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Summary Report of the 2015 UIS Innovation Data Collection

UNESCO

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Country and region codes

ARG	Argentina
AUS	Australia
AUT	Austria
AZE	Azerbaijan
BLR	Belarus
BEL	Belgium
BRA	Brazil
BUL	Bulgaria
CAN	Canada
CHL	Chile
CHN	China
HKG	China, Hong Kong Special Administrative Region
COL	Colombia
CRI	Costa Rica
CRO	Croatia
CUB	Cuba
CYP	Cyprus
CZE	Czechia
DNK	Denmark
ECU	Ecuador
EGY	Egypt
SLV	El Salvador
EST	Estonia
ETH	Ethiopia
FIN	Finland
FRA	France
DEU	Germany
GHA	Ghana
GRC	Greece
HUN	Hungary
ISL	Iceland
IND	India
IDN	Indonesia
IRL	Ireland
ISR	Israel
ITA	Italy
JPN	Japan
KAZ	Kazakhstan
KEN	Kenya

LVA	Latvia
LTU	Lithuania
LUX	Luxembourg
MYS	Malaysia
MLT	Malta
MEX	Mexico
MAR	Morocco
NLD	Netherlands
NZL	New Zealand
NIG	Nigeria
NOR	Norway
PAN	Panama
PHL	Philippines
POL	Poland
PRT	Portugal
KOR	Republic of Korea
ROM	Romania
RUS	Russian Federation
SRB	Serbia
SVK	Slovakia
SVN	Slovenia
ZAF	South Africa
ESP	Spain
SWE	Sweden
MKD	The former Yugoslav Republic of Macedonia
TUR	Turkey
UGA	Uganda
UKR	Ukraine
GBR	United Kingdom of Great Britain and Northern Ireland
TZA	United Republic of Tanzania
URY	Uruguay
USA	United States of America

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Section 1. The 2015 UIS innovation data collection

Committed to increase the availability of timely, accurate and policy-relevant science, technology and innovation statistics, the UNESCO Institute for Statistics (UIS) has been formally engaged in the production of innovation indicators since 2010. To date, one pilot data collection and two global data collections have been carried out.

The first global innovation data collection was carried out by the UIS in 2013. Since then, the gathering of innovation data has become a regular activity of the Institute, taking place biennially. The UIS innovation dataset currently covers a total of 71 countries at different stages of development.

Box 1. Revision of the Oslo Manual

UIS work on innovation statistics relies heavily on the Oslo Manual's recommendations. At present in its third edition, the Oslo Manual (OECD and Eurostat, 2005) provides methodological guidelines for the collection and interpretation of innovation data in the business sector with the aim to foster international comparability.

The first edition of the Oslo Manual was published in 1992 and, in spite of its existence for 25 years, innovation statistics have not yet reached full international harmonisation. The Oslo Manual is currently undergoing a revision process and its fourth edition is expected to be finalised in December 2017.

Reviewing the Manual is an important step towards the production of more consistent and comparable innovation data. Nonetheless, the harmonisation of international innovation statistics is not feasible without the commitment of countries carrying out innovation surveys to truly comply with Oslo Manual guidelines.

This report presents the main results of the 2015 UIS innovation data collection, which gathered country-level data for innovation in manufacturing[1]. This report does not intend to compare countries in a 'most or least, best or worst' ranking fashion. Instead, it seeks to identify trends, common features or dissimilarities presented by firms in countries with different levels of income when undertaking innovative efforts.

The basic innovation indicators presented refer to the types of innovation implemented by firms, innovation activities and linkages used, as well as obstacles they faced when trying to innovate. For analytical purposes, countries are arranged into two groups according to their income levels[2], namely: 38 high-income countries and 33 low- and middle-income countries.

[1] Detailed information about methodological procedures adopted by countries in their national innovation surveys can be found in Annexes I and II.

[2] Based on the classification of the World Bank: http://data.worldbank.org/about/country-and-lending-groups

Section 2. Innovation rates

Product and process innovations have been part of the scope of the Oslo Manual since its very first edition. Organizational and marketing innovations, however, only became part of the formal Oslo Manual's measurement framework in its third version.

Definition

An **innovation** is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. A common feature of an innovation is that it must have been implemented (Oslo Manual §146).

A new or improved product is implemented when it is introduced on the market. New processes, marketing methods or organizational methods are implemented when they are brought into actual use in the firm's operations (Oslo Manual §150).

An innovation does not need to be commercially successful: a new product may not sell as much as expected and can turn out to be a commercial failure.

