America and the Caribbean and Sub-Saharan Africa, and for warehousing in Sub-Saharan Africa. These data suggest a need to develop transport-related infrastructure, so that service markets reforms can bring maximum benefits to users.

As for infrastructure performance, it is possible to compare service performance over LPI years. Figure 2.3 shows performance in the bottom quintile, where improvements are particularly important, over 2014–18. Across most types of service provider, respondent satisfaction has clearly increased. The bottom quintile is particularly important, as underdeveloped logistics services markets are often a key constraint on performance. But figure 2.3 suggests that even in challenging environments, governments and the private sector can move toward higher performance in a fairly short time. For other quintiles, results are more variable.

Streamlining border procedures and facilitating trade

The survey collects a set of indicators related to the time to trade, the ease of clearance at

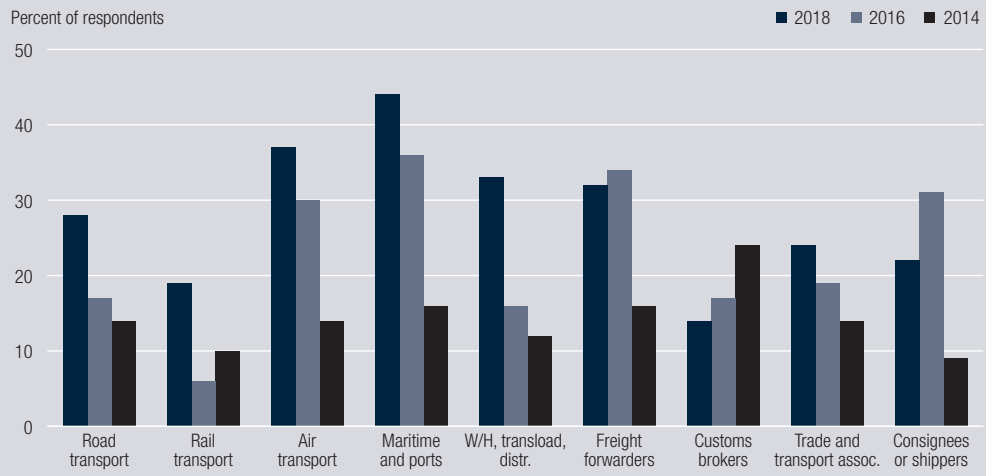
Table 2.4 **Difference between respondents rating services "high" or "very high" and those rating infrastructure "high" or "very high," by World Bank developing country region**

Percentage points

Region	Maritime transport and ports	Air transport	Road transport	Rail transport	Warehousing, transloading, and distribution
East Asia and Pacific	9	9	3	0	4
Europe and Central Asia	9	18	16	2	6
Latin America and Caribbean	21	18	12	5	11
Middle East and North Africa	0	–9	8	3	–7
South Asia	6	10	1	–8	4
Sub-Saharan Africa	5	12	16	14	16

Source: Logistics Performance Index 2018.

Figure 2.3 **Respondents rating the quality of each infrastructure service type as "high" or "very high," bottom LPI quintile, 2014–18**



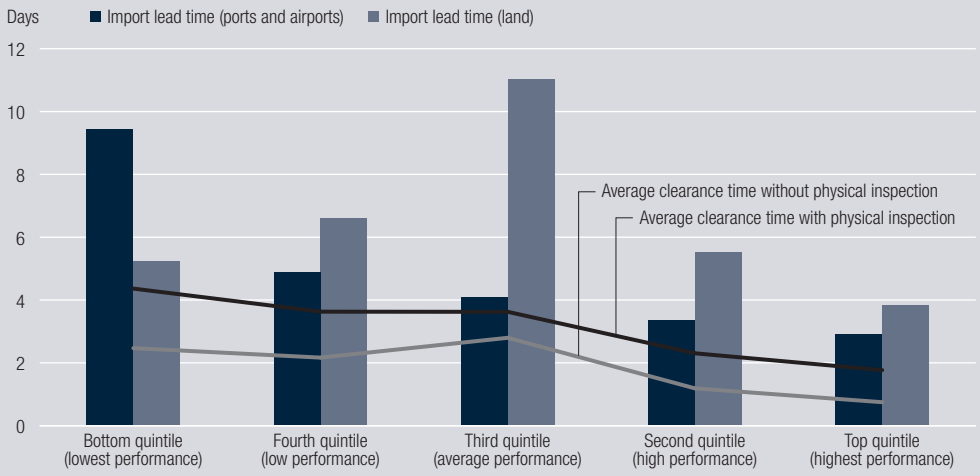
Source: Logistics Performance Index 2014, 2016, and 2018.

the border, and the experience with red tape. Breakdowns of these data by region and income group are in appendix 3, and for time and distance by country in appendix 4. These indicators provide contrasting insight into the depth of implementation of trade and transportation reforms. The principles of trade facilitation are widely accepted—for instance, automated submission is the norm in all performance groups. But lead times to import or clear goods or amounts of red tape still differentiate much between the bottom three quintiles and the two top performance tiers: for the bottom three clearance times are three times as much and paperwork twice as much as for the top two.

Import and export time

The time to complete trade transactions is a useful outcome measure of logistics performance. The median import lead time for port and airport supply chains, as measured for the LPI, is generally lower in higher performing groups (figure 2.4).[7] It takes nearly three times as long to import in the bottom quintile as in the top quintile. This substantial gap is similar to the one in 2016. But unlike previous reports, this year's does not show a consistent relationship between time and performance quintile. Instead, results for the third quintile, particularly the land supply chain, seem anomalously high. These relationships will need to be inspected closely in future years to see whether

Figure 2.4 **Median import time and average clearance time, by LPI quintile**



Source: Logistics Performance Index 2018.

Customs procedures are becoming more similar worldwide: even the bottom quintile countries tend to adopt core customs best practices

the issue is sampling error or changes in respondent demographics, or concrete issues of performance that need to be addressed.

Importing by land takes longer than importing by air or sea in all LPI quintiles except the bottom one—possibly another anomalous result. The correlation between land distance and import lead time suggests that geographic hurdles—in addition to infrastructure, service provision, and other logistics issues—are important in determining a country's ability to connect with world markets.

Besides geography and speed en route, the efficiency of border processes affects import lead times. The time for border processes can be reduced at all stages, but especially clearing goods on arrival (see figure 2.4). Although the time to clear goods through customs is a small fraction of total import time for all LPI quintiles, it rises sharply if goods are physically inspected, even in high-performing countries. Core customs procedures are similar across quintiles. But physical inspection is far more prevalent in low-performing countries, which may even subject the same shipment to repeated inspections by multiple agencies (table 2.5). Countries with low logistics performance need to cut red tape, physical inspections, and excessive and opaque procedural requirements.

Export supply chains typically have a much lighter procedural burden than import supply chains, so lead times are shorter for exports

Table 2.5 **Respondents indicating that listed customs procedures are available and being used, by LPI quintile**

Percent of respondents, unless otherwise indicated

Customs procedure	Bottom quintile	Fourth quintile	Third quintile	Second quintile	Top quintile
Online processing of customs declaration	76	94	83	92	95
Requirement that a licensed customs broker be used for clearance	100	81	57	86	67
Choice of location of final clearance	63	67	81	74	75
Release with guarantee pending final clearance	61	52	50	69	64
Physical inspection of import shipments (percent of shipments)	33	29	20	17	9
Multiple physical inspections of import shipments	18	11	11	3	5

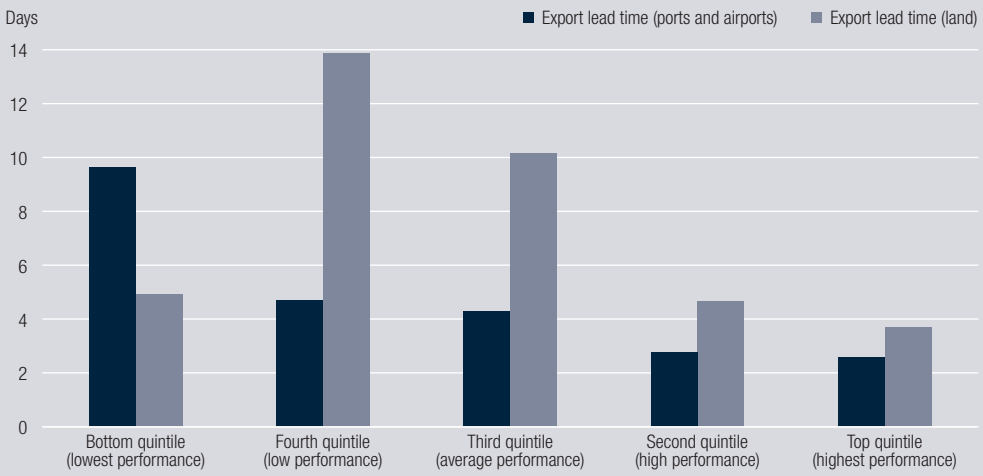
Source: Logistics Performance Index 2018.

than for imports (figure 2.5). Export lead times for overall logistics performance have generally declined, but not for land supply chains in the third and fourth quintiles, an anomalous result that will need to be monitored in future reports. The familiar logistics gap between income groups appears again for export lead times, which are nearly four times as long for low- as for high-income countries (figure 2.6). That gap is far wider than in previous editions, perhaps due to a different locational composition of survey respondents. Export times for land supply chains differ much more between low-income countries and the rest than between middle- and high-income countries. Many low-income countries have long export lead times, hurting their export competitiveness and ability to trade internationally.

Unlike lead times, customs procedures are becoming more similar worldwide (see table 2.5). Even the bottom quintile countries tend to adopt core customs best practices.

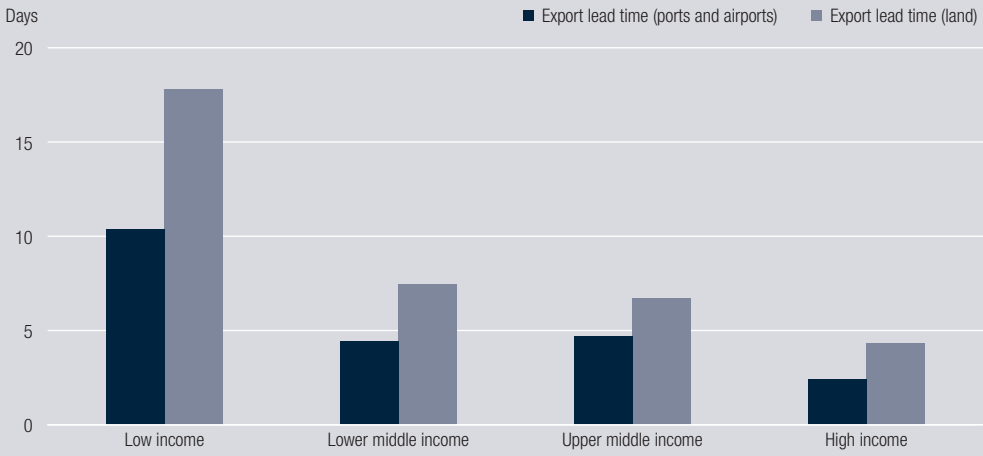
Even as customs procedures gradually improve, customs is not the only agency in border management in many countries, and the other agencies constrain supply chain performance.

Figure 2.5 Median export lead time, by LPI quintile



Source: Logistics Performance Index 2018.

Figure 2.6 Median export lead time, by income group



Source: Logistics Performance Index 2018.

Table 2.6 **Respondents rating the quality and competence of three border agencies as "high" or "very high," by LPI quintile**

Percent of respondents

LPI quintile	Customs agencies	Quality/standards inspection agencies	Health/sanitary and phytosanitary agencies
Bottom quintile	15	26	25
Fourth quintile	15	23	21
Third quintile	32	32	21
Second quintile	44	43	39
Top quintile	76	58	55

Source: Logistics Performance Index 2018.

In 2018, the performance gap between customs and other border agencies is narrower than in previous LPI reports, and even reversed in the fourth quintile (table 2.6). Previous editions stressed that for many countries, the key to improving border agency performance may lie with reforms to agencies other than customs. There is evidence that some countries have been moving forward on this agenda, though the data will need to be monitored in future years to see whether the trend continues.

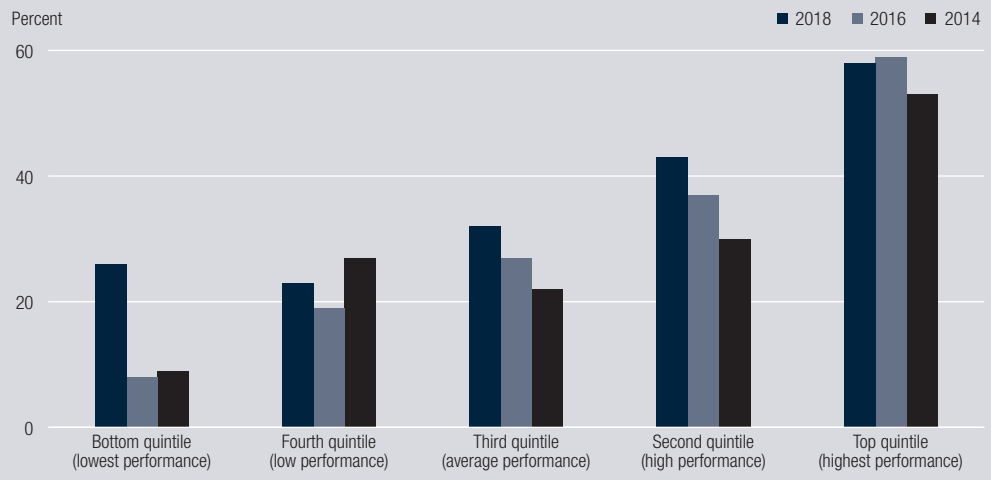
It remains important to look beyond customs when designing trade facilitation reforms. Fewer inspection procedures are required for products that are not perishable or time sensitive. Health and sanitary and phytosanitary (SPS) agencies have been slow to automate, although that may be changing. Cooperation among all agencies—standards, transport, veterinary, and health/SPS—is critical to reform. So is introducing modern approaches to regulatory compliance.

Whereas customs performance has remained constant across the board since the 2014 LPI report, quality and standards/inspection agencies have improved considerably in lower quintiles. Figures 2.7 and 2.8 show a clear trend toward greater satisfaction with them.

Red tape

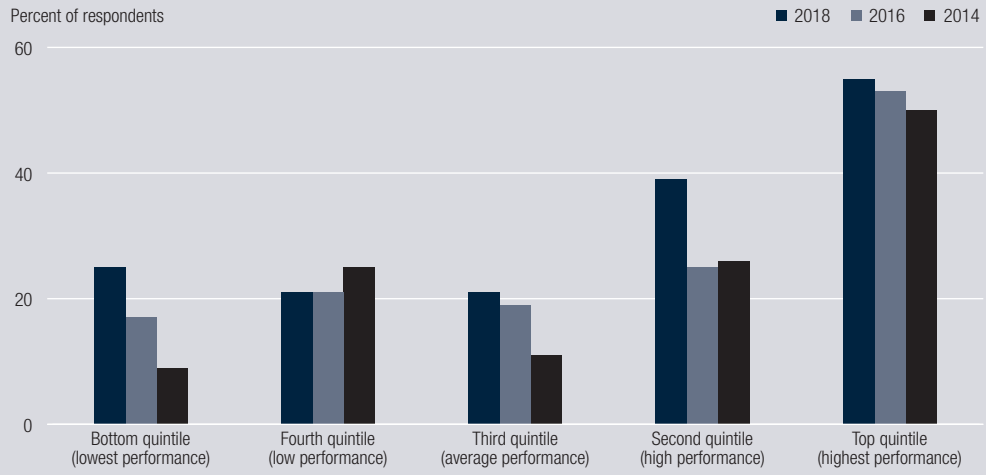
Indicators for red tape show a continuing lack of border coordination, resulting in a burden on private logistics operators similar to the one in previous editions. In countries in the bottom quintile, operators typically deal with around twice as many government agencies and

Figure 2.7 **Respondents rating the quality and competence of quality and inspection agencies as "high" or "very high," by LPI quintile, 2014–18**



Source: Logistics Performance Index 2014, 2016, and 2018.

Figure 2.8 **Respondents rating the quality and competence of health and sanitary/ phytosanitary agencies as "high" or "very high," by LPI quintile, 2014–18**



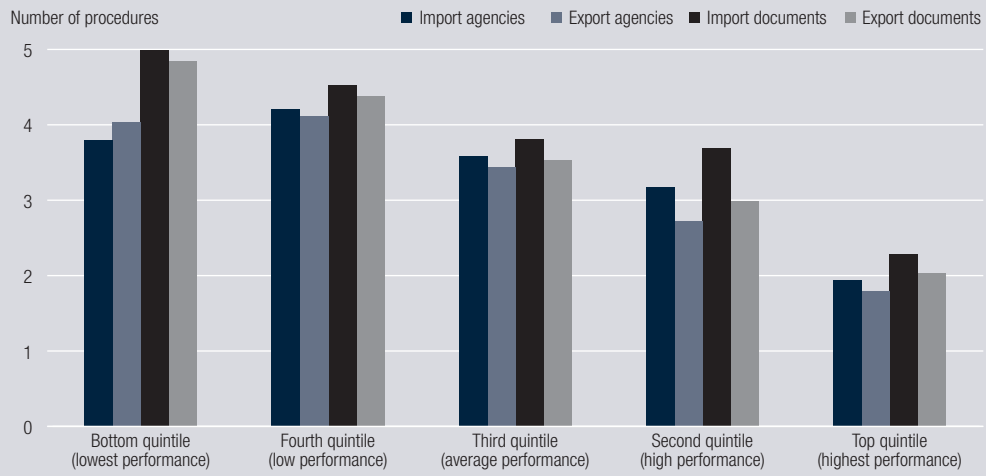
Source: Logistics Performance Index 2014, 2016, and 2018.

documentary requirements operators as countries in the top quintile (figure 2.9). Countries in the top quintile typically require two supporting documents for trade transactions, and those in the bottom, four to five—a persistent logistics gap in the previous and current LPIs.

Simplifying documentation for imports and exports has long been high on the trade facilitation agenda, prompting initiatives to bring border agencies together and create a single window for trade. The World Bank and International Finance Corporation's *Doing Business* indicators place great weight on such simplification. Still, steps in other aspects of border management and, more generally, soft and hard trade-related infrastructure are also needed.