The changes to definitions presented in the third edition of the Oslo Manual led to the redesign of national innovation surveys, in order to include two new types of innovation. This redesign mostly comprised the creation of additional modules to national questionnaires without amending modules that were already in place, mainly to avoid the loss of time series data. In other words, in many countries previously existing survey modules – for instance on innovation activities – were not modified to cover organizational and marketing innovations in addition to product and process innovations. Bearing this in mind, one could well claim that these two new types of innovation were not completely integrated into innovation surveys and innovation statistics.

This section presents innovation rates of countries. The innovation rates are firstly presented for the four types of innovation currently covered by the Oslo Manual: product innovation, process innovation, organizational innovation and marketing innovation. Subsequently, due to aforementioned reasons, the discussion focuses on indicators related to product and process innovations.

2.1 Types of innovators

Figure 1 shows the shares of manufacturing firms that implemented the four types of innovation in the high-income group for which data are available.

Marketing innovation has the highest shares of innovators in 11 high-income countries – including Ireland (38.7%) and Greece (38.2%). Product innovation and process innovation tie for second place, each prevailing in 10 high-income countries as the type of innovation that was implemented by most firms. This was, for instance, observed in Germany, where 43.8% of manufacturing firms were product innovators.

Definitions

Product innovation is the implementation of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness, or other functional characteristics (Oslo Manual §156). Firms that implemented at least one product innovation are product innovators.

Process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software (Oslo Manual §163). Firms that implemented at least one process innovation are process innovators.

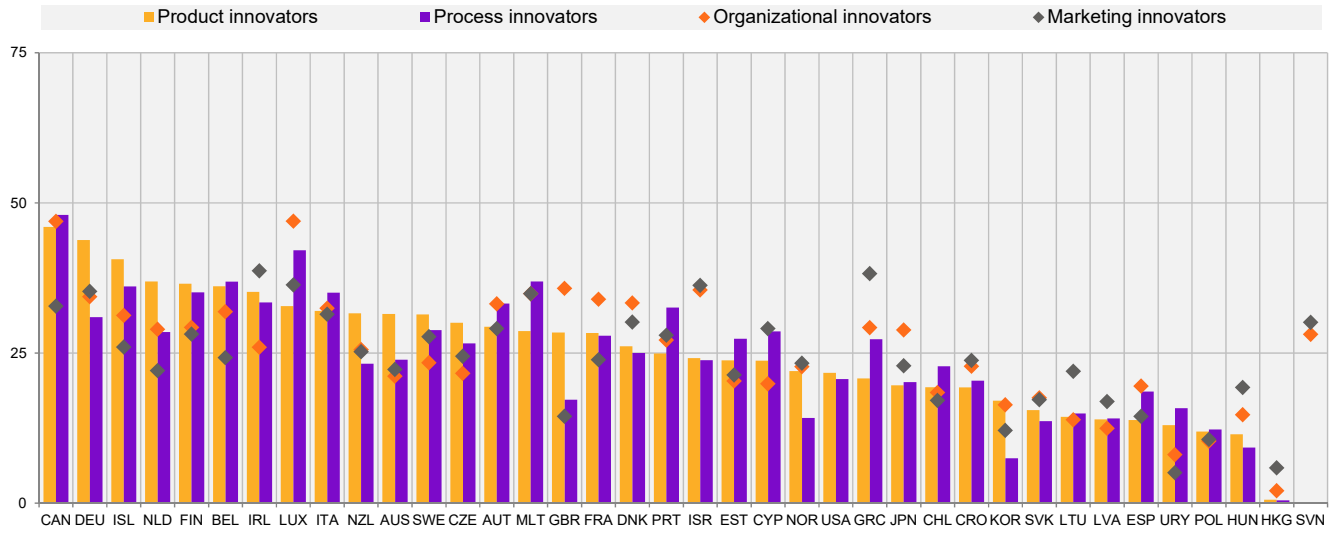
Organizational innovation is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations (Oslo Manual §177). Firms that implemented at least one organizational innovation are organizational innovators.

Marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion, or pricing (Oslo Manual §169). Firms that implemented at least one marketing innovation are marketing innovators.

The lowest share of innovators are found in marketing innovation in 11 of these countries. For example, in Uruguay 5% of firms are marketing innovators.

Figure 2 illustrates the shares of innovators in low- and middle-income countries for which data are available. In this group, process and organizational innovations prevail in nine countries. For instance, process innovations were implemented by 63.1% of firms in Uganda and organizational innovations were implemented by 64.8% of firms in Cuba. Product innovation, on the other hand, is the least prominent type of innovation in almost 45% of low- and middle-income countries.