The World Trade Organization (WTO) Agreement on Trade Facilitation (TFA) can help in two areas. First, its standards are subject to the WTO's binding trade disciplines, unlike previous conventions, although developing countries remain free to select which parts of the TFA will become immediately binding, which will be deferred, and which

Figure 2.9 **Red tape affecting import and export transactions, by LPI quintile**



Source: Logistics Performance Index 2014, 2016, and 2018.

will apply only once technical assistance is received. Second, to support this framework, the TFA strengthens the delivery of technical assistance and capacity-building support for developing and least developed countries. Many of the agreement's measures are relatively straightforward to implement, while others, such as introducing national single-window systems, can be quite complex and will require sustained effort from governments.

Supply chain reliability: A key concern for all countries

Logistics performance is strongly associated with supply chain reliability and predictable shipment delivery. The causes of delays identified in the survey are more worrisome in the three bottom performance quintiles than in the top performers or even the second quintile.

Some causes of delays or unreliability are endogenous to a country's supply chain: the quality of service and the cost and speed of clearance processes are examples. But other causes, such as dependence on indirect maritime routes, lie outside the domestic supply chain and are not under a country's control.

The LPI details possible causes of delay not directly related to how domestic services and agencies perform (table 2.7). Again, the contrast is striking between the top and bottom LPI quintiles, especially in three areas: informal (corrupt) payments, compulsory warehousing, and preshipment inspection. The first two overlap with the problems identified in previous LPI reports. Since the 2016 report, reported delays in the bottom quintile declined considerably, consistent with the lower prevalence of most kinds of delays in the bottom quintile than in the middle ones. It is hoped that this important change reflects catching up, and monitoring the trend in future reports will be important.

Despite clear improvements, delays and unexpected costs are more common in bottom quintile countries than the top performers, undermining overall supply chain performance. Worse, across LPI quintiles the incidence of delays is generally increasing, except in the lowest quintile in some cases. The general pattern suggests that supply chain predictability is an acute commercial problem but may be moving in the right direction in the lowest-performing countries.

Predictable, reliable supply chains are central to good logistics performance. Indeed, highly uncertain lead times can disrupt production and exporting, forcing firms to adopt costly strategies such as express shipping or sharply higher inventories, eroding competitiveness within global and regional value chains that use just-in-time production. Although firms can adopt strategies, such as building in redundancies to deal with disruptions affecting one supplier, countries that want their firms to join, and move up in, global and regional value chains must provide the conditions for predictable, reliable supply chains.

An additional reason for policy makers to focus greater attention on supply chain reliability and predictability is the emerging networked structure of global and regional trade, linked in part to the rise of value chains. In a network, small disruptions at one link can spread rapidly and sometimes unpredictably to

Predictable, reliable supply chains are central to good logistics performance; highly uncertain lead times can disrupt production and exporting

Table 2.7 **Respondents reporting that shipments are "often" or "nearly always" delayed, by delay category and LPI quintile**

Percent of respondents

LPI quintile	Compulsory warehousing	Preshipment inspection	Maritime transshipment	Theft	Informal payments
Bottom quintile	26	20	11	8	13
Fourth quintile	27	21	13	5	30
Third quintile	23	27	14	14	22
Second quintile	14	13	18	5	13
Top quintile	5	5	6	2	3

Source: Logistics Performance Index 2018.

In the top quintile, most respondents report that import and export shipments "always" or "nearly always" arrive on schedule, but in the bottom quintile, only around half as many do

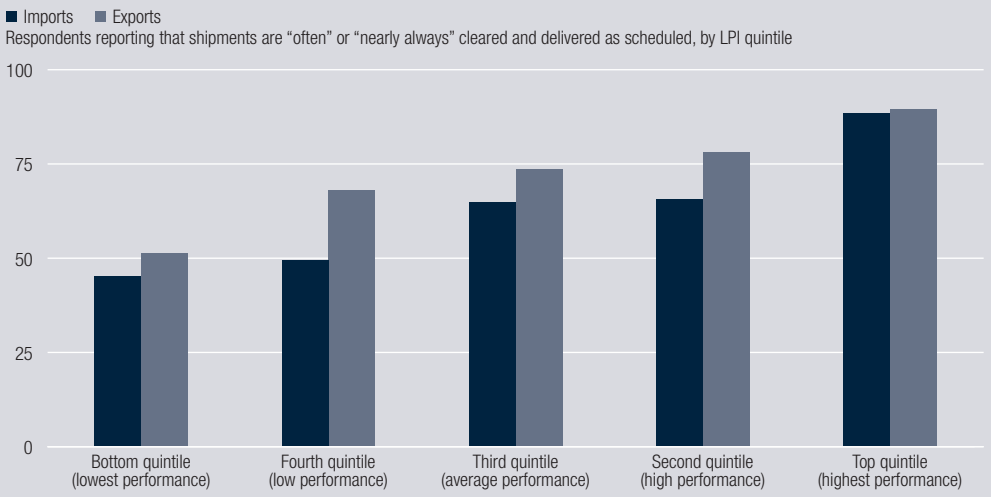
other links. The efficiency gains associated with networked production models thus come with increased systemic risk, because the structure itself can be vulnerable to small shocks affecting crucial links. Countries that cannot provide the conditions for developing predictable and reliable supply chains will become increasingly disconnected from world markets, where networked production models are common. Low-performing countries need greater policy attention to improve their connectivity and to stem any further marginalization in the global trading system.

Supply chain reliability and predictability are further reflected in a key performance metric from the domestic LPI, timeliness of clearance and delivery (figure 2.10). Given that the frequency of delays tends to rise with declining logistics performance, it is unsurprising that the timeliness of clearance and delivery generally suffers as one moves down the LPI quintiles. In the top quintile, most respondents report that import and export shipments "always" or "nearly always" arrive on schedule, but in the bottom quintile, only around half as many do. However, compared with the 2016 LPI report, performance in the low and middle quintiles is noticeably improved, so some convergence is taking place. This finding again highlights the importance of low-performing countries taking steps to improve predictability and reliability of supply chains, to continue narrowing this part of the logistics gap.

The fourth LPI quintile has the largest difference between on-schedule arrival rates for exports and those for imports (see figure 2.10), as in the previous LPI report. The bottom quintile has a substantially narrower gap. A lower rate of favorable survey responses for imports suggests that supply chain unreliability discriminates in practice (if not in law) against foreign goods. As traditional trade barriers continue to fall around the world, policies contributing to such other barriers become ever larger determinants of performance and trade outcomes. So, addressing the causes of unexpected delays —including unpredictability in clearance, inland transit delays, and low service reliability— should be an important part of logistics reform in low-performing countries.

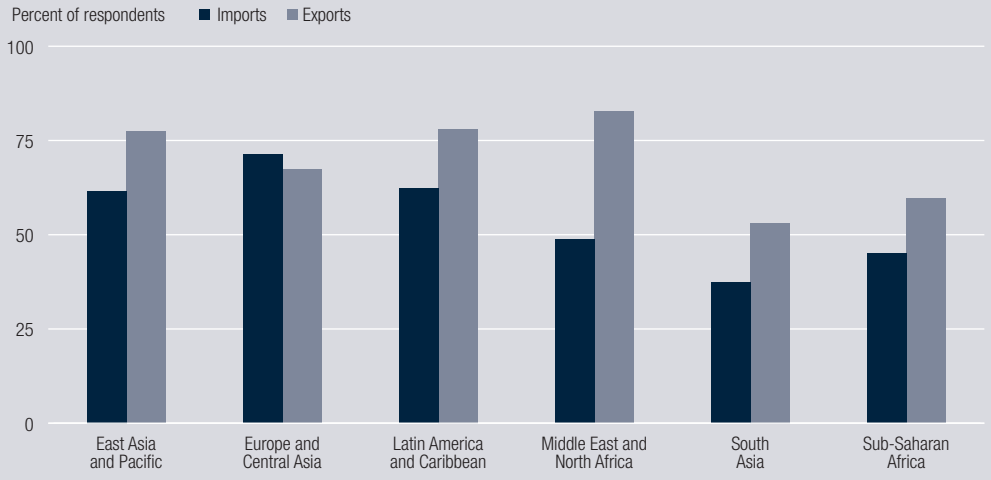
The patterns for supply chain reliability are more striking in some World Bank regions than others (figure 2.11). The geographic predictability gap may influence competitiveness and the spread of regional supply chains and production networks. However, caution is appropriate in approaching figure 2.11 because the data vary considerably from one year to another, in part

Figure 2.10 **Respondents reporting that shipments are "often" or "nearly always" cleared and delivered as scheduled, by LPI quintile**



Source: Logistics Performance Index 2018.

Figure 2.11 **Respondents reporting that shipments are "often" or "nearly always" cleared and delivered as scheduled, by World Bank developing country region**



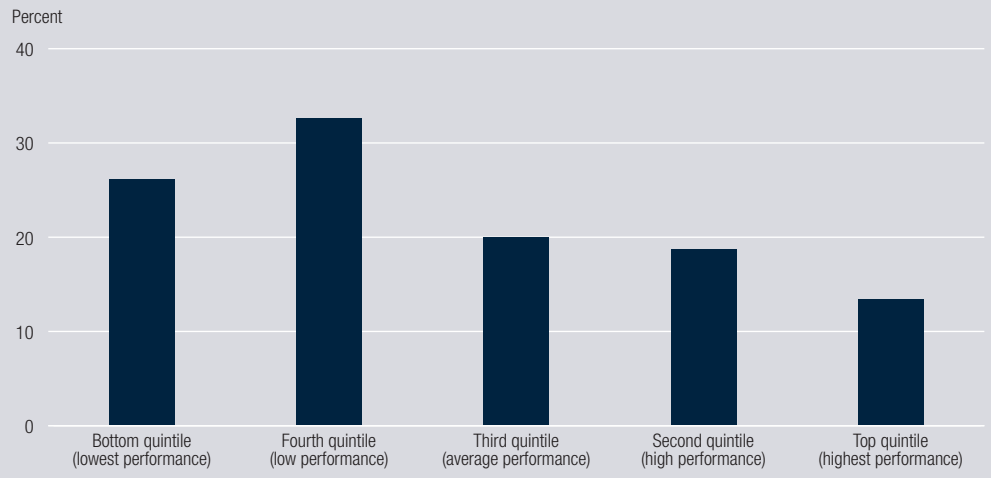
Source: Logistics Performance Index 2018.

due to differences in response patterns across countries.

Supply chain quality is not just a matter of time and cost. A further consideration—for private sector operators and their clients—is shipment predictability, which varied widely in the 2018 LPI, as in previous reports (figure 2.12). In the top LPI quintile, just 13 percent of shipments fail to meet company quality criteria —the same proportion as previously. Twice as many shipments in the bottom quintile fail to meet company quality criteria. However, performance in the bottom quintile has improved noticeably since the 2016 LPI, while the result for the fourth quintile appears anomalous—it has the highest percentage failing to meet company quality criteria. This finding again illustrates that the logistics gap is real but perhaps narrowing from an overall perspective of supply chain efficiency and reliability.

The most important quality criterion in freight forwarding is delivery within the

Figure 2.12 **Shipments not meeting company quality criteria, by LPI quintile**



Source: Logistics Performance Index 2018.

promised time window. Almost as important is the absence of errors in cargo composition or documentation. The window of acceptable quality is much narrower, and errors are much less tolerated, in high-performing countries than in low-performing countries. The shipment quality gap only partly reflects these differing expectations.

SECTION 3

Logistics trends, reform implementation, and the Logistics Performance Index

The global logistics landscape displays positive trends, even though disparities remain between the top performers and many developing countries. In developing countries, the logistics agenda appears even more prominent today than it was in 2007, as interventions expand with changes in demand, changes in industry, and the increasingly central role of sustainability-related concerns. Often motivated by the Logistics Performance Index, national governments and regional groups are promoting reform. And international organizations—the Organisation for Economic Co-operation and Development (OECD), the United Nations Conference on Trade and Development, the World Bank, and regional development banks—are supporting them.

The LPI: Stimulating and informing reforms

Since their inception, the LPI and its conceptual framework have motivated comprehensive reforms, as in India and Oman (for Oman, see box 3.3 below). Since 2016, India has emphasized logistics among its high-priority economic reforms to meet challenges of large country size, congested hubs, and internal barriers to trading good and services. To complement the groundbreaking unification of the sales tax across states, the government of India appointed a Special Secretary for logistics, in charge of cross-cutting policies and coordination. And in 2018, the government commissioned a subnational LPI, applying the World Bank LPI concept.[8]

The LPI and related datasets produced at the World Bank[9] are widely used as inputs for analytical policy work and in academic research in areas such as transportation, operations research, and trade (box 3.1).

Shifting priorities

Global logistics has changed in big ways since the first LPI report. The 2008–09 trade crunch that ended an era of fast growing international trade put pressure on traditional actors. And new players and new business models, such as e-commerce, have emerged. Technology and new concerns about supply chain resilience drive industry changes and reshape the policy agenda.

Megatrends and policies

A recent publication by the World Economic Forum, prepared by leading experts, identified eight megatrends likely to drive the future of logistics:

1. Logistics skill shortages.
2. Restructuring global value chains.
3. Supply risk and recovery (resilience).
4. Digital transformation of supply chains.
5. Sustainability of supply chains.
6. E-commerce driving demand chains.
7. Logistics property and infrastructure.
8. Collaborative business models.[10]

Most of these trends are directly relevant for the logistics policy agenda. So, the 2018 LPI survey asked about the drivers of change for freight forwarding services. Most respondents across country income groups see the demand for services growing, fueled by the expansion of e-commerce (figure 3.1).

The importance of skill development for logistics

Despite extensive mechanization and automation, logistics remains a people business. Logistics at an operational level is labor-intensive, with many blue-collar workers (such as truck drivers and warehouse operators) and

Box 3.1 Use of the LPI in research and policy-making literature

Since its launch in 2007, the LPI has established itself as an important source of global trade and transport facilitation and logistics performance indicators for policy makers, academics, logistics practitioners, and traders. It is also used by advocacy groups. Almost 90 research or policy-making publications since 2008 have used LPI data (see figure), in addition to several textbooks and many materials and theses.

Use of LPI in the research and policy making literature, 2008–18

Source: World Bank staff calculations.

The LPI is also a component in various trade and transport indicators, such as the World Economic Forum Enabling Trade Index, first published in 2008, and the European Union Transport Scoreboard, launched in 2014.[a] Almost all multilateral agencies—such as the Asian Development Bank, the African Development Bank, the Inter-American Development Bank, the United Nations Economic Commission for Europe, the United Nations Commission on Trade and Development, and the United Nations Economic and Social Commission for Asia and the Pacific—include the LPI as a regular element in their trade and transport publications. In addition, large and small consultancies and several logistics firms, regularly include LPI data in their reports.

Thematically, the use of LPI can broadly be arranged into two main categories: trade and transport facilitation and supply chain management, transport, and logistics competitiveness (see table). In more than 40 publications, LPI data are the main empirical evidence, and an almost equal number use the data as a reference. Most of the publications are academic papers that may address both categories. A non-exhaustive list of the references is in appendix 7.

Thematic division of use of LPI in the research and policy making literature

	Trade economics, trade and transport facilitation and similar	SCM/logistics/transport and competitiveness issues on national or industry levels	Total
Main empirical data	27	14	41
Major reference data	21	13	34
Minor reference	2	11	13
Total	50	38	88

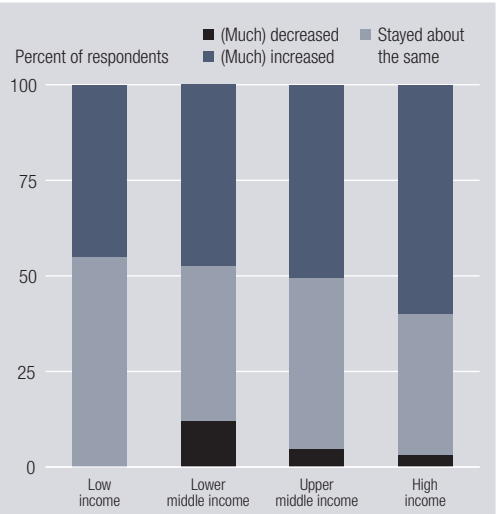
a. The World Economic Forum's Enabling Trade Index has used the LPI three times, and the European Union Transport Scoreboard twice.

administrative clerks. The quality, training, and retention of these employees is a major factor in logistics performance. Lower-quality service hurts production and international trade. Yet human resources, often overlooked or taken for granted, depend not only on the policies of companies but also on national initiatives to educate and train people for logistics occupations.

In 2017, the World Bank and the Kühne Logistics University published a report on skills, competencies, and training in the logistics sector.[11] It highlighted a general perception that qualified logistics-related labor is in short supply at all levels in both developed and developing countries, suggesting that the problem is likely to remain or worsen over the next five years. Respondents in developing countries see the most severe skill shortage at the managerial level—for example, in filling senior supply chain management positions. In developed countries, the most severe shortage is for a qualified blue-collar workforce, such as truck drivers.

Reasons for the shortages include the low prestige and status of operational logistics workers. The sector offers comparatively low salaries, leading to an inferior position in the war for talent. Many developing countries, even if they suffer from high unemployment, have a limited supply of skilled labor. Logistics developments, particularly in information technology, demand new competencies that the workforce does not possess. Developing countries

Figure 3.1 **Increased use of electronic trading platforms (business to business and business to consumer) by shippers mean that our business volumes have...**



Source: Logistics Performance Index 2018.

lag behind developed ones in training budgets, course content, and the quality of the educational experience and training provider. Vocational schools for logistics jobs are lacking. And training—if there is any—is limited to short-term, on-the-job instruction by colleagues during daily operations. This failure disproportionally affects the young, an untapped reservoir of apprentices.

National governments and international agencies have traditionally paid more attention to infrastructure and trade facilitation than to fostering quality services and a skilled workforce. Employees are hired by private companies, and their training is largely a private responsibility. But governments play an important role directly by regulating or providing training—and indirectly by facilitating private initiatives. Developing countries need a major expansion of logistics training and skill development initiatives. Public interventions promoting logistics competence include the following:

- Education and training by public institutions, or financial support to training.
- Education policy and curricula development.
- Advocacy, public–private dialogue, and multi-stakeholder collaboration.
- Regulation of freight and logistics services, including customs brokerage and trucking.
- Setting and harmonizing competency standards for different jobs.
- Raising skill levels in state-owned logistics enterprises (typically ports and railways).
- Investing in human capital as a component of the development of logistics and freight infrastructure.