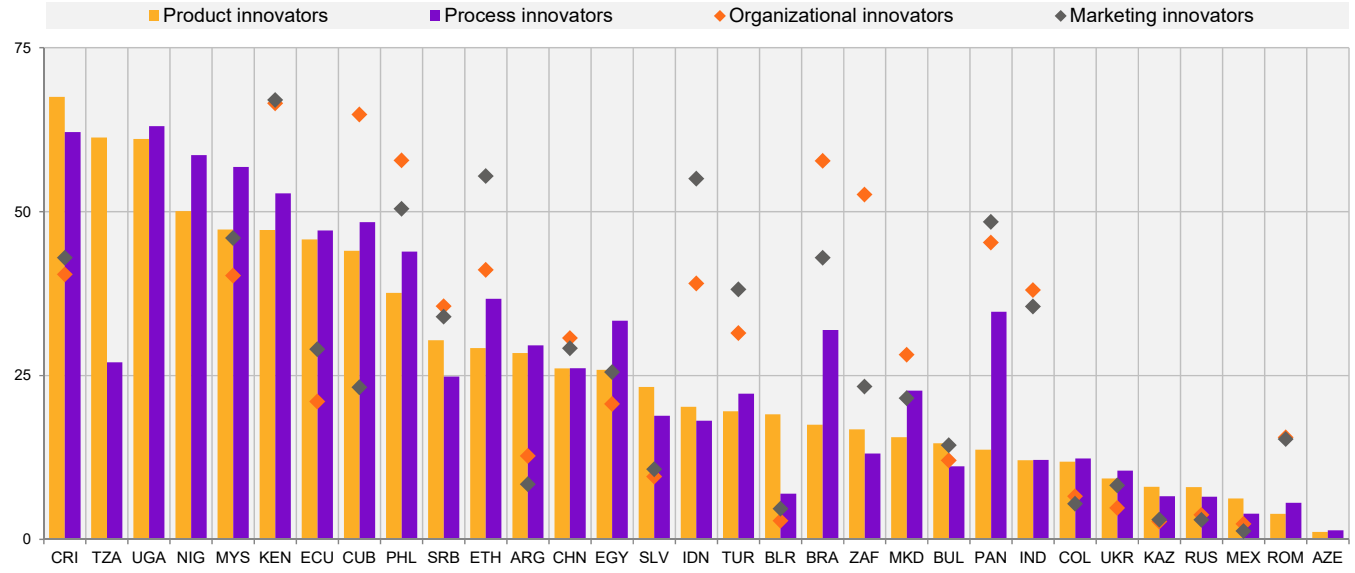
Figure 1. Innovators in high-income countries (as a percentage of manufacturing firms)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection and Eurostat

Figure 2. Innovators in low- and middle-income countries (as a percentage of manufacturing firms)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD

2.2 Innovation-active and innovative firms

There are a few basic indicators on innovation that are often used along with the indicators on the share of innovators. Mainly, they refer to the combination of firms that implemented more than one type of innovation or had abandoned or ongoing innovation activities.

Definition

Innovation-active firms are those that implemented product or process innovations or had abandoned or ongoing innovation activities to develop product or process innovations, regardless of organizational or marketing innovations.

In this report, two basic indicators are examined: the percentage of innovative firms and the percentage of innovation-active firms.[3] At times, these indicators, in particular the latter, can cover the four types of innovation. However, it is common practice to cover only product or process innovation. Henceforth, this report will focus on product or process innovations, regardless of organizational or marketing innovation.