As part of its country work, the World Bank recently began to offer a comprehensive assessment of skills and competencies at the national level to support logistics improvements (box 3.2). It pinpoints labor skills and constraints in logistics jobs and suggests priorities for intervention to upgrade skills.

Supply chain resilience

Commerce and production have been disrupted by natural events and man-made disasters, such as civil wars or, recently, cyber-disasters. In the current era of globalization, extended supply chains have created more interdependence. Local events create disturbances much beyond the area directly affected when supply chains are interrupted with no backup. In 2010, the eruptions of the Eyjafjallajökull volcano in Iceland grounded most European air transportation for weeks and broke the air cargo export supply chains of many African developing countries for several weeks. In 2011, the tsunami in Japan and the floods in Thailand disrupted trade by striking key nodes of global value chains. In such severe events, supply chain links can take a long time to rebuild and may even be permanently altered.

The resilience of international and domestic supply chains is thus emerging as a policy concern, requiring measures by government agencies and private companies, as in Canada, Japan, the Nordic countries, and the United States.

In mid-2017, cyberattacks on global providers created significant physical supply chain disruption for weeks, so the 2018 LPI survey included a question on the importance of resilience in cybersecurity. The perceived magnitude of cyberthreat and preparedness

In the current era of globalization, extended supply chains have created more interdependence, and commerce and production have been disrupted by natural events and man-made disasters

to respond go hand in hand, and developing countries lag behind (figures 3.2 and 3.3).

Environmental sustainability of logistics

This edition of Connecting to Compete, like the three previous editions, included a question on the demand for environmentally friendly international logistics. The results are consistent: Environmentally friendly supply chains are associated with higher logistics performance (figure 3.4). This trend is good news, as logistics has a fairly large footprint not only on the economy but also on the environment.

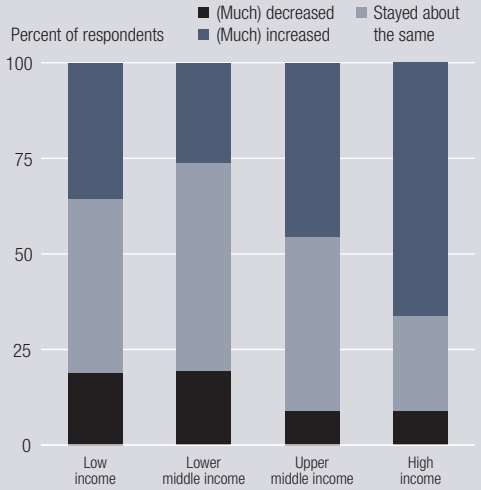
Asking for green logistics?

Emissions from all logistics activities are hard to measure, but transport offers a good proxy: 23 percent of all energy-related emissions can be attributed to transport,[12] and about 7 percent of global CO_2 emissions can be attributed to freight transport,[13] which is estimated to have emitted 3.2 gigatons of CO_2 in 2015.[14] This number is estimated to rise in the next decades, with a higher growth in emerging economies than in Europe.

In top-quintile countries, 28 percent of respondents indicated in 2018 that shippers often or nearly always ask for environmentally friendly shipping options—in emission levels and choices of routes, vehicles, and schedules (down from 34 percent in 2016). The share drops to 14 percent in second-quintile countries, and then steadily declines in the third (9 percent), fourth (7 percent) and fifth (5 percent) quintiles (see figure 3.4).

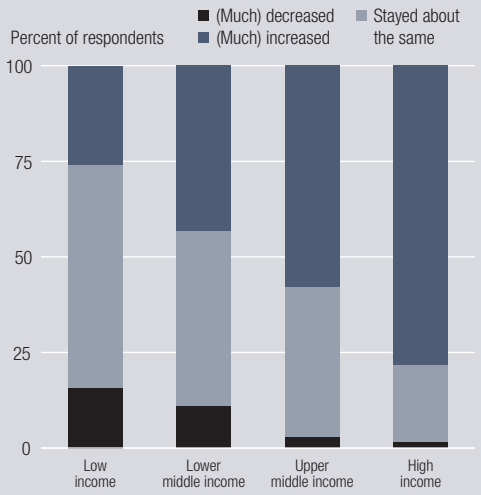
The picture is slightly more balanced for respondents answering that shippers "sometimes" ask for environmentally sustainable shipping options, ranging from 27 percent in the top quintile and 21 percent in the bottom one.

Figure 3.2 Cybersecurity threats in logistics have...



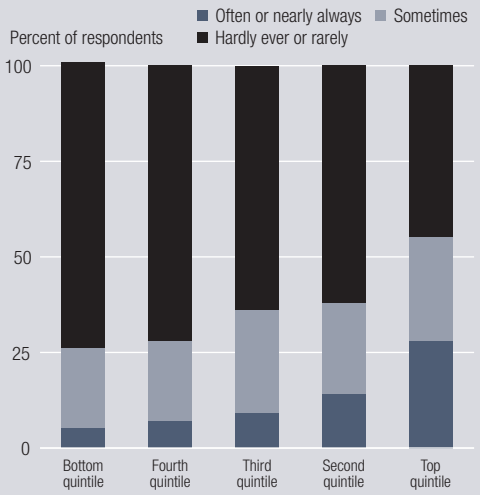
Source: Logistics Performance Index 2018.

Figure 3.3 Our firm's preparedness for cyberthreats has...



Source: Logistics Performance Index 2018.

Figure 3.4 The demand for green logistics



Source: Logistics Performance Index 2018.

Box 3.2 **Assessing logistics skills, competencies, and training: A new toolkit**

In 2017, to support logistics service improvements, the World Bank introduced the "Logistics skills, competencies, and training toolkit," which was co-developed with the Kühne Logistics University. The toolkit systematically evaluates logistics skill requirements, assesses whether they are being met by current training and education, and suggests priority areas for intervention to upgrade logistics skills.

The toolkit assesses 20 areas, tailoring the assessment to interviewees not knowledgeable about every area (see table).

The toolkit mainly relies on qualitative data obtained from interviews with logistics stakeholders, such as shippers, recruitment agencies, educational institutions, professional associations, logistics service providers, and government ministries dealing with transport and professional training. Following the interviews, each assessment area is assigned a maturity level on a scale from 1 to 5 (from minimal capacity to global best practice). An assessment report is then prepared, with recommendations for policy responses.

To test the toolkit, a pilot study was performed in 2017 in Togo, a small, Sub-Saharan economy located between Benin and Ghana. It has a population of around 7.8 million, nearly 60 percent younger than 25. Because Togo exports phosphates, cocoa, coffee, and cotton, logistics is a key to economic prosperity. The toolkit enabled a useful scan of the skills and competencies in logistics, and provided valuable policy insights on how to address educational and training needs.

Source: World Bank 2017b.

Areas assessed by the logistics skills, competencies, and training toolkit

Demand	Recruitment of operative logistics staff	Skill level of existing operative logistics employees	Recruitment of administrative logistics staff	Skill level of existing administrative employees
	Recruitment of logistics supervisors	Skill level of existing logistics supervisory employees	Recruitment of logistics managers	Skill level of logistics managers currently in post
Supply	Availability of vocational education in logistics	Quality of vocational education in logistics	Availability of logistics education by private training providers	Quality of logistics education by private training providers
	Availability of logistics education by universities	Quality of logistics education by universities	Availability of in-house training	Quality of in-house training
	Certification of logistics skills	Role of associations	Attractiveness of logistics industry	Availability of recruitment services

Higher costs and fewer choices for shipping are likely the chief culprits for the discrepancy between higher and lower performing countries, as are fears of adding transit time in an already long and unpredictable supply chain.

Reducing the logistics footprint

Decarbonization measures can curb the detrimental effect of freight transport. They include improved asset utilization in logistics (such as for storage and handling), higher energy efficiency of road and rail freight, low-carbon energy for ships (such as biofuels), fuel efficiency in air cargo, and modal shifts (a moving higher proportion of freight to modes with lower carbon intensity). [15]

Climate change mitigation also features in the United Nations Sustainable Development Goals (SDGs) adopted in September 2015. While transport and logistics are not explicitly named, they influence several of the 17 SDGs: 7, affordable and clean energy; 9, industry, innovation, and infrastructure; 11, sustainable cities and communities; 12, responsible consumption and production; and 13, climate action.

Several organizations focused on specific modes of transport (road, rail, air, and maritime, including seaports) reference the SDGs. They include the International Civil Aviation Organization in its 2030 Agenda for Sustainable Development through promoting sustainable air transport.[16] For maritime shipping, the International Maritime Organization formulates maritime policies and in April 2018 adopted an initial strategy to halve emissions from maritime transport by 2050 from the 2008 level.[17]

In addition, the worldwide port industry launched its SDG initiative called the World

While the development of connecting infrastructure remains a central concern, middle-income countries have to deal with an increasingly complex set of policies

Ports Sustainability Program in March 2018.[18] The road transport industry is recognizing the SDG, too: its primary organization, the International Road Transport Union, is promoting the agenda among its members and in cooperation with relevant bodies, such as the United Nations Economic Commission for Europe.[19]

Other international bodies that have green logistics and transport on their agenda include the International Energy Agency (IEA) and the International Transport Forum (ITF), both linked to the OECD.[20] The IEA's guidance for countries to reduce dependence on oil and greenhouse gas emissions runs under the theme, "Avoid, Shift, Improve." Its recent transport policy reports include "The Future of Trucks," which highlights how improved efficiency and alternative truck fuels can help meet environmental objectives,[21] and the "Global EV Outlook 2017," which features recent developments of electric vehicles as well as market and policy implications.[22]

The ITF launched its "Decarbonizing Transport" initiative in 2016, with the goal of achieving zero transport emissions around 2050. At the heart of the project are tools to enable decisionmakers to select the most fitting CO_2 reduction measures. The initiative focuses on assessing the impacts of CO_2 reducing measures, not on advocating specific measures.

Country-level examples include the Nordic countries—Denmark, Finland, Iceland, Norway, and Sweden—which have embraced the goal of being fossil free by 2050.[23] While 87 percent of electricity generated across the Nordic countries is already carbon-free, several challenges remain: the variability of wind energy in Denmark, the reliance on biomass and forestry products in Finland, and the investments in oil and hydropower in Norway.

The logistics footprint is also spatial, requiring large land areas for facilities such as warehouses, and transport connections to and from them. Logistics not only competes for space with industry and commerce, but also generates traffic in high-density areas. With growing urbanization in developing countries, rapidly increasing urban freight transport has a big impact economically (inefficiencies and urban competitiveness), environmentally (air pollution and noise), and socially (quality of life and health). Hence, the sharper focus on urban logistics and the spatial planning of logistics facilities, as in logistics centers and zones.

Managing the complexity of implementation

The initial focus of logistics related reform emphasized building connecting infrastructure and facilitating trade at the border. That traditional agenda remains important for developing countries, especially for low logistics performers (see section 2), and is still at the core of interventions of international organizations. Connecting infrastructure in developing countries is a high priority of development partners. It is also targeted by the major connectivity initiatives such as the Belt and Road. Trade facilitation good practices have been spelled out in documents and conventions by specialized international organizations such as the United Nations Economic Commission for Europe and the World Customs Organization since the 1970s. Regulatory reforms of the logistics services sectors are also key to logistics performance, as advocated in previous editions of *Connecting to Compete*. Regulatory improvements aim to enhance the quality of service delivery, building on market mechanisms and private sector participation. These reforms are nevertheless challenging to implement in many developing countries. They deal with sectors such as trucking, brokerage, and terminal or warehousing operations, which in many places operate with limited efficiency and with barriers to modernization or entry of new services.

The emerging policy areas, such as resilience and urban logistics, are at least as relevant to developing countries as to developed countries. The network nature of logistics means that standards and business models applicable in high-performing countries will soon appear in lower-performing countries.

Managing logistics as a sector of the economy

Countries aiming at improving their logistics performance must see logistics as a cross-cutting

policy concern. The work crosses administrative boundaries of transportation, commerce, infrastructure, industry, finance, and the environment. And it requires mechanisms to involve the private sector (box 3.3).

The complexity of the agenda is likely to challenge countries in the second and third LPI performance tiers most. Their policy-making has to reconcile the need for consistency and depth of reforms with a set of priorities wider than those facing top performers, which are farther along, or countries in the two bottom tiers, which can focus on fewer issues.

National logistics bodies exist in several countries. They help address the cross-cutting nature of logistics, set common strategies, insure consistency across sectors, and address gaps not crossed by other agencies. China has a large government-related Federation of Logistics and Purchasing. Association of Southeast Asian Nations countries have consultative bodies to develop and refine national strategies. Morocco set up a dedicated agency in 2013 to promote the logistics sector. Dinalog in the Netherlands —a partnership of the private sector, academia, and government agencies with shared funding —develops strategy, promotes innovation, consolidates knowledge and data, and facilitates investments.[24]

Another question is the legal and regulatory status of logistics as a sector of the economy. Logistics encompasses specific activities, creates new concerns because of its footprint, and brings new types of services. Very specific logistics regulations apply to services, to movements of goods, and to facilities and assets. But traditional transport, commerce, urban, and fiscal provisions rarely consider logistics as an activity or service. Many countries with an emerging modern logistics sectors are promoting a framework law to clarify the status of logistics and to improve consistency with other regulatory

Box 3.3 Logistics policy making in Oman

In response to declining hydrocarbon revenues and a rising need to diversify away from oil, Oman is improving its logistics performance. In the first *Connecting to Compete* in 2007, it ranked 48th, and in 2018, 43rd.

Given that Oman was an international logistics hub in the 16th century, and wanting to capitalize on Oman's geographical position, the Omani government started work on a National Logistics Strategy in December 2013. The government was particularly interested in how to profit from Oman's political environment and its previous investments in infrastructure.

Oman's National Logistics Strategy 2040 (SOLS 2040) was developed in consultation with 65 specialists from the private sector, government, and academia. It was approved in February 2015 and confirmed as a part of a five-year plan (2016–20) in the National Program for Enhancing Economic Diversification (Tanfeedh). Oman's strategy targets the five sectors with the most growth potential: manufacturing, tourism, mining, fisheries, and transport and logistics. It aims to boost investment, create job opportunities, and increase their contribution to GDP.

SOLS 2040 identifies the need for integrated development of transport and distribution and of supporting soft infrastructure. The approach requires integrating transport modes and infrastructure, depots, terminals, ports, customs and legal procedures, finance and insurance, information technology, security, and such intermediaries as freight forwarders. The implementation of SOLS 2040 was entrusted to the Oman Logistics Center, a focal agency for simplifying, harmonizing, and automating government logistics processes along four pillars: markets, trade facilitation, human capital, and technology applications.

Continuous interaction between the public and private sectors rapidly built trust among stakeholders. The logistics sector has grown faster (10 percent from 2016 to 2017) than the overall economy (8 percent), and the awareness of logistics has increased.

The next step under the National Logistics Strategy is to establish Oman as an international logistics hub. Oman is not aiming to directly challenge the United Arab Emirates, especially in air freight, but to act as a complementary second hub. Oman's Liner Shipping Connectivity Index has improved in recent years (63.6 in 2017), slightly ahead of Saudi Arabia (59.5), but still behind the United Arab Emirates (73.7). Significant shares of Omani imports and exports are routed through the UAE ports of Jebel Ali and Sharjah. The Omani government plans to further develop a 2,244 km rail network to link Oman to the GCC rail network and to connect Oman's major ports, industrial areas, and free zones at Sohar, Salalah, and Duqm. Oman hopes to reduce shipping times to the Upper Gulf by 2–10 days by offering significantly lower costs.[a]

Source: Al-Futaisi and Salem 2015; UNCTAD 2017; http://www.tanfeedh.gov.om/en/news-National-programme-Tanfeedh-to-enhance.php; https://www.isc.hbs.edu/resources/courses/moc-course-at-harvard/Documents/pdf/student-projects/UAE_TransportLogisticsCluster_2007.pdf.

a. Based on a benchmark voyage direct from Singapore to Suez with no Middle East call. Ports Benchmarking Study 2014, Mercator International LLC.

Table 3.1 **Interaction of LPI performance quintile and logistics priorities**

●●● Very important ●● Important ● Less important

	Lowest performer	Fourth	Third	Second	Best performer
Transportation infrastructure	●●●	●●●	●●	●●	●●
Trade and transport facilitation	●●●	●●●	●●	●	●
Service markets and regulations	●●	●●●	●●●	●	●
Skills	●●	●●●	●●●	●●●	●
Green logistics	●	●	●●	●●	●●●
Urban logistics	●	●●	●●●	●●●	●●●
Spatial planning	●	●	●●	●●	●●
Resilience	●●	●●	●●	●●	●●
Dedicated logistics body	●	●	●●●	●●●	●●
Specific legal framework	●	●	●●	●●	●
National data system	●●	●●	●●●	●●●	●●●

areas. Greece and Morocco have done so recently. Despite limited experience, a framework legal instrument should be carefully evaluated.

Informing reforms with data

Data are essential for motivating, designing, and monitoring policy changes. Logistics observatories, implemented in Asia, Europe, and Latin America, typically rely on national surveys and the maintenance of a few key performance indicators based on existing data.[25]

One of the biggest changes since the 2007 *Connecting to Compete* is a quantum shift of country-specific logistics data from scarce to abundant. The automation of supply chain processing and the spread of tracking and tracing almost globally provide micro-level data on logistics that can be used to evaluate not only international gateways and corridors but also supply chain connectivity within countries. Transforming the massive raw data on individual movements into relevant decision-oriented dashboards is a major technical and organizational challenge, with limited experience so far and few established methodologies or guidelines. Exceptions include South Africa and Canada, which have performance-monitoring systems for their internal logistics networks based on micro-logistics data.[26] And Finland's large-scale biennial national logistics surveys are in the public domain.[27]

* * *

More advanced economies deal with a broader array of policies addressing the performance and externalities of domestic supply chains than lower logistics performers. Table 3.1 summarizes how logistics priorities connect with logistics performance.

Notes

1 Boston Consulting Group 2016.

2 This section uses single-year results for 2018 rather than the aggregated 2012–18 LPI.

3 The ranking of countries by LPI score uses the weighted aggregate value of the scores from the four most recent LPI surveys, with greatest weight given to 2018. This reduces the noise and random variation across different editions of LPI surveys to provide a more balanced picture.