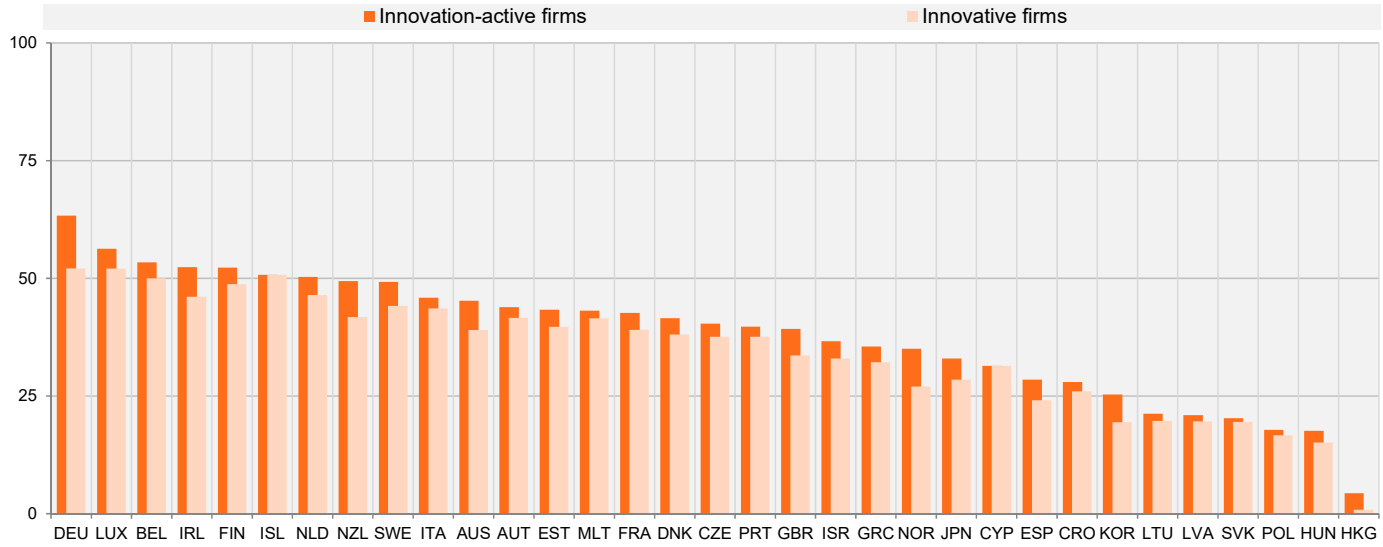
Figures 3 and **4** present the shares of product or process innovation-active and innovative firms in high- and low- and middle-income countries, respectively. In these figures, the difference between the darker and lighter bars represents the share of firms that only had abandoned or ongoing innovation activities.

In the group of high-income countries, not many gaps are observed between the two bars. Germany is the only country where the percentage of innovation-active firms is composed by a share of firms that only had abandoned or ongoing innovation activities above 10 percentage points. The share of 63.3% innovation-active firms is the sum of the 11.2% firms that only had abandoned or ongoing innovation activities and the 52.1% of firms that were de facto product or process innovators. Other high-income countries where the gap between the two bars nears 10 percentage points are: Norway (8%) and New Zealand (7.7%).

In low- and middle-income countries, there are three cases where the participation of firms with only abandoned or ongoing innovation activities in the composition of the rate of innovation-active firms is higher than 10 percentage points. In India, the share of 35.6% of innovation-active firms covers 17.1% of firms with only abandoned or ongoing innovation activities, which leaves the country with a share of 18.5% firms that were actually innovative in terms of product or process innovations. Additionally, a gap of more than 10 percentage points is observed in Cuba (12.8%) and Panama (11.6%).

[3] Innovation-active firms are frequently used as a denominator in the production of innovation indicators, including in this report. In the absence of data on innovation-active firms, the number of innovative firms was used as denominator. Details can be found in Annexes I, II and III.

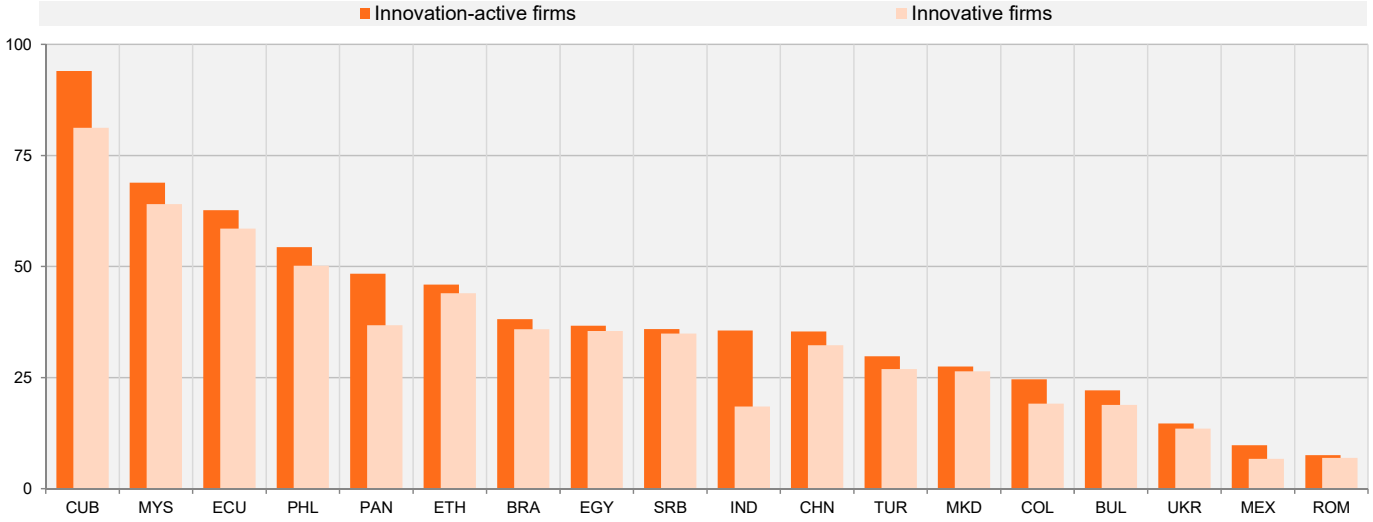
Figure 3. Product or process innovation-active and innovative firms in high-income countries (as a percentage of manufacturing firms)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection and Eurostat