4 Boston Consulting Group 2016.

5 In 2018, the number of respondents from low-Income countries was smaller than in 2016 (but close to the number in 2014). This may have generated more "noise" in the 2018 data, so the findings should be treated with caution.

6 The respondents in the LPI survey are freight forwarders and express carriers, so the quality and competence of these service providers are assessed by their peers.

7 Lead time to import is the median time for shipments from port of discharge to arrival at the consignee.

8 See https://economictimes.indiatimes.com/news/economy/policy/government-ropes-in-deloitte-to-rank-states-on-logistics/articleshow/59552798.cms.

9 The World Bank–UNESCAP International Trade Costs database is available at http://databank.worldbank.org/data/reports.aspx?source=escap-world-bank-international-trade-costs.

10 WEF 2017.

11 McKinnon and others 2017.

12 ITF 2016b.

13 ITF 2016a.

14 McKinnon 2018, p. 9.

15 McKinnon 2018, p. 15

16 ICAO n.d.

17 IMO 2018.

18 World Ports Sustainability Program, available at: https://www.wpspevent.org/home

19 IRU 2017.

20 Not all OECD members are members of the IEA or the ITF. Both organizations can have members that are not members of the OECD.

21 IEA 2017a.

22 IEA 2017b.

23 European Commission DG (Directorate-General) Environment News Alert Service 2017.

24 See http://www.dinalog.org.

25 ITF 2016.

26 Arvis and others 2016.

27 In English at https://blogit.utu.fi/logistiikkaselvitys/en/225-2/.

APPENDIX 1

Aggregated international LPI results across four editions: 2012, 2014, 2016, and 2018

Economy	Mean LPI rank	Mean LPI score	% of highest performer	Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness		Missing values
				Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	
Germany	1	4.19	100.0	1	4.09	1	4.38	4	3.83	1	4.26	1	4.22	1	4.40	
Netherlands	2	4.07	97.2	3	3.97	2	4.23	6	3.76	2	4.12	7	4.08	6	4.30	
Sweden	3	4.07	97.2	4	3.95	3	4.22	2	3.88	5	4.04	11	4.02	4	4.32	
Belgium	4	4.05	96.9	13	3.74	10	4.03	1	3.97	3	4.10	4	4.11	2	4.40	
Singapore	5	4.05	96.6	2	4.00	5	4.14	8	3.72	4	4.08	8	4.05	3	4.34	
United Kingdom	6	4.01	95.7	8	3.85	7	4.09	10	3.69	7	4.04	5	4.10	5	4.32	
Japan	7	3.99	95.3	5	3.91	4	4.19	14	3.61	8	4.03	9	4.03	9	4.24	
Austria	8	3.99	95.2	14	3.71	8	4.07	5	3.78	6	4.04	2	4.13	11	4.22	
Hong Kong SAR, China	9	3.96	94.6	9	3.85	11	4.02	3	3.85	10	3.94	13	3.95	13	4.18	
United States	10	3.92	93.7	11	3.76	6	4.10	23	3.54	11	3.93	3	4.13	16	4.14	
Denmark	11	3.92	93.6	7	3.88	17	3.89	16	3.59	9	3.98	14	3.94	8	4.26	
Finland	12	3.92	93.5	6	3.89	14	3.95	21	3.56	14	3.88	6	4.10	15	4.17	
Switzerland	13	3.91	93.4	12	3.75	9	4.07	20	3.57	12	3.92	10	4.02	12	4.20	
United Arab Emirates	14	3.89	92.8	17	3.66	13	3.98	7	3.76	16	3.83	16	3.89	10	4.23	
France	15	3.86	92.2	18	3.63	12	4.00	15	3.60	17	3.82	12	3.99	14	4.17	
Luxembourg	16	3.84	91.8	16	3.67	18	3.84	11	3.68	15	3.83	22	3.78	7	4.27	
Canada	17	3.81	90.9	15	3.70	16	3.91	28	3.45	13	3.90	15	3.91	21	4.03	
Spain	18	3.78	90.3	21	3.57	22	3.79	9	3.72	18	3.78	21	3.78	19	4.04	
Australia	19	3.77	90.0	10	3.76	15	3.92	31	3.40	19	3.76	19	3.83	22	4.00	
Norway	20	3.74	89.3	19	3.62	19	3.84	27	3.48	20	3.75	18	3.83	25	3.96	
Italy	21	3.73	89.2	23	3.44	20	3.82	22	3.55	23	3.68	17	3.84	18	4.09	
New Zealand	22	3.68	88.0	20	3.58	21	3.79	36	3.27	21	3.69	24	3.73	17	4.10	
Korea, Rep.	23	3.65	87.3	24	3.43	23	3.75	29	3.43	26	3.63	23	3.75	24	3.96	
Taiwan, China	24	3.65	87.2	25	3.42	25	3.67	24	3.54	24	3.68	27	3.67	27	3.93	
Ireland	25	3.63	86.8	22	3.45	26	3.50	25	3.53	22	3.69	20	3.79	30	3.85	
Czech Republic	26	3.62	86.4	26	3.34	29	3.38	12	3.65	25	3.65	26	3.68	23	3.98	
China	27	3.60	86.1	30	3.28	24	3.73	18	3.57	27	3.58	28	3.63	29	3.86	
Portugal	28	3.56	85.1	32	3.24	35	3.23	17	3.59	28	3.54	25	3.69	20	4.03	
South Africa	29	3.51	83.8	29	3.29	28	3.39	26	3.53	33	3.42	30	3.56	31	3.85	
Qatar	30	3.50	83.7	35	3.18	27	3.43	13	3.62	31	3.46	31	3.53	34	3.78	
Poland	31	3.50	83.5	31	3.26	40	3.17	19	3.57	29	3.49	33	3.49	26	3.94	
Hungary	32	3.41	81.5	36	3.18	32	3.31	35	3.29	36	3.27	29	3.61	32	3.82	
Israel	33	3.39	81.0	27	3.32	31	3.33	61	2.93	32	3.44	32	3.50	28	3.89	2012
Thailand	34	3.36	80.2	37	3.13	41	3.17	32	3.40	35	3.29	35	3.38	36	3.75	
Malaysia	35	3.34	79.9	38	3.06	33	3.30	30	3.43	34	3.34	38	3.32	46	3.60	
Estonia	36	3.30	78.8	28	3.30	43	3.13	41	3.19	42	3.15	46	3.20	33	3.80	
Turkey	37	3.29	78.6	47	2.94	30	3.36	40	3.19	37	3.23	36	3.37	39	3.68	
Iceland	38	3.29	78.6	40	3.02	39	3.18	55	3.00	30	3.48	34	3.38	38	3.72	
Slovenia	39	3.29	78.5	34	3.21	34	3.25	44	3.16	41	3.17	40	3.30	41	3.65	
Chile	40	3.28	78.4	33	3.23	45	3.09	37	3.24	47	3.09	39	3.30	37	3.73	
Panama	41	3.26	77.8	44	2.95	42	3.14	33	3.35	38	3.20	43	3.25	42	3.63	

Economy	Mean LPI rank	Mean LPI score	% of highest performer	Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness		Missing values
				Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	
India	42	3.22	77.0	43	2.97	48	3.01	38	3.24	39	3.18	37	3.33	50	3.57	
Lithuania	43	3.20	76.4	41	3.02	49	3.00	54	3.03	45	3.10	42	3.25	35	3.78	
Greece	44	3.19	76.2	49	2.88	36	3.19	48	3.13	52	3.02	41	3.25	40	3.67	
Vietnam	45	3.16	75.5	51	2.86	54	2.92	45	3.15	40	3.17	44	3.23	47	3.60	
Oman	46	3.16	75.5	52	2.82	37	3.18	34	3.29	50	3.06	60	2.96	44	3.61	
Slovak Republic	47	3.14	75.0	46	2.94	44	3.09	42	3.19	43	3.13	57	3.02	54	3.45	
Croatia	48	3.12	74.4	42	3.01	47	3.02	56	2.99	44	3.10	55	3.08	51	3.51	
Cyprus	49	3.10	74.0	39	3.04	53	2.94	53	3.04	58	2.93	59	2.98	43	3.62	
Romania	50	3.10	74.0	58	2.73	58	2.86	46	3.15	53	3.01	48	3.19	45	3.61	
Indonesia	51	3.08	73.6	62	2.69	61	2.81	51	3.08	48	3.07	45	3.23	49	3.59	
Saudi Arabia	52	3.08	73.6	60	2.70	38	3.18	52	3.05	57	2.94	47	3.19	56	3.43	
Mexico	53	3.08	73.6	54	2.78	56	2.90	50	3.09	49	3.06	51	3.14	52	3.49	
Bahrain	54	3.06	73.2	50	2.88	57	2.89	49	3.09	51	3.03	50	3.16	66	3.31	
Latvia	55	3.02	72.3	48	2.93	46	3.03	57	2.97	59	2.92	56	3.06	69	3.25	
Brazil	56	3.02	72.1	85	2.52	51	2.99	65	2.89	46	3.10	49	3.17	53	3.47	
Bulgaria	57	3.00	71.7	55	2.77	64	2.71	43	3.16	54	2.96	63	2.93	57	3.43	
Botswana	58	2.96	70.7	45	2.95	59	2.85	73	2.82	75	2.71	77	2.81	48	3.60	2018
Kuwait	59	2.96	70.6	57	2.75	50	3.00	62	2.91	63	2.81	66	2.88	59	3.39	
Egypt, Arab Rep.	60	2.95	70.5	65	2.67	55	2.91	59	2.94	55	2.95	64	2.91	67	3.30	
Malta	61	2.94	70.3	56	2.77	52	2.95	64	2.91	61	2.85	61	2.95	71	3.24	
Argentina	62	2.93	70.0	90	2.49	60	2.81	63	2.91	62	2.82	52	3.13	58	3.41	
Kenya	63	2.93	69.9	67	2.66	67	2.68	70	2.86	60	2.88	53	3.11	61	3.35	
Philippines	64	2.91	69.6	70	2.62	71	2.67	39	3.20	64	2.80	58	3.01	83	3.11	
Rwanda	65	2.90	69.3	64	2.68	76	2.60	47	3.14	69	2.77	73	2.83	64	3.31	
Côte d'Ivoire	66	2.89	69.0	68	2.66	69	2.67	58	2.96	56	2.95	62	2.95	85	3.11	
Tanzania	67	2.88	68.8	69	2.66	63	2.72	66	2.89	65	2.80	69	2.85	62	3.34	2018
Serbia	68	2.83	67.7	82	2.53	78	2.59	67	2.89	68	2.78	68	2.86	63	3.32	
Ukraine	69	2.83	67.5	95	2.46	105	2.38	81	2.77	70	2.76	54	3.08	55	3.45	
Ecuador	70	2.82	67.4	63	2.69	74	2.62	72	2.82	77	2.70	67	2.87	75	3.22	
Colombia	71	2.81	67.1	89	2.50	81	2.58	60	2.93	66	2.79	70	2.84	80	3.17	
Uganda	72	2.79	66.7	53	2.78	96	2.45	74	2.82	78	2.70	86	2.69	68	3.27	2012, 2014
Brunei Darussalam	73	2.78	66.5	61	2.70	77	2.59	84	2.74	84	2.64	75	2.82	78	3.18	2012, 2014
Peru	74	2.78	66.5	74	2.59	91	2.46	68	2.88	87	2.62	85	2.72	60	3.36	
Uruguay	75	2.78	66.4	73	2.60	82	2.57	80	2.78	67	2.79	74	2.83	91	3.10	
Jordan	76	2.78	66.3	87	2.51	65	2.70	86	2.74	83	2.67	79	2.79	70	3.24	
Kazakhstan	77	2.77	66.2	78	2.57	79	2.59	87	2.73	89	2.60	78	2.81	65	3.31	
Bosnia and Herzegovina	78	2.76	65.8	71	2.62	85	2.52	89	2.70	74	2.73	82	2.75	77	3.20	
Costa Rica	79	2.74	65.4	88	2.50	97	2.45	77	2.79	81	2.67	65	2.88	92	3.09	
Namibia	80	2.73	65.1	72	2.60	62	2.74	93	2.68	86	2.64	107	2.55	81	3.14	2018
Iran, Islamic Rep.	81	2.71	64.8	96	2.46	70	2.67	94	2.68	72	2.76	95	2.63	95	3.07	2014
Lebanon	82	2.71	64.7	98	2.45	75	2.61	82	2.77	103	2.52	72	2.83	98	3.05	
Paraguay	83	2.70	64.6	80	2.53	87	2.50	101	2.66	76	2.70	105	2.56	73	3.23	
Malawi	84	2.69	64.3	76	2.58	83	2.56	103	2.61	71	2.76	92	2.65	105	2.99	2016
Russian Federation	85	2.69	64.2	131	2.25	73	2.64	105	2.59	73	2.74	88	2.67	74	3.23	

Economy	Mean LPI rank	Mean LPI score	% of highest performer	Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness		Missing values
				Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	
Dominican Republic	86	2.68	64.1	102	2.43	102	2.39	83	2.77	93	2.59	71	2.84	99	3.03	
Morocco	87	2.67	63.8	114	2.36	80	2.58	75	2.80	92	2.59	104	2.57	93	3.09	2014
El Salvador	88	2.66	63.6	105	2.40	113	2.31	76	2.79	82	2.67	94	2.63	88	3.10	
Cambodia	89	2.66	63.5	94	2.47	120	2.26	69	2.87	106	2.50	93	2.64	82	3.13	
Bahamas, The	90	2.65	63.3	59	2.72	84	2.56	100	2.66	105	2.51	102	2.58	118	2.87	
Mauritius	91	2.65	63.3	86	2.51	68	2.68	137	2.35	79	2.69	84	2.72	106	2.98	2016
Sri Lanka	92	2.65	63.2	77	2.57	104	2.39	108	2.57	85	2.64	81	2.77	113	2.93	2016
Benin	93	2.65	63.2	93	2.48	94	2.45	98	2.66	107	2.50	101	2.58	79	3.17	
Montenegro	94	2.65	63.2	91	2.49	93	2.46	92	2.68	97	2.55	108	2.55	84	3.11	
Pakistan	95	2.64	62.9	104	2.41	100	2.43	79	2.79	80	2.69	112	2.52	112	2.93	
Burkina Faso	96	2.63	62.9	101	2.44	89	2.48	78	2.79	96	2.56	126	2.42	97	3.06	
Maldives	97	2.63	62.8	97	2.46	72	2.64	104	2.59	115	2.42	103	2.57	96	3.07	
Albania	98	2.62	62.5	118	2.33	123	2.24	85	2.74	95	2.56	111	2.52	72	3.24	2014
Macedonia, FYR	99	2.62	62.5	115	2.36	86	2.51	96	2.66	90	2.60	113	2.52	100	3.01	
Bangladesh	100	2.60	62.0	120	2.33	109	2.36	99	2.66	94	2.56	89	2.67	108	2.97	2012
Ghana	101	2.60	62.0	103	2.41	92	2.46	102	2.63	104	2.51	100	2.58	109	2.95	
Mozambique	102	2.59	61.9	100	2.45	130	2.22	71	2.86	120	2.38	96	2.62	107	2.98	2012, 2018
Nigeria	103	2.59	61.8	145	2.15	88	2.50	118	2.52	100	2.54	83	2.73	86	3.10	
Tunisia	104	2.59	61.8	130	2.27	117	2.27	115	2.53	113	2.45	80	2.78	76	3.20	
São Tomé and Principe	105	2.56	61.3	83	2.52	114	2.30	130	2.44	99	2.55	90	2.66	116	2.90	
Honduras	106	2.56	61.2	123	2.30	112	2.32	97	2.66	91	2.60	97	2.61	121	2.85	
Algeria	107	2.56	61.1	127	2.28	95	2.45	113	2.54	101	2.53	91	2.65	117	2.89	
Nicaragua	108	2.56	61.0	84	2.52	99	2.44	111	2.54	98	2.55	115	2.49	129	2.77	2012, 2018
Mali	109	2.55	60.9	136	2.22	116	2.28	95	2.66	117	2.40	76	2.81	119	2.87	2012
Belarus	110	2.54	60.6	126	2.29	103	2.39	124	2.47	102	2.53	124	2.44	87	3.10	
Jamaica	111	2.52	60.3	99	2.45	106	2.36	114	2.53	110	2.48	120	2.48	123	2.81	
Solomon Islands	112	2.52	60.2	66	2.66	125	2.23	151	2.24	88	2.61	131	2.37	102	3.00	
Moldova	113	2.52	60.1	122	2.31	131	2.21	90	2.69	123	2.36	133	2.36	90	3.10	
Comoros	114	2.51	60.1	75	2.58	119	2.27	123	2.47	129	2.32	87	2.67	132	2.74	
Guatemala	115	2.51	59.9	116	2.35	118	2.27	126	2.46	125	2.35	117	2.49	89	3.10	
Armenia	116	2.51	59.9	107	2.39	101	2.39	110	2.55	112	2.45	128	2.38	122	2.84	
Uzbekistan	117	2.50	59.7	147	2.13	98	2.44	134	2.38	109	2.49	110	2.54	101	3.01	
Zambia	118	2.49	59.4	129	2.27	115	2.29	88	2.72	111	2.46	154	2.18	110	2.94	2012
Togo	119	2.48	59.4	119	2.33	127	2.23	106	2.58	130	2.29	114	2.50	111	2.93	
Lao PDR	120	2.48	59.2	111	2.37	128	2.23	116	2.52	114	2.45	119	2.48	130	2.77	
Nepal	121	2.45	58.6	140	2.19	132	2.20	131	2.40	122	2.36	106	2.56	104	2.99	
Guyana	122	2.45	58.6	92	2.48	134	2.17	138	2.35	121	2.36	109	2.55	127	2.79	
Azerbaijan	123	2.45	58.5	81	2.53	66	2.69	109	2.56	153	2.14	153	2.18	146	2.62	2016, 2018
Georgia	124	2.45	58.5	109	2.38	108	2.36	132	2.38	139	2.27	130	2.37	114	2.92	
Cameroon	125	2.43	58.1	128	2.27	111	2.36	119	2.51	108	2.50	132	2.37	152	2.56	
Djibouti	126	2.43	58.1	124	2.29	90	2.47	141	2.33	154	2.14	121	2.46	115	2.91	
Trinidad and Tobago	127	2.41	57.5	106	2.40	107	2.36	127	2.46	134	2.28	142	2.27	139	2.65	2012, 2014
Guinea-Bissau	128	2.40	57.4	138	2.21	160	1.94	117	2.52	131	2.29	98	2.60	124	2.80	
Mongolia	129	2.40	57.3	132	2.25	142	2.12	128	2.45	145	2.23	149	2.21	94	3.07	
Sudan	130	2.40	57.3	148	2.13	139	2.14	121	2.49	116	2.41	122	2.45	134	2.73	

Economy	Mean LPI rank	Mean LPI score	% of highest performer	Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness		Missing values
				Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	
Ethiopia	131	2.40	57.2	79	2.54	140	2.13	112	2.54	119	2.39	145	2.24	158	2.49	2018
Kyrgyz Republic	132	2.38	57.0	110	2.38	126	2.23	157	2.20	147	2.21	116	2.49	126	2.79	
Congo, Rep.	133	2.38	56.7	151	2.07	141	2.12	107	2.58	142	2.25	129	2.38	125	2.80	
Fiji	134	2.37	56.7	113	2.37	110	2.36	148	2.27	136	2.27	136	2.32	138	2.65	
Venezuela, RB	135	2.37	56.5	160	1.94	124	2.24	120	2.49	128	2.32	123	2.44	133	2.74	
Bolivia	136	2.36	56.5	134	2.24	138	2.16	122	2.48	146	2.21	140	2.29	131	2.75	
Madagascar	137	2.35	56.1	121	2.32	137	2.16	154	2.22	141	2.25	125	2.42	136	2.70	
Gambia, The	138	2.34	56.0	149	2.08	161	1.90	91	2.68	144	2.23	118	2.48	150	2.60	2016
Myanmar	139	2.34	55.9	137	2.21	145	2.11	155	2.22	133	2.28	135	2.33	120	2.86	
Chad	140	2.34	55.9	143	2.15	121	2.26	136	2.35	118	2.39	141	2.28	151	2.58	
Senegal	141	2.34	55.8	125	2.29	122	2.24	129	2.44	137	2.27	151	2.19	153	2.56	
Turkmenistan	142	2.34	55.8	133	2.25	129	2.23	135	2.36	150	2.20	137	2.32	143	2.63	2012
Congo, Dem. Rep.	143	2.33	55.6	135	2.23	152	2.04	149	2.26	126	2.34	127	2.41	141	2.65	
Papua New Guinea	144	2.31	55.2	112	2.37	144	2.11	145	2.29	159	2.11	134	2.36	147	2.61	
Guinea	145	2.30	54.9	108	2.39	166	1.80	133	2.38	138	2.27	99	2.59	166	2.30	
Liberia	146	2.29	54.7	153	2.04	150	2.06	156	2.22	143	2.24	157	2.15	103	2.99	
Tajikistan	147	2.29	54.6	154	2.02	133	2.17	143	2.32	132	2.29	143	2.26	142	2.65	
Niger	148	2.29	54.6	146	2.14	146	2.10	146	2.28	140	2.26	139	2.29	145	2.62	
Yemen, Rep.	149	2.27	54.3	150	2.08	151	2.05	142	2.33	135	2.27	144	2.24	144	2.63	2016
Central African Republic	150	2.26	54.0	117	2.35	135	2.17	150	2.25	156	2.13	150	2.21	161	2.46	2016
Bhutan	151	2.25	53.7	141	2.16	159	1.98	164	2.12	124	2.36	138	2.31	155	2.54	
Cuba	152	2.23	53.4	144	2.15	148	2.09	144	2.30	151	2.20	155	2.18	160	2.46	
Lesotho	153	2.22	53.0	139	2.20	153	2.02	162	2.14	158	2.12	148	2.22	149	2.60	
Burundi	154	2.22	53.0	163	1.90	157	2.00	147	2.28	127	2.33	147	2.23	154	2.55	
Libya	155	2.21	52.9	156	2.00	136	2.17	158	2.18	148	2.21	166	1.90	128	2.78	
Equatorial Guinea	156	2.21	52.7	158	1.99	164	1.82	125	2.46	160	2.11	158	2.14	137	2.66	2012
Mauritania	157	2.20	52.5	142	2.16	147	2.09	161	2.15	162	2.06	156	2.18	156	2.54	
Gabon	158	2.19	52.3	157	1.99	149	2.07	153	2.23	155	2.13	163	2.06	148	2.61	
Iraq	159	2.18	52.2	162	1.90	158	2.00	140	2.33	166	1.98	160	2.13	135	2.73	
Angola	160	2.18	52.1	166	1.79	156	2.01	139	2.33	157	2.13	159	2.14	140	2.65	
Zimbabwe	161	2.17	51.8	155	2.01	155	2.01	163	2.13	149	2.20	152	2.19	162	2.45	
Eritrea	162	2.11	50.4	152	2.05	162	1.89	165	2.12	152	2.19	162	2.09	165	2.31	
Syrian Arab Republic	163	2.10	50.2	167	1.70	143	2.12	166	2.09	165	2.00	146	2.23	157	2.50	
Sierra Leone	164	2.06	49.3	164	1.82	154	2.02	160	2.15	167	1.96	161	2.10	164	2.31	2014
Afghanistan	165	2.04	48.7	161	1.91	163	1.83	159	2.18	163	2.02	167	1.76	159	2.48	
Haiti	166	2.02	48.3	159	1.96	165	1.81	167	1.98	164	2.02	164	1.96	163	2.37	
Somalia	167	2.00	47.7	165	1.81	167	1.69	152	2.24	161	2.07	165	1.94	167	2.18	2012

Source: Logistics Performance Index 2012, 2014, 2016 and 2018.

Note: The LPI index is a multidimensional assessment of logistics performance, rated on a scale from 1 (worst) to 5 (best). The six core components captured by the LPI survey are rated by respondents on a scale of 1–5, where 1 is very low or very difficult and 5 is very high or very easy, except for question 15, where 1 is hardly ever and 5 is nearly always. The relative LPI score is obtained by normalizing the LPI score: Percentage of highest performer = 100 × [LPI – 1] / [LPI highest – 1]. Thus, the best performer has the maximum relative LPI score of 100 percent.

Methodology for computing the aggregated International LPI

Scores of the six components across the four most recent LPI surveys were used to generate a "big picture" to better indicate countries' logistics performance. This approach reduces random variation from one LPI survey to another and enables the comparison of 167 countries. Each year's scores in each component were given weights: 6.7 percent for 2012, 13.3 percent for 2014, 26.7 percent for 2016, and 53.3 percent for 2018. In this way, the most recent data carry the highest weight.

We compute aggregated the score over 2018, 2016, 2014, and 2012 in the following way.

First, we fill missing values, according to:

Score14 = Score12 if Score 14 is missing

Score16 = Score14 if Score 16 is missing

Score18 = Score16 if Score 18 is missing

Then:

Score16 = Score18 if Score 16 is still missing

Score14 = Score16 if Score 14 is still missing

Score12 = Score14 if Score 12 is missing

For example, the following table:

Score18	Score16	Score14	Score12
a_1	a_2	a_3	.
b_1	.	b_3	.
.	c_2	.	c_4
.	.	d_3	d_4
e_1	e_2	.	.

would be extrapolated in this way:

Score18	Score16	Score14	Score12
a_1	a_2	a_3	a_3
b_1	b_3	b_3	b_3
c_2	c_2	c_4	c_4
d_3	d_3	d_3	d_4
e_1	e_2	e_2	e_2

Second, we weight the values in the following way:

Consolidated score = 8w*Score18 + 4w*Score16 + 2w*Score14 + w*Score12

So that: w = 0.067, 2w = 0.133, 4w = 0.267, 8w = 0.533.

APPENDIX 2

International LPI results for 2018, with bounds

	LPI rank			LPI score				Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness	
Economy	Rank	Lower bound	Upper bound	Score	Lower bound	Upper bound	% of highest performer	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Germany	1	1	1	4.20	4.16	4.25	100.0	1	4.09	1	4.37	4	3.86	1	4.31	2	4.24	3	4.39
Sweden	2	2	12	4.05	3.90	4.20	95.4	2	4.05	3	4.24	2	3.92	10	3.98	17	3.88	7	4.28
Belgium	3	2	12	4.04	3.92	4.16	94.9	14	3.66	14	3.98	1	3.99	2	4.13	9	4.05	1	4.41
Austria	4	2	14	4.03	3.88	4.17	94.5	12	3.71	5	4.18	3	3.88	6	4.08	7	4.09	12	4.25
Japan	5	2	10	4.03	3.96	4.09	94.5	3	3.99	2	4.25	14	3.59	4	4.09	10	4.05	10	4.25
Netherlands	6	2	11	4.02	3.95	4.09	94.3	5	3.92	4	4.21	11	3.68	5	4.09	11	4.02	11	4.25
Singapore	7	2	15	4.00	3.86	4.13	93.6	6	3.89	6	4.06	15	3.58	3	4.10	8	4.08	6	4.32
Denmark	8	2	17	3.99	3.82	4.16	93.5	4	3.92	17	3.96	19	3.53	9	4.01	3	4.18	2	4.41
United Kingdom	9	3	11	3.99	3.93	4.05	93.3	11	3.77	8	4.03	13	3.67	7	4.05	4	4.11	5	4.33
Finland	10	1	21	3.97	3.68	4.26	92.7	8	3.82	11	4.00	16	3.56	15	3.89	1	4.32	8	4.28
United Arab Emirates	11	2	15	3.96	3.86	4.05	92.3	15	3.63	10	4.02	5	3.85	13	3.92	13	3.96	4	4.38
Hong Kong SAR, China	12	7	17	3.92	3.83	4.01	91.2	9	3.81	15	3.97	8	3.77	12	3.93	15	3.92	15	4.14
Switzerland	13	7	17	3.90	3.80	4.00	90.6	16	3.63	9	4.02	20	3.51	11	3.97	5	4.10	13	4.24
United States	14	12	17	3.89	3.83	3.94	90.1	10	3.78	7	4.05	23	3.51	16	3.87	6	4.09	19	4.08
New Zealand	15	2	23	3.88	3.63	4.12	89.8	13	3.71	13	3.99	27	3.43	8	4.02	16	3.92	9	4.26
France	16	14	17	3.84	3.79	3.90	88.8	19	3.59	12	4.00	17	3.55	17	3.84	12	4.00	14	4.15
Spain	17	12	18	3.83	3.74	3.92	88.4	17	3.62	19	3.84	6	3.83	18	3.80	19	3.83	20	4.06
Australia	18	14	26	3.75	3.60	3.90	85.9	7	3.87	16	3.97	40	3.25	21	3.71	20	3.82	21	3.98
Italy	19	18	22	3.74	3.68	3.80	85.6	23	3.47	18	3.85	21	3.51	24	3.66	18	3.85	17	4.13
Canada	20	14	27	3.73	3.56	3.89	85.2	18	3.60	21	3.75	30	3.38	14	3.90	21	3.81	22	3.96
Norway	21	12	30	3.70	3.45	3.94	84.2	21	3.52	24	3.69	26	3.43	23	3.69	14	3.94	24	3.94
Czech Republic	22	17	28	3.68	3.53	3.83	83.7	30	3.29	26	3.46	10	3.75	20	3.72	24	3.70	16	4.13
Portugal	23	16	30	3.64	3.44	3.85	82.6	35	3.17	32	3.25	7	3.83	22	3.71	23	3.72	18	4.13
Luxembourg	24	18	30	3.63	3.45	3.81	82.2	20	3.53	25	3.63	31	3.37	19	3.76	29	3.61	26	3.90
Korea, Rep.	25	20	29	3.61	3.49	3.74	81.6	25	3.40	22	3.73	33	3.33	28	3.59	22	3.75	25	3.92
China	26	23	27	3.61	3.55	3.66	81.4	31	3.29	20	3.75	18	3.54	27	3.59	27	3.65	27	3.84
Taiwan, China	27	18	31	3.60	3.42	3.78	81.2	22	3.47	23	3.72	24	3.48	30	3.57	25	3.67	35	3.72
Poland	28	20	33	3.54	3.35	3.73	79.3	33	3.25	35	3.21	12	3.68	29	3.58	31	3.51	23	3.95
Ireland	29	20	37	3.51	3.28	3.74	78.4	26	3.36	29	3.29	28	3.42	26	3.60	28	3.62	33	3.76
Qatar	30	19	41	3.47	3.21	3.74	77.3	38	3.00	27	3.38	9	3.75	31	3.42	30	3.56	36	3.70
Hungary	31	28	39	3.42	3.25	3.59	75.6	27	3.35	30	3.27	43	3.22	38	3.21	26	3.67	32	3.79
Thailand	32	29	37	3.41	3.29	3.53	75.3	36	3.14	41	3.14	25	3.46	32	3.41	33	3.47	28	3.81
South Africa	33	30	39	3.38	3.25	3.51	74.2	34	3.17	36	3.19	22	3.51	39	3.19	35	3.41	34	3.74
Chile	34	31	41	3.32	3.21	3.43	72.4	32	3.27	34	3.21	38	3.27	43	3.13	44	3.20	31	3.80
Slovenia	35	28	49	3.31	3.08	3.55	72.3	24	3.42	31	3.26	47	3.19	50	3.05	40	3.27	38	3.70
Estonia	36	28	50	3.31	3.06	3.56	72.2	28	3.32	44	3.10	39	3.26	40	3.15	43	3.21	30	3.80
Israel	37	30	47	3.31	3.13	3.49	72.1	29	3.32	28	3.33	75	2.78	34	3.39	32	3.50	48	3.59
Panama	38	31	47	3.28	3.12	3.43	71.1	45	2.87	42	3.13	34	3.31	35	3.33	36	3.40	46	3.60
Vietnam	39	31	48	3.27	3.11	3.44	71.0	41	2.95	47	3.01	49	3.16	33	3.40	34	3.45	40	3.67
Iceland	40	23	72	3.23	2.80	3.65	69.5	54	2.77	37	3.19	72	2.79	25	3.61	37	3.35	37	3.70
Malaysia	41	31	55	3.22	3.00	3.44	69.4	43	2.90	40	3.15	32	3.35	36	3.30	47	3.15	53	3.46
Greece	42	34	51	3.20	3.04	3.37	68.9	47	2.84	38	3.17	35	3.30	48	3.06	45	3.18	42	3.66

	LPI rank			LPI score			% of	Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness	
Economy	Rank	Lower bound	Upper bound	Score	Lower bound	Upper bound	highest performer	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Oman	43	31	59	3.20	2.93	3.47	68.6	44	2.87	39	3.16	36	3.30	49	3.05	66	2.97	29	3.80
India	44	40	49	3.18	3.10	3.26	68.0	40	2.96	52	2.91	44	3.21	42	3.13	38	3.32	52	3.50
Cyprus	45	31	64	3.15	2.85	3.45	67.2	37	3.05	55	2.89	50	3.15	53	3.00	48	3.15	45	3.62
Indonesia	46	31	64	3.15	2.85	3.45	67.2	62	2.67	54	2.89	42	3.23	44	3.10	39	3.30	41	3.67
Turkey	47	40	51	3.15	3.05	3.24	67.0	58	2.71	33	3.21	53	3.06	51	3.05	42	3.23	44	3.63
Romania	48	40	55	3.12	3.01	3.23	66.2	80	2.58	51	2.91	48	3.18	47	3.07	41	3.26	39	3.68
Croatia	49	34	65	3.10	2.84	3.37	65.7	39	2.98	46	3.01	58	2.93	45	3.10	61	3.01	47	3.59
Côte d'Ivoire	50	38	63	3.08	2.86	3.30	65.0	51	2.78	56	2.89	45	3.21	37	3.23	49	3.14	71	3.23
Mexico	51	43	60	3.05	2.90	3.20	64.1	53	2.77	57	2.85	51	3.10	52	3.02	62	3.00	49	3.53
Bulgaria	52	40	64	3.03	2.84	3.23	63.5	42	2.94	64	2.76	41	3.23	55	2.88	59	3.02	65	3.31
Slovak Republic	53	34	82	3.03	2.69	3.36	63.3	50	2.79	48	3.00	52	3.10	41	3.14	64	2.99	86	3.14
Lithuania	54	38	74	3.02	2.76	3.28	63.0	46	2.85	66	2.73	74	2.79	54	2.96	50	3.12	43	3.65
Saudi Arabia	55	44	66	3.01	2.83	3.19	62.8	66	2.66	43	3.11	56	2.99	57	2.86	46	3.17	67	3.30
Brazil	56	48	64	2.99	2.85	3.12	62.0	102	2.41	50	2.93	61	2.88	46	3.09	51	3.11	51	3.51
Rwanda	57	38	86	2.97	2.66	3.29	61.7	64	2.67	65	2.76	29	3.39	60	2.85	86	2.75	61	3.35
Colombia	58	49	74	2.94	2.77	3.11	60.6	75	2.61	72	2.67	46	3.19	56	2.87	53	3.08	81	3.17
Bahrain	59	48	76	2.93	2.75	3.12	60.4	63	2.67	68	2.72	55	3.02	58	2.86	60	3.01	68	3.29
Philippines	60	51	77	2.90	2.73	3.07	59.5	85	2.53	67	2.73	37	3.29	69	2.78	57	3.06	100	2.98
Argentina	61	57	72	2.89	2.80	2.98	58.9	98	2.42	62	2.77	59	2.92	68	2.78	58	3.05	58	3.37
Ecuador	62	52	79	2.88	2.72	3.05	58.8	48	2.80	69	2.72	80	2.75	70	2.75	55	3.07	75	3.19
Kuwait	63	44	108	2.86	2.54	3.18	58.1	56	2.73	45	3.02	98	2.63	67	2.80	96	2.66	59	3.37
Iran, Islamic Rep.	64	43	114	2.85	2.50	3.20	57.9	71	2.63	63	2.77	79	2.76	62	2.84	85	2.77	60	3.36
Serbia	65	50	96	2.84	2.59	3.09	57.5	78	2.60	74	2.60	57	2.97	80	2.70	76	2.79	62	3.33
Ukraine	66	52	91	2.83	2.62	3.04	57.2	89	2.49	119	2.22	68	2.83	61	2.84	52	3.11	56	3.42
Egypt, Arab Rep.	67	45	115	2.82	2.48	3.17	57.0	77	2.60	58	2.82	73	2.79	63	2.82	89	2.72	74	3.19
Kenya	68	55	91	2.81	2.62	3.01	56.7	67	2.65	79	2.55	99	2.62	64	2.81	56	3.07	79	3.18
Malta	69	42	125	2.81	2.41	3.21	56.7	60	2.70	53	2.90	89	2.70	66	2.80	75	2.80	98	3.01
Latvia	70	56	90	2.81	2.62	3.00	56.5	49	2.80	49	2.98	81	2.74	81	2.69	77	2.79	113	2.88
Kazakhstan	71	56	90	2.81	2.63	2.99	56.5	65	2.66	81	2.55	84	2.73	90	2.58	83	2.78	50	3.53
Bosnia and Herzegovina	72	56	91	2.81	2.62	3.00	56.5	69	2.63	97	2.42	66	2.84	65	2.80	70	2.89	72	3.21
Costa Rica	73	58	90	2.79	2.63	2.95	56.0	70	2.63	84	2.49	76	2.78	79	2.70	67	2.96	83	3.16
Paraguay	74	56	98	2.78	2.58	2.99	55.7	68	2.64	80	2.55	91	2.69	76	2.72	101	2.61	55	3.45
Russian Federation	75	63	89	2.76	2.65	2.87	54.9	97	2.42	61	2.78	96	2.64	71	2.75	97	2.65	66	3.31
Benin	76	58	109	2.75	2.54	2.96	54.7	82	2.56	83	2.50	83	2.73	98	2.50	87	2.75	57	3.42
Montenegro	77	60	106	2.75	2.56	2.93	54.5	83	2.56	75	2.57	92	2.68	74	2.72	105	2.58	63	3.33
Mauritius	78	55	116	2.73	2.45	3.01	54.1	59	2.70	59	2.80	151	2.12	59	2.86	63	3.00	99	3.00
Lebanon	79	56	119	2.72	2.43	3.00	53.6	106	2.38	73	2.64	70	2.80	104	2.47	74	2.80	77	3.18
Brunei Darussalam	80	60	114	2.71	2.51	2.91	53.3	73	2.62	89	2.46	113	2.51	77	2.71	88	2.75	80	3.17
Macedonia, FYR	81	58	119	2.70	2.44	2.97	53.3	91	2.45	87	2.47	67	2.84	72	2.74	100	2.64	96	3.03
Lao PDR	82	60	115	2.70	2.47	2.93	53.1	74	2.61	91	2.44	85	2.72	83	2.65	69	2.91	117	2.84
Peru	83	60	115	2.69	2.48	2.91	52.9	86	2.53	111	2.28	65	2.84	110	2.42	108	2.55	54	3.45
Jordan	84	64	112	2.69	2.52	2.86	52.7	88	2.49	70	2.72	119	2.44	93	2.55	84	2.77	76	3.18
Uruguay	85	63	114	2.69	2.50	2.87	52.6	87	2.51	94	2.43	82	2.73	78	2.71	82	2.78	109	2.91

	LPI rank			LPI score				Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness	
Economy	Rank	Lower bound	Upper bound	Score	Lower bound	Upper bound	% of highest performer	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Maldives	86	61	119	2.67	2.44	2.89	52.0	105	2.40	71	2.72	94	2.66	125	2.29	104	2.60	64	3.32
Dominican Republic	87	66	115	2.66	2.49	2.84	51.9	103	2.41	105	2.36	77	2.77	108	2.44	65	2.97	101	2.98
Albania	88	64	115	2.66	2.46	2.86	51.8	114	2.35	110	2.29	69	2.82	92	2.56	95	2.67	73	3.20
São Tomé and Principe	89	66	115	2.65	2.47	2.84	51.6	57	2.71	106	2.33	121	2.42	84	2.65	81	2.78	97	3.01
Djibouti	90	61	130	2.63	2.37	2.90	51.1	113	2.35	60	2.79	118	2.45	135	2.25	72	2.85	85	3.15
Burkina Faso	91	61	133	2.62	2.34	2.90	50.6	100	2.41	95	2.43	60	2.92	106	2.46	124	2.40	95	3.04
Armenia	92	73	122	2.61	2.42	2.80	50.2	81	2.57	86	2.48	95	2.65	97	2.50	113	2.51	111	2.90
Honduras	93	76	116	2.60	2.45	2.76	50.1	125	2.24	88	2.47	93	2.66	75	2.72	93	2.68	118	2.83
Sri Lanka	94	63	135	2.60	2.32	2.87	49.9	79	2.58	85	2.49	112	2.51	109	2.42	78	2.79	122	2.79
Cameroon	95	73	129	2.60	2.38	2.81	49.8	90	2.46	76	2.57	63	2.87	87	2.60	118	2.47	142	2.57
Mali	96	63	136	2.59	2.30	2.88	49.7	133	2.15	109	2.30	88	2.70	107	2.45	54	3.08	119	2.83
Malawi	97	61	138	2.59	2.28	2.89	49.5	94	2.43	126	2.18	105	2.55	82	2.68	94	2.67	102	2.97
Cambodia	98	75	129	2.58	2.38	2.78	49.3	109	2.37	130	2.14	71	2.79	111	2.41	111	2.52	84	3.16
Uzbekistan	99	75	129	2.58	2.38	2.77	49.3	140	2.10	77	2.57	120	2.42	88	2.59	90	2.71	91	3.09
Bangladesh	100	68	134	2.58	2.34	2.82	49.2	121	2.30	100	2.39	104	2.56	102	2.48	79	2.79	107	2.92
El Salvador	101	82	118	2.58	2.45	2.70	49.2	120	2.30	114	2.25	86	2.71	91	2.56	117	2.47	90	3.10
Uganda	102	73	133	2.58	2.34	2.81	49.2	76	2.61	124	2.19	78	2.76	99	2.50	123	2.41	110	2.90
Belarus	103	78	125	2.57	2.41	2.74	49.2	112	2.35	92	2.44	134	2.31	85	2.64	109	2.54	78	3.18
Solomon Islands	104	60	143	2.57	2.23	2.91	49.1	52	2.77	120	2.21	142	2.20	73	2.73	126	2.37	87	3.12
Tunisia	105	75	129	2.57	2.38	2.76	49.0	107	2.38	133	2.10	115	2.50	123	2.30	71	2.86	70	3.24
Ghana	106	65	138	2.57	2.29	2.85	48.9	92	2.45	90	2.44	109	2.53	95	2.51	106	2.57	115	2.87
Comoros	107	60	144	2.56	2.20	2.91	48.6	72	2.63	113	2.25	116	2.49	138	2.21	68	2.93	120	2.80
Kyrgyz Republic	108	73	138	2.55	2.29	2.80	48.3	55	2.75	103	2.38	138	2.22	114	2.36	99	2.64	106	2.94
Morocco	109	79	133	2.54	2.35	2.73	48.1	115	2.33	93	2.43	103	2.58	101	2.49	112	2.51	114	2.88
Nigeria	110	64	144	2.53	2.21	2.86	47.9	147	1.97	78	2.56	110	2.52	112	2.40	92	2.68	92	3.07
Zambia	111	84	130	2.53	2.36	2.69	47.7	129	2.18	108	2.30	54	3.05	103	2.48	158	1.98	94	3.05
Bahamas, The	112	85	130	2.53	2.37	2.69	47.6	61	2.68	98	2.41	114	2.50	130	2.27	110	2.52	125	2.75
Jamaica	113	79	135	2.52	2.32	2.72	47.4	99	2.42	107	2.32	107	2.53	94	2.54	116	2.48	121	2.79
Nepal	114	77	138	2.51	2.28	2.75	47.3	122	2.29	123	2.19	129	2.36	105	2.46	98	2.65	89	3.10
Congo, Rep.	115	65	151	2.49	2.12	2.85	46.4	123	2.27	138	2.07	64	2.87	127	2.28	125	2.38	103	2.95
Moldova	116	92	137	2.46	2.30	2.62	45.5	124	2.25	141	2.02	90	2.69	122	2.30	142	2.21	82	3.17
Algeria	117	85	143	2.45	2.21	2.69	45.2	138	2.13	96	2.42	122	2.39	113	2.39	103	2.60	124	2.76
Togo	118	78	150	2.45	2.16	2.74	45.2	119	2.31	116	2.23	111	2.52	134	2.25	120	2.45	112	2.88
Georgia	119	84	146	2.44	2.19	2.69	45.1	95	2.42	102	2.38	124	2.38	132	2.26	139	2.26	105	2.95
Congo, Dem. Rep.	120	104	138	2.43	2.28	2.57	44.6	108	2.37	132	2.12	127	2.37	100	2.49	114	2.51	133	2.69
Sudan	121	91	141	2.43	2.23	2.62	44.6	136	2.14	125	2.18	102	2.58	96	2.51	115	2.51	139	2.62
Pakistan	122	98	140	2.42	2.26	2.58	44.3	139	2.12	121	2.20	97	2.63	89	2.59	136	2.27	136	2.66
Chad	123	75	156	2.42	2.07	2.76	44.3	134	2.15	104	2.37	125	2.37	86	2.62	127	2.37	138	2.62
Trinidad and Tobago	124	93	143	2.42	2.22	2.61	44.2	96	2.42	101	2.38	101	2.59	129	2.27	135	2.27	144	2.53
Guatemala	125	93	143	2.41	2.22	2.61	44.2	132	2.16	122	2.20	130	2.33	136	2.25	122	2.42	88	3.11
Turkmenistan	126	97	141	2.41	2.23	2.59	44.0	111	2.35	117	2.23	136	2.29	120	2.31	107	2.56	130	2.72
Gambia, The	127	84	153	2.40	2.11	2.69	43.8	141	2.08	155	1.82	87	2.71	142	2.21	73	2.81	131	2.71
Madagascar	128	97	146	2.39	2.19	2.59	43.4	118	2.32	128	2.16	146	2.19	118	2.33	102	2.61	128	2.73

	LPI rank			LPI score			% of highest performer	Customs		Infrastructure		International shipments		Logistics quality and competence		Tracking and tracing		Timeliness	
Economy	Rank	Lower bound	Upper bound	Score	Lower bound	Upper bound		Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Guinea-Bissau	129	86	153	2.39	2.11	2.67	43.3	144	2.01	159	1.78	108	2.53	126	2.28	80	2.78	116	2.86
Mongolia	130	100	148	2.37	2.17	2.58	42.9	127	2.22	135	2.10	117	2.49	140	2.21	152	2.10	93	3.06
Bolivia	131	113	146	2.36	2.19	2.52	42.4	117	2.32	129	2.15	106	2.54	139	2.21	148	2.13	127	2.74
Guyana	132	114	145	2.36	2.20	2.52	42.4	84	2.55	137	2.09	148	2.17	137	2.24	121	2.44	137	2.65
Fiji	133	94	154	2.35	2.10	2.60	42.2	101	2.41	99	2.40	149	2.16	119	2.31	132	2.31	143	2.54
Tajikistan	134	108	151	2.34	2.12	2.56	41.8	150	1.92	127	2.17	133	2.31	116	2.33	131	2.33	104	2.95
Mauritania	135	108	153	2.33	2.11	2.55	41.6	128	2.20	112	2.26	145	2.19	144	2.19	119	2.47	134	2.68
Equatorial Guinea	136	82	160	2.32	1.93	2.70	41.2	151	1.91	151	1.88	62	2.88	133	2.25	149	2.13	126	2.75
Myanmar	137	115	154	2.30	2.10	2.50	40.5	131	2.17	143	1.99	144	2.20	128	2.28	143	2.20	108	2.91
Syrian Arab Republic	138	115	155	2.30	2.08	2.51	40.5	154	1.82	82	2.51	126	2.37	124	2.29	128	2.37	148	2.44
Lesotho	139	107	159	2.28	1.99	2.56	39.9	110	2.36	145	1.96	140	2.21	154	2.03	129	2.37	132	2.70
Yemen, Rep.	140	80	160	2.27	1.82	2.71	39.5	104	2.40	131	2.12	141	2.21	131	2.26	146	2.16	151	2.43
Senegal	141	115	159	2.25	2.01	2.50	39.1	130	2.17	118	2.22	128	2.36	149	2.11	150	2.11	145	2.52
Venezuela, RB	142	130	156	2.23	2.08	2.38	38.4	156	1.79	134	2.10	123	2.38	141	2.21	133	2.29	141	2.58
Liberia	143	115	159	2.23	1.97	2.49	38.4	152	1.91	149	1.91	155	2.08	148	2.14	155	2.05	69	3.25
Somalia	144	117	159	2.21	1.97	2.45	37.8	145	2.00	157	1.81	100	2.61	121	2.30	140	2.23	157	2.20
Guinea	145	126	159	2.20	1.99	2.41	37.5	93	2.45	160	1.56	132	2.32	152	2.07	91	2.70	160	2.04
Cuba	146	128	159	2.20	2.00	2.39	37.4	143	2.03	139	2.04	137	2.27	143	2.20	147	2.15	147	2.46
Iraq	147	137	159	2.18	2.04	2.31	36.7	153	1.84	140	2.03	131	2.32	159	1.91	144	2.19	129	2.72
Papua New Guinea	148	128	159	2.17	1.95	2.40	36.7	116	2.32	144	1.97	150	2.15	160	1.88	138	2.26	150	2.44
Bhutan	149	129	159	2.17	1.95	2.39	36.5	135	2.14	150	1.91	160	1.80	115	2.35	130	2.35	146	2.49
Gabon	150	117	160	2.16	1.87	2.45	36.3	148	1.96	136	2.09	153	2.10	151	2.07	153	2.07	135	2.67
Central African Republic	151	116	160	2.15	1.81	2.48	35.9	126	2.24	148	1.93	135	2.30	157	1.93	151	2.10	156	2.33
Zimbabwe	152	128	160	2.12	1.84	2.40	35.0	146	2.00	154	1.83	156	2.06	147	2.16	137	2.26	152	2.39
Haiti	153	140	159	2.11	1.95	2.27	34.7	142	2.03	147	1.94	157	2.01	145	2.19	154	2.05	149	2.44
Libya	154	136	160	2.11	1.89	2.32	34.6	149	1.95	115	2.25	159	1.99	153	2.05	160	1.64	123	2.77
Eritrea	155	130	160	2.09	1.79	2.38	34.0	137	2.13	152	1.86	154	2.09	146	2.17	145	2.17	159	2.08
Sierra Leone	156	137	160	2.08	1.85	2.31	33.7	155	1.82	156	1.82	147	2.18	156	2.00	134	2.27	154	2.34
Niger	157	116	160	2.07	1.66	2.48	33.4	157	1.77	142	2.00	158	2.00	150	2.10	141	2.22	155	2.33
Burundi	158	139	160	2.06	1.85	2.28	33.2	159	1.69	146	1.95	139	2.21	117	2.33	156	2.01	158	2.17
Angola	159	142	160	2.05	1.85	2.25	32.7	160	1.57	153	1.86	143	2.20	155	2.00	157	2.00	140	2.59
Afghanistan	160	155	160	1.95	1.79	2.11	29.6	158	1.73	158	1.81	152	2.10	158	1.92	159	1.70	153	2.38

Note: The LPI index is a multidimensional assessment of logistics performance, rated on a scale from 1 (worst) to 5 (best). The six core components captured by the LPI survey are rated by respondents on a scale of 1–5, where 1 is very low or very difficult and 5 is very high or very easy, except for question 15, where 1 is hardly ever and 5 is nearly always. The relative LPI score is obtained by normalizing the LPI score: Percentage of highest performer = 100 × [LPI – 1] / [LPI highest – 1]. Thus, the best performer has the maximum relative LPI score of 100 percent.
Source: Logistics Performance Index 2018.

APPENDIX 3

Domestic LPI results, by region and income group

Percent of respondents, unless otherwise indicated. Data for regional averages include low- and middle-income countries only.

		Region						Income group			
Question	**Response categories**	**East Asia and Pacific**	**Europe and Central Asia**	**Latin America and Caribbean**	**Middle East and North Africa**	**South Asia**	**Sub-Saharan Africa**	**Low income**	**Lower middle income**	**Upper middle income**	**High income**
Question 17: Level of fees and charges											
Port charges	High or very high	35	53	60	47	56	65	71	63	39	35
	Low or very low	8	6	3	3	8	3	2	2	9	18
Airport charges	High or very high	30	59	54	34	61	60	64	59	40	35
	Low or very low	11	10	13	27	7	10	9	6	19	9
Road transport charges	High or very high	39	31	69	15	63	44	51	53	36	25
	Low or very low	14	17	11	50	7	4	2	8	24	31
Rail transport rates	High or very high	15	50	29	6	46	19	27	29	26	31
	Low or very low	28	17	15	71	8	21	11	30	24	17
Warehousing/transloading service charges	High or very high	26	30	44	25	39	32	45	37	25	31
	Low or very low	23	20	4	40	14	4	2	8	23	32
Agent fees	High or very high	17	34	19	20	48	9	23	22	18	21
	Low or very low	32	23	21	33	24	18	18	19	29	25
Question 18: Quality of infrastructure											
Ports	Low or very low	38	49	54	21	38	31	52	39	35	15
	High or very high	33	14	26	70	18	45	26	26	42	66
Airports	Low or very low	22	21	37	10	61	35	60	31	16	9
	High or very high	36	22	23	53	14	39	25	22	42	65
Roads	Low or very low	30	43	50	11	75	42	62	42	33	14
	High or very high	33	21	9	45	7	17	13	12	30	58
Rail	Low or very low	59	53	68	58	64	54	60	64	53	37
	High or very high	10	20	0	12	10	13	3	6	19	34
Warehousing/ transloading facilities	Low or very low	21	19	27	20	55	18	38	30	10	10
	High or very high	33	23	6	56	7	30	14	17	37	61
Telecommunications and IT	Low or very low	31	21	27	15	13	21	33	27	14	5
	High or very high	43	48	26	69	37	47	35	36	52	75
Question 19: Quality and competence of service											
Roads	Low or very low	19	33	27	8	45	10	17	26	20	8
	High or very high	36	37	21	54	8	33	18	25	44	74
Rail	Low or very low	50	44	69	46	56	38	38	58	46	24
	High or very high	11	22	5	16	2	26	17	13	19	45
Air transport	Low or very low	14	14	11	4	4	12	14	12	10	6
	High or very high	45	40	41	44	24	51	34	39	52	74
Maritime transport	Low or very low	11	23	9	5	23	15	26	16	8	6
	High or very high	42	23	47	69	24	50	36	41	46	71
Warehousing/transloading and distribution	Low or very low	14	25	9	29	39	1	5	23	10	4
	High or very high	37	29	18	49	12	46	32	24	42	70
Freight forwarders	Low or very low	6	23	8	13	29	2	5	18	7	6
	High or very high	47	43	22	64	39	55	39	36	53	79
Customs agencies	Low or very low	30	20	31	23	57	25	33	35	20	12
	High or very high	39	27	15	22	14	36	24	24	33	72

Question	Response categories	Region						Income group			
		East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa	Low income	Lower middle income	Upper middle income	High income
Quality/standards inspection agencies	Low or very low	25	26	36	8	63	20	35	31	21	6
	High or very high	24	25	15	59	12	34	20	25	31	62
Health/sanitary and phytosanitary agencies	Low or very low	29	41	60	16	64	35	46	43	39	10
	High or very high	19	18	4	52	7	31	20	16	24	61
Customs brokers	Low or very low	11	17	21	6	49	13	23	24	8	10
	High or very high	50	36	14	56	18	28	19	28	40	66
Trade and transport associations	Low or very low	15	35	41	32	46	29	42	36	22	15
	High or very high	33	29	13	45	13	31	19	21	37	58
Consignees or shippers	Low or very low	19	24	7	13	14	12	20	19	8	10
	High or very high	32	18	9	39	17	35	20	23	29	52
Question 20: Efficiency of processes											
Clearance and delivery of imports as scheduled	Hardly ever or rarely	6	13	10	17	14	15	21	13	7	3
	Often or nearly always	62	71	62	49	37	45	46	48	69	87
Clearance and delivery of exports as scheduled	Hardly ever or rarely	1	13	7	2	34	18	19	15	6	1
	Often or nearly always	77	67	78	83	53	60	58	65	78	88
Transparency of customs clearance	Hardly ever or rarely	8	22	28	20	55	16	33	24	14	5
	Often or nearly always	57	60	37	70	22	60	40	48	63	84
Transparency of other border agencies	Hardly ever or rarely	12	15	26	12	57	23	45	19	14	5
	Often or nearly always	52	53	27	56	21	47	30	42	51	79
Provision of adequate and timely information on regulatory changes	Hardly ever or rarely	14	27	47	29	44	27	39	31	26	10
	Often or nearly always	61	47	25	69	24	39	23	45	48	69
Expedited customs clearance for traders with high compliance levels	Hardly ever or rarely	10	18	28	23	55	23	35	26	16	10
	Often or nearly always	56	52	28	61	17	31	19	39	50	73
Question 21: Sources of major delays											
Compulsory warehousing/ transloading	Often or nearly always	13	13	24	18	47	30	44	25	11	5
	Hardly ever or rarely	37	38	36	39	22	44	34	28	49	68
Preshipment inspection	Often or nearly always	10	17	19	32	39	24	30	27	11	7
	Hardly ever or rarely	58	51	28	37	20	25	21	30	49	72
Maritime transshipment	Often or nearly always	12	16	13	10	44	10	10	23	10	7
	Hardly ever or rarely	44	38	41	45	17	34	26	27	52	51
Criminal activities (such as stolen cargo)	Often or nearly always	4	16	7	1	21	5	0	14	8	2
	Hardly ever or rarely	68	70	49	75	36	74	75	53	69	85

Question	Response categories	Region						Income group			
		East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa	Low income	Lower middle income	Upper middle income	High income
Solicitation of informal payments	Often or nearly always	13	16	25	11	35	29	21	33	14	3
	Hardly ever or rarely	45	68	33	68	25	34	28	33	61	86
Question 22: Changes in the logistics environment since 2015											
Customs clearance procedures	Much worsened or worsened	10	8	17	26	20	16	14	26	5	5
	Improved or much improved	66	51	57	56	46	65	56	55	64	63
Other official clearance procedures	Much worsened or worsened	10	10	18	18	22	9	8	21	8	5
	Improved or much improved	55	40	45	52	36	57	54	47	48	55
Trade and transport infrastructure	Much worsened or worsened	9	12	22	14	26	10	10	24	7	5
	Improved or much improved	56	56	54	52	29	44	29	48	60	60
Telecommunications and IT infrastructure	Much worsened or worsened	7	9	14	1	0	10	14	7	9	1
	Improved or much improved	58	71	50	77	43	64	51	63	63	72
Private logistics services	Much worsened or worsened	1	9	13	5	24	0	0	10	7	4
	Improved or much improved	60	64	66	67	42	64	51	66	65	72
Regulation related to logistics	Much worsened or worsened	7	18	7	23	29	9	10	17	9	14
	Improved or much improved	52	39	48	47	25	47	38	41	52	36
Solicitation of informal payments	Much worsened or worsened	6	25	10	16	34	26	26	21	14	2
	Improved or much improved	38	37	47	50	25	45	48	32	48	43
Question 23: Developments since 2015											
Demand for traditional freight forwarding as a commercial service	Much decreased or decreased	13	20	13	30	28	14	10	13	27	5
	Increased or much increased	47	49	51	50	28	50	45	46	51	46
Increased use of electronic trading platforms (business to business and business to consumer) by shippers mean that business volumes have	Much decreased or decreased	2	9	7	8	2	8	3	5	12	0
	Increased or much increased	63	46	45	51	28	49	60	51	47	45
Cybersecurity threats in logistics	Much decreased or decreased	18	20	3	23	15	17	9	9	19	19
	Increased or much increased	22	39	40	37	24	42	66	46	26	36
Firm's preparedness for cyber threats	Much decreased or decreased	11	10	3	7	1	13	1	3	11	16
	Increased or much increased	47	50	45	62	30	43	78	58	43	26

Question	Response categories	Region						Income group			
		East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa	Low income	Lower middle income	Upper middle income	High income
Question 24: Export time and distance											
Port or airport supply chain	Distance (kilometers)	508.35	461.75	468.04	577.22	112.13	618.05	150.70	612.90	458.82	353.02
	Lead time (days)	2.36	4.83	4.72	2.81	3.43	9.37	2.42	4.72	4.45	10.35
Land supply chain	Distance (kilometers)	893.34	1,348.99	430.52	699.71	848.13	1,377.22	593.71	1,059.78	940.82	1,163.99
	Lead time (days)	6.88	8.00	4.16	4.07	7.71	16.22	4.33	6.71	7.44	17.80
Question 25: Import time and distance											
Port or airport supply chain	Distance (kilometers)	137.19	499.72	147.42	539.87	235.61	684.06	174.67	486.33	239.47	659.91
	Lead time (days)	3.47	3.60	5.48	4.54	4.31	6.81	2.64	5.29	3.83	6.91
Land supply chain	Distance (kilometers)	468.98	1,574.14	595.27	739.79	566.81	955.95	624.00	1,125.82	741.75	719.68
	Lead time (days)	6.56	8.24	5.80	5.03	6.77	8.33	5.13	7.98	7.11	5.56
Question 26: Percentage of shipments meeting quality criteria											
	% of shipments	83	79	86	76	65	68	86	81	74	70
Question 27: Number of agencies											
	Imports	3.31	2.57	3.37	3.56	5.69	4.43	2.12	3.14	3.76	4.79
	Exports	3.16	2.89	3.16	2.92	6.05	4.21	1.93	3.03	3.57	4.76
Question 28: Number of forms											
	Imports	4.56	3.68	3.38	4.27	5.32	4.90	2.41	3.68	4.53	5.14
	Exports	4.17	4.01	3.34	3.23	4.69	4.76	2.02	3.60	4.10	5.21
Question 29: Clearance time (days)											
	Without physical inspection	1.20	2.75	1.71	1.60	1.58	2.89	0.73	2.36	1.88	2.34
	With physical inspection	2.57	2.86	3.35	2.95	3.02	4.64	1.60	3.16	3.64	3.86
Question 31: Physical inspection											
	% of import shipments	22	15	21	43	29	34	10	21	28	32
Question 32: Multiple inspections											
	% of shipments physically inspected	13	9	3	9	6	18	5	9	12	13
Question 33: Customs											
Can customs declarations be submitted and processed electronically and online?	% yes	92	92	75	80	90	86	97	85	89	82
Does customs code require importer to use a licensed customs broker to clear goods?	% yes	78	72	86	82	91	88	64	78	82	92
Are you or your customer able to choose the location of the final clearance of the goods for imports?	% yes	79	84	95	61	37	55	74	86	72	45
Can goods be released pending final clearance against an accepted guarantee?	% yes	53	57	52	75	58	60	69	56	67	46

Note: Responses are calculated at the country level and then averaged by region and income group.
Source: Logistics Performance Index 2018.

APPENDIX 4

Domestic LPI results, time and distance data

	Question 24: Export time and distance				Question 25: Import time and distance			
	Port or airport supply chain[a]		Land supply chain[b]		Port or airport supply chain[c]		Land supply chain[b]	
Economy	Distance[d] (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)
Albania	300	10			25	14		
Argentina	117	4	265	4	49	5	517	8
Armenia	300	7	300	25				
Australia	75	1			75	1		
Austria	332	2	496	3	344	3	486	3
Azerbaijan	1,025	3	2,646	7	43	2	296	4
Belarus	75	2	25	8	43	2	1,581	7
Belgium	160	2	245	3	186	3	216	3
Benin	75	14			75	10	75	3
Bolivia	52	3	304	6	75	6	968	8
Brazil	276	5	366	5	240	5	352	5
Brunei Darussalam	25	1	25	1	25	1	25	1
Bulgaria	438	2	1,136	3	276	2	1,256	3
Burkina Faso	750	5			300	2		
Burundi	25	18			750		750	3
Cameroon	150	5	2,092	13	474	6	1,581	11
Canada	161	4	766	3	188	5		
Chile	300	3			300	3		
China	337	2	707	6	328	6	784	4
Colombia	237	2			43	5		
Congo, Rep.	3,500	18						
Côte d'Ivoire	36	4	1,250	14	36	4	306	16
Czech Republic	300	7	750	3	474	5	300	3
Denmark	43	3	75	2	52	3	75	3
Dominican Republic			1,250	6			2,000	18
Egypt, Arab Rep.	349	2	792	5	452	5	554	6
Estonia	75	2	968	4	75	2	1,250	4
Ethiopia	750	60	750	25	750	10	750	14
Finland	230	2	785	5	172	3	553	5
France	261	2	673	3	177	3	439	3
Gabon	3,500	25			3,500	25		
Georgia	300	2	1,225	4	300	2	775	3
Germany	212	2	569	2	350	2	559	3
Ghana	296	1	1,620	1	296	1	25	2
Greece	219	3	841	3	302	3	783	7
Guatemala	150	4			300	5		
Haiti			25	1			25	1
Hong Kong SAR, China			300	2	750	2	474	2
India	246	3	569	6	203	3	812	8
Indonesia	171	2	297	3	277	4	277	4
Iran, Islamic Rep.	1,581	3			1,250	5		
Italy	269	3	541	5	210	4	519	5
Japan	25	2			25	3		

	Question 24: Export time and distance				Question 25: Import time and distance			
	Port or airport supply chain[a]		Land supply chain[b]		Port or airport supply chain[c]		Land supply chain[b]	
Economy	Distance[d] (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)
Kazakhstan	2,000	10					3,500	18
Kenya	298	4	203	3	429	4	483	4
Kuwait	75	2	150	2	43	3	75	4
Lao PDR	25	2	750	3	25	2	750	3
Latvia	25	1	2,000	46	25	1	3,500	53
Lithuania	150	2	1,581	4	43	2	1,581	4
Luxembourg	96	2	471	3	101	2	393	3
Macedonia, FYR	300	1			300	2		
Madagascar	300	1			75	1		
Malawi	750	4	3,500	88	1,250	14		
Malaysia	75	2	75	4	43	2	75	4
Malta	25	1			25	1		
Mauritius	52	1			66	2		
Mexico	3,500	5			300	5		
Mongolia			1,250	14			1,250	14
Morocco	159	2	523	2	292	3	631	2
Mozambique	75	3			75	5		
Myanmar	88	3	683	4	106	4	579	5
Namibia	25	3	3,500	25	300	4	3,500	25
Nepal	61	1	1,486	10	133	2	582	5
Netherlands	48	2	265	1	99	1	453	2
Nigeria	64	3	61	6	87	2	426	4
Norway	75	1	75	1	75	2		
Oman	198	2	320	3	157	2	256	3
Pakistan	66	4	489	7	306	8	306	7
Panama	75	3	300	2	75	2	75	2
Papua New Guinea	3,500	2	3,500	2	75	2	75	2
Paraguay	25	3						
Peru	39	2	512	2	84	4	75	1
Philippines	36	1			25	2		
Poland	75	1	750	4	300	1	750	5
Portugal	141	3	1,601	3	157	3	1,738	6
Qatar	25	10	25	7	75	7		
Romania	203	2	835	3	482	2	1,249	4
Russian Federation	306	3	3,500	3	2,646	5	2,092	9
Rwanda			2,000	6			2,000	7
Saudi Arabia	235	4	940	5	232	5	483	7
Senegal	296	1	25	1	300	7		
Serbia	75	2	909	4	300	2	777	4
Singapore	30	2	33	1	29	2	33	2
Slovenia	300	1	256	2	300	3	474	3
Spain	143	2	298	2	101	3	326	2
Sri Lanka	75	6			300	4		
Sweden	474	1	1,025	1	300	3	1,025	5
Switzerland	36	3	750	3	52	2	300	2
Taiwan, China	75	1			75	2		

	Question 24: Export time and distance				Question 25: Import time and distance			
	Port or airport supply chain[a]		Land supply chain[b]		Port or airport supply chain[c]		Land supply chain[b]	
Economy	Distance[d] (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)	Distance (kilometers)	Lead time (days)
Tanzania	51	4	776	7	51	4	326	5
Thailand	300	4	300	18	300	5	300	18
Tunisia	219	4	784	5	166	5	1,034	6
Turkey	252	3	1,267	6	332	3	1,087	6
Uganda	750	3	750	5	3,500	14	1,250	6
United Arab Emirates	89	2	249	2	107	2	119	2
United Kingdom	147	2	562	4	197	3	429	3
United States	275	2	612	5	263	2	483	4
Uzbekistan	429	16	1,647	16	750	3	3,129	23
Venezuela, RB	209	15	422	7	162	12	750	3
Vietnam	43	2	477	9	56	3	131	5

a. From the point of origin (the seller's factory, typically located either in the capital city or in the largest commercial center) to the port of loading or equivalent (port/airport), and excluding international shipping (EXW to FOB).
b. From the point of origin (the seller's factory, typically located either in the capital city or in the largest commercial center) to the buyer's warehouse (EXW to DDP).
c. From the port of discharge or equivalent to the buyer's warehouse (DAT to DDP).
d. Aggregates of the distance indicator for port and airport.
Source: Logistics Performance Index 2018.

Economy	Question 26: % of shipments meeting quality criteria	Question 27: Number of agencies		Question 28: Number of forms		Question 29: Clearance time (days)[a]		Question 31: Physical inspection	Question 32: Multiple inspection
	% of shipments	Imports	Exports	Imports	Exports	Without physical inspection	With physical inspection	% of import shipments	% of shipments physically inspected
Afghanistan		8	8	8	6				
Albania	87	3	4	4	3	13	14	6	18
Argentina	75	5	4	4	3	2	4	36	6
Australia	93	2	2	1	1	1	2	1	1
Austria	86	2	2	2	2	0	1	2	2
Azerbaijan	61	3	4	5	8	2	2	50	6
Belarus	57	3	4	4	4	1	1	6	1
Belgium	82	1	1	2	2	1	1	3	1
Benin	88	3	2	5	2	5	6	18	6
Bolivia	83	3	3	2	3	3	7	30	1
Brazil	82	4	4	5	4	2	5	8	5
Brunei Darussalam	88	1	1	1	1	0	1	6	18
Bulgaria	86	2	2	3	3	1	1	7	3
Burkina Faso	88	5	5	3	5	3	5	3	1
Burundi	40	5	3	4	4	4	7	18	3
Cameroon	40	5	8	9	9	2	5	37	18
Canada	57	2	2	3	1	1	4	2	1
Chile	93	5	5	5	5	1	1	3	1
China	81	3	3	4	4	1	2	3	1
Colombia	96	3	3	5	3	2	2	3	1
Côte d'Ivoire	51	5	4	6	4	2	6	30	6
Czech Republic	88	1	1	2	2	1	1	1	1
Denmark	92	1	1	1	1	1	2	1	1
Dominican Republic	97	2	2	3	3	1	1	50	1
Egypt, Arab Rep.	81	6	5	6	5	2	4	40	14
Estonia	93	3	3	1	1	0	1	3	
Ethiopia	97	4	6	7	11	1	0	75	75
Finland	93	1	1	2	1	0	1	2	1
France	79	2	2	2	2	1	1	3	2
Gabon	83	1	1	6	5	7	7	50	50
Georgia	62	2	2	2	2	1	1	3	1
Germany	95	1	1	1	1	1	1	2	2
Ghana	61	1	1	1	1	7	10	35	50
Greece	95	2	2	3	3	1	2	2	1
Guatemala	87	4	3	4	4	1	1	42	3
Haiti	100	1	1	1	2	1	3	1	1
Hong Kong SAR, China	95	3	3	4	3	1	2	75	1
India	77	3	3	3	3	1	2	19	3
Indonesia	73	4	3	5	3	1	7	8	2
Iran, Islamic Rep.	69	3	2	4	2	1	3	75	7
Italy	90	2	2	3	2	1	2	3	2
Japan	93	3	2	1	1	1	1	1	1
Kazakhstan	93	4	6	5	8	10	5	18	50
Kenya	53	6	4	6	4	3	4	66	39
Kuwait	62	4	3	9	3	2	1	75	4
Lao PDR	93	3	3	4	4	2	3	18	1

Economy	Question 26: % of shipments meeting quality criteria	Question 27: Number of agencies		Question 28: Number of forms		Question 29: Clearance time (days)[a]		Question 31: Physical inspection	Question 32: Multiple inspection
	% of shipments	Imports	Exports	Imports	Exports	Without physical inspection	With physical inspection	% of import shipments	% of shipments physically inspected
Latvia	89	3	2	2	2	0	1	4	11
Lithuania	97	3	3	2	2	0	1	6	2
Luxembourg	89	2	2	2	2	1	1	3	2
Macedonia, FYR	93	1	1	4	3	1	1	35	6
Madagascar	40	11	11	11	11	2	4	6	3
Malawi	40	3	2	5	6	6	10	75	1
Malaysia	69	2	2	2	2	0	1	4	1
Malta	93	1	1	1	1	1	1	3	1
Mauritius	66	8	5	4	2	1	3	16	3
Mexico	93	2	2	2	2	1	2	6	1
Mongolia	88	2		11	11	1	1	75	75
Morocco	82	3	3	3	3	1	2	13	5
Mozambique	88	2	2	3	3	1	2	35	3
Myanmar	66	4	4	6	6	2	3	28	6
Namibia	90	3	3	2	3	2	4	11	1
Nepal	59	9	9	9	8	1	1	75	10
Netherlands	82	2	1	1	1	0	0	2	1
Nigeria	93	6	6	6	6	2	3	56	21
Norway	93	1	1	2	2	1	2	1	1
Oman	67	4	3	3	2	1	2	36	4
Pakistan	83	4	4	2	2	2	5	17	4
Panama	93	3	3	3	3	1	1	6	3
Papua New Guinea	97	5	5	2	2	1	3	6	3
Paraguay		3	3	4	4	3	3	1	1
Peru	88	5	5	3	3	2	4	15	4
Philippines	87	4	4	6	6	2	2	30	1
Poland	73	2	1	3	3	1	2	3	1
Portugal	82	3	2	3	3	1	2	6	2
Qatar		1	2	3	3	2	7	75	75
Romania	86	2	2	4	5	1	2	8	5
Russian Federation	69	3	3	2	2	2	4	22	4
Rwanda	85	3	2	3	3	2	2	4	3
Saudi Arabia	69	3	3	3	3	2	3	25	9
Senegal	59	3	5	4	3	1	2	35	18
Serbia	95	3	3	3	3	1	1	8	5
Singapore	94	2	2	1	1	0	1	2	2
Slovenia	96	3	3	2	2	0	1	4	2
Spain	75	2	2	2	2	1	2	4	2
Sri Lanka	40	4		4	4	2	4	6	6
Sweden	97	2	2	3	3	1	2	2	1
Switzerland	91	1	1	2	2	0	1	3	1
Taiwan, China	83	2	2	3	3	1	1	1	1
Tanzania	75	7	7	6	6	2	3	70	10
Thailand	93	3	3	2	2	1	1	35	35
Tunisia	74	3	3	5	3	2	3	45	10
Turkey	77	3	3	4	4	1	2	12	6

Economy	Question 26: % of shipments meeting quality criteria	Question 27: Number of agencies		Question 28: Number of forms		Question 29: Clearance time (days)[a]		Question 31: Physical inspection	Question 32: Multiple inspection
	% of shipments	Imports	Exports	Imports	Exports	Without physical inspection	With physical inspection	% of import shipments	% of shipments physically inspected
Uganda	59	3	4	3	3	3	5	6	35
United Arab Emirates	86	3	2	4	3	1	1	10	3
United Kingdom	90	2	1	2	2	1	2	2	1
United States	91	3	2	4	3	2	3	3	1
Uzbekistan	78	3	3	4	4	1	1	1	1
Venezuela, RB	50	6	7	6	7	3	6	50	7
Vietnam	83	3	2	3	2	1	3	10	3

a. Time taken between the submission of an accepted customs declaration and notification of clearance.
Source: Logistics Performance Index 2018.

APPENDIX 5

The LPI methodology

Because logistics has many dimensions, measuring and summarizing performance across countries is challenging. Examining the time and costs associated with logistics processes—port processing, customs clearance, transport, and the like—is a good start, and in many cases this information is readily available. But even when complete, this information cannot be easily aggregated into a single, consistent, cross-country dataset, because of structural differences in countries' supply chains. Even more important, many critical elements of good logistics—such as process transparency and service quality, predictability, and reliability—cannot be assessed using only time and cost information.

Constructing the international LPI

The first part of the LPI survey (questions 10–15) provides the raw data for the international LPI. Each survey respondent rates eight overseas markets on six core components of logistics performance. The eight countries are chosen based on the most important export and import markets of the country where the respondent is located, on random selection, and—for landlocked countries—on neighboring countries that form part of the land bridge connecting them with international markets. The method used to select the group of countries rated by each respondent varies by the characteristics of the country where the respondent is located (table A5.1).

Table A5.1 Methodology for selecting country groups for survey respondents

	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 import 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 and Central Asia c. Latin America d. Europe less Central Asia and OECD	Two countries randomly from a 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 and Central Asia c. Latin America d. Europe less Central Asia and OECD + Two countries randomly from the combined country groups a, b, c, and d
Respondents from landlocked countries	Four most important export partner countries + Two most important import partner countries + Two land-bridge countries	Three most important export partner countries + The most important import partner country + Two land-bridge countries + Two countries randomly, one from each country group: a. Africa, East Asia and Central Asia, and Latin America b. Europe less Central Asia and OECD	

Source: Authors.

Respondents take the survey online. For the 2018 edition, the survey was open between September 2017 and February 2018. The web engine for 2018 was the same as the new engine put in place in 2012. It incorporates the Uniform Sampling Randomized (USR) approach to gain the most possible responses from underrepresented countries. Because the survey engine relies heavily on a specialized country selection methodology for survey respondents based on high trade volume between countries, the USR can help countries with lower trade volumes rise to the top during country selection.

The 2017–18 survey engine builds a set of countries for the survey respondents that are subject to the rule set (see table A5.1). After 200 surveys, the USR is introduced into the engine's process for country selection. For each new survey respondent, the USR solicits a response from a country chosen at random but with non-uniform probability—with weights chosen to evolve the sampling toward uniform probability. Specifically, a country i is chosen with a probability $(N - n_i) / 2N$, where n_i is the sample size of country i so far, and N is the total sample size.

The international LPI is a summary indicator of logistics sector performance, combining data on six core performance components into a single aggregate measure. Some respondents did not provide information for all six components, so interpolation is used to fill in missing values. The missing values are replaced with the country mean response for each question, adjusted by the respondent's average deviation from the country mean in the answered questions.

The six core components are:

- *The efficiency of customs and border management clearance,* rated from "very low" (1) to "very high" (5) in survey question 10.
- *The quality of trade and transport infrastructure,* rated from "very low" (1) to "very high" (5) in survey question 11.
- *The ease of arranging competitively priced shipments,* rated from "very difficult" (1) to "very easy" (5) in survey question 12.
- *The competence and quality of logistics services,* rated from "very low" (1) to "very high" (5) in survey question 13.
- *The ability to track and trace consignments,* rated from "very low" (1) to "very high" (5) in survey question 14.
- *The frequency with which shipments reach consignees within scheduled or expected delivery times,* rated from "hardly ever" (1) to "nearly always" (5) in survey question 15.

The LPI is constructed from these six indicators using principal component analysis (PCA), a standard statistical technique used to reduce the dimensionality of a dataset. In the LPI, the inputs for PCA are country scores on questions 10–15, averaged across all respondents providing data on a given overseas market. Scores are normalized by subtracting the sample mean and dividing by the standard deviation before conducting PCA. The output from PCA is a single indicator—the LPI—that is a weighted average of those scores. The weights are chosen to maximize the percentage of variation in the LPI's original six indicators that is accounted for by the summary indicator.

Full details of the PCA procedure are in tables A5.2 and A5.3. The first line of table A5.2

Table A5.2 Results of principal component analysis for the International LPI 2018

Component	Eigenvalue	Difference	Proportion	Cumulative
1	5.53535	5.36359	0.9226	0.9226
2	0.17175	0.0648739	0.0286	0.9512
3	0.106876	0.0292183	0.0178	0.9690
4	0.0776582	0.00796402	0.0129	0.9819
5	0.0696941	0.0310184	0.0116	0.9936
6	0.0386757	na	0.0064	1.0000

Source: World Bank staff analysis.

Table A5.3 Component loadings for the International LPI 2018

Component	Weight
Customs	0.4072
Infrastructure	0.4130
International shipments	0.3961
Logistics quality and competence	0.4166
Tracking and tracing	0.4106
Timeliness	0.4056

Source: World Bank staff analysis.

shows that the first (principal) eigenvalue of the correlation matrix of the six core indicators is greater than one—and much larger than any other eigenvalue. Standard statistical tests, such as the Kaiser Criterion and the eigenvalue scree plot, suggest that a single principal component be retained to summarize the underlying data. This principal component is the international LPI. Table A5.2 shows that the international LPI accounts for 92 percent of the variation in the six components.

To construct the international LPI, normalized scores for each of the six original indicators are multiplied by their component loadings (table A5.3) and then summed. The component loadings represent the weight given to each original indicator in constructing the international LPI. Since the loadings are similar for all six, the international LPI is close to a simple average of the indicators. Although PCA is re-run for each version of the LPI, the weights remain very steady from year to year. There is thus a high degree of comparability across the various LPI editions.

Constructing the confidence intervals

To account for the sampling error created by the LPI's survey-based methodology, LPI scores are presented with approximate 80 percent confidence intervals. These intervals make it possible to provide upper and lower bounds for a country's LPI score and rank. To determine whether a change in score or a difference between two scores is statistically significant, confidence intervals must be examined carefully. For example, a statistically significant improvement in a country's performance should not be concluded unless the lower bound of the country's 2018 LPI score exceeds the upper bound of its 2016 score.

To calculate the confidence interval, the standard error of LPI scores across all respondents is estimated for a country. The upper and lower bounds of the confidence interval are then

$$LPI \pm \frac{t_{(0.1,N-1)}S}{\sqrt{N}},$$

where LPI is a country's LPI score, N is the number of survey respondents for that country, s is the estimated standard error of each country's LPI score, and t is Student's t-distribution. As a result of this approach, confidence intervals and low-high ranges for scores and ranks are larger for small markets with few respondents, since these estimates are less certain.

The high and low scores are used to calculate upper and lower bounds on country ranks. The upper bound is the LPI rank a country would receive if its LPI score were at the upper bound of the confidence interval rather than at the center. The lower bound is the LPI rank a country would receive if its LPI score were at the lower bound of the confidence interval rather than at the center. In both cases, the scores of all other countries are kept constant.

The average confidence interval on the 1–5 scale is 0.2, or about 7 percent of the average country's LPI score. Because of the bunching of LPI scores in the middle of the distribution, the confidence interval translates into an average of 16 rank places, using upper and lower rank bounds as calculated above. Caution must be taken when interpreting small differences in LPI scores and rankings.

Despite being the most comprehensive data source for country logistics and trade facilitation, the LPI has two important limitations. First, the experience of international freight forwarders might not represent the broader logistics environment in poor countries, which often rely on traditional operators. And the international and traditional operators might differ in their interactions with government agencies—and in their service levels. Second, for landlocked countries and small-island states, the LPI might reflect access problems outside the country assessed, such as transit difficulties. The low rating of a landlocked country might not adequately reflect its trade facilitation efforts, which depend on the workings of complex international transit systems. Landlocked countries cannot eliminate transit inefficiencies with domestic reforms.

Constructing the domestic LPI database

The second part of the LPI survey instrument is the domestic LPI, in which respondents provide

qualitative and quantitative information on the logistics environment in the country where they work.

Questions 17–22 ask respondents to choose one of five performance categories. In question 17, for example, they can describe port charges in their country as "very high," "high," "average," "low," or "very low." As in the international LPI, these options are coded from 1 (worst) to 5 (best). Appendix 3 displays country averages of the percentage of respondents rating each aspect of the logistics environment as 1–2 or 4–5. Question 23 referred to the use of electronic platforms in logistics and to cyberthreats.

With a few exceptions, questions 24–35 ask respondents for quantitative information on their countries' international supply chains, offering choices in a dropdown menu. When a response indicates a single value, the answer is coded as the logarithm of that value. When a response indicates a range, the answer is coded as the logarithm of the midpoint of that range. For example, export distance can be indicated as less than 50 kilometers, 50–100 kilometers, 100–500 kilometers, and so forth—so a response of 50–100 kilometers is coded as log(75). Full details of the coding matrix are available on request.

Country scores are produced by exponentiating the average of responses in logarithms across all respondents for a given country. This method is equivalent to taking a geometric average in levels. Scores for regions, income groups, and LPI quintiles are simple averages of the relevant country scores.

APPENDIX 6

Respondent demographics

Operators on the ground are best placed to assess the vital aspects of logistics performance. The LPI thus uses a structured online survey of logistics professionals at multinational freight forwarders and at the main express carriers. The 2018 LPI data are based on a survey conducted between September 2017 and February 2018, answered by 869 respondents at international logistics companies in 108 countries.

Geographic dispersion of respondents

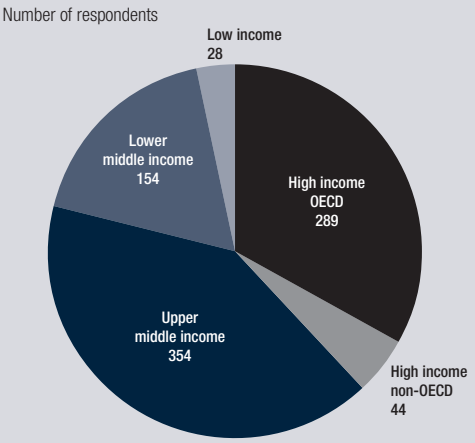
Among the respondents, 62 percent are in either low income countries (3 percent) or middle-income countries (59 percent). The overall number is similar to the 2016 LPI, but this year there are relatively many more contributions from upper-middle-income countries. The lack of representation of low income countries is due to their more marginal role in world trade, and the difficulty of communicating effectively with operators on the ground (figure A6.1).

Among developing countries, all regions are well represented, especially Latin America and Caribbean (figure A6.2). Increasing involvement of local associations and operators will hopefully help build response rates in the future in other regions.

Respondents' positions in their companies

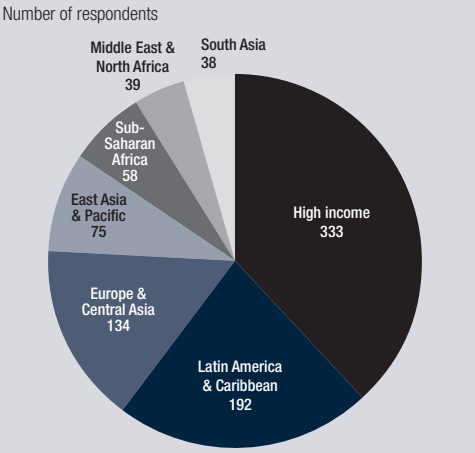
The LPI assesses both large companies and small and medium enterprises. Large companies (those with 250 employees or more) account for around 29 percent of responses, which is higher than in 2016. Most of the responses are thus from small and medium enterprises.

Figure A6.1 **Composition of respondents, by income group**



Source: Logistics Performance Index 2018.

Figure A6.2 **Composition of respondents, by region**



Note: World Bank regions do not include high-income countries, so they are included as a separate category.
Source: Logistics Performance Index 2018.

Knowledgeable senior company members are important to the survey. The 2018 respondents include senior executives (43 percent,

fewer than in 2016), area or country managers (13 percent), and department managers (19 percent). These groups of professionals have oversight of, or are directly involved in, day-to-day operations, not only from company headquarters but also from country offices. The relative seniority of respondents has slightly decreased from 2016 to 2018. Two-thirds of respondents are at corporate or regional headquarters (39 percent) or at country branch offices (26 percent). The rest are at local branch offices (10 percent) or independent firms (25 percent).

43 percent of respondents are involved in providing a large range of logistics services as their main line of work. Such services include warehousing and distribution, customer-tailored logistics solutions, courier services, bulk or break-bulk cargo transport, and less- than-full-container, full-container, or full-trailer load transport. 38 percent of respondents are at companies with business models based on full-container or full-trailer load transport (24 percent) or on customer-tailored logistics solutions (14 percent). These shares have converged as compared to 2016.

Among all respondents, 35 percent deal with multimodal transport, 25 percent with maritime transport, and 13 percent with air transport. These last two numbers are similar to the 2016 ones, while the number of respondents dealing with multimodal transport has gone down. In 2018, 6 percent of respondents handle domestic trade, and 53 percent deal with exports or imports.

Finally, 26 percent work with most of the world's regions, while others concentrate their work in Europe (34 percent), Asia (19 percent), the Americas (14 percent), Africa (4 percent), or the Middle East (3 percent). Hardly any work with Australia and the Pacific (3 respondents).

APPENDIX 7

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What is the Logistics Performance Index?

Based on a worldwide survey of global freight forwarders and express carriers, the Logistics Performance Index is a benchmarking tool developed by the World Bank that measures performance along the logistics supply chain within a country. Allowing for comparisons across 167 countries, the index can help countries identify challenges and opportunities and improve their logistics performance. The World Bank conducts the survey every two years.

Reliable logistics is indispensable to integrate global value chains—and reap the benefit of trade opportunities for growth and poverty reduction. The ability to connect to the global logistics web depends on a country's infrastructure, service markets, and trade processes. Government and the private sector in many developing countries should improve these areas—or face the large and growing costs of exclusion.

Logistics Performance Index

International Federation for Freight Forwarders Associations

GFP

Global Facilitation Partnership for Transportation and Trade

Turun yliopisto
University of Turku

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This is the sixth edition of *Connecting to Compete,* a report summarizing the findings from the new dataset for the Logistics Performance Index (LPI) and its component indicators. The 2018 LPI also provides expanded data on supply chain performance and constraints in more than 100 countries, including information on time, distance and reliability, and ratings on domestic infrastructure quality, services, and border agencies. The 2018 LPI encapsulates the firsthand knowledge of movers of international trade. This information is relevant for policymakers and the private sector seeking to identify reform priorities for "soft" and "hard" trade and logistics infrastructure. Findings include:

- Gaps in logistics performance between the bottom and top performers persist.
- Supply chain reliability and service quality are strongly associated with logistics performance.
- Infrastructure and trade facilitation initiatives still play an important role in assuring basic connectivity and access to gateways for most developing countries.
- The logistics policy agenda continues to broaden, with growing focus on supply chain resilience, cyber security, environmental sustainability, and skills shortages.