Figure 4. Product or process innovation-active and innovative firms in low- and middle-income countries (as a percentage of manufacturing firms)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection and Eurostat

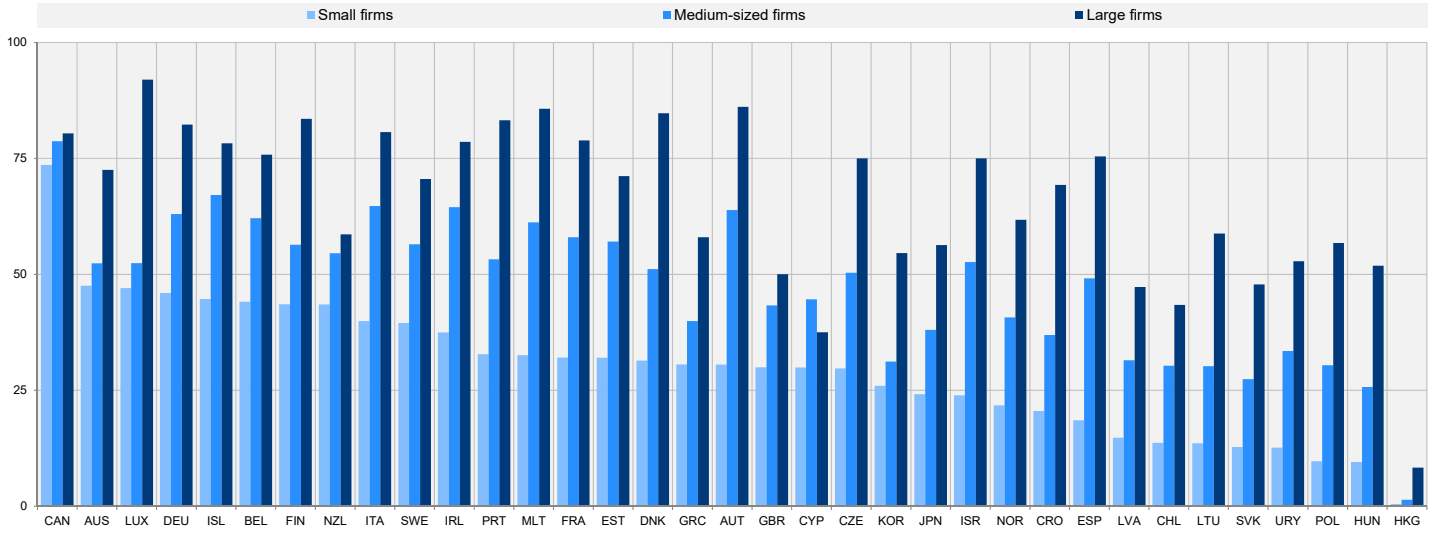
It is important to note that data on innovation-active firms are not available for a number of countries. In high-income countries, the lack of data is mainly due to the non-coverage of abandoned or ongoing innovation activities in national innovation surveys. In low- and middle-income countries, data quality issues are an additional cause for missing data.

The size of firms is important in innovation, thus disaggregating data by size breakdowns is key in innovation indicators. Product or process innovative firms are broken down by size class for high- and low- and middle-income countries in **Figures 5** and **6**. Overall, larger manufacturing firms tend to present higher rates of innovation.

In high-income countries, the share of large innovative firms is above 50% in 30 out of 35 countries for which this breakdown is available, varying from 8.3% in Hong Kong Special Administrative Region of China to 92% in Luxembourg. In low- and middle-income countries, the share of innovators in large firms is above 50% in 11 out of 18 countries for which data are available. The shares of large innovative firms vary from 20.6% in South Africa to 89.7% in Costa Rica.

Overall, there are four countries where the observed shares of product or process innovative firms do not follow the trend that higher shares of innovators are found in larger size classes. In Cyprus, India, Panama and South Africa this is not observed; such cases require further investigation.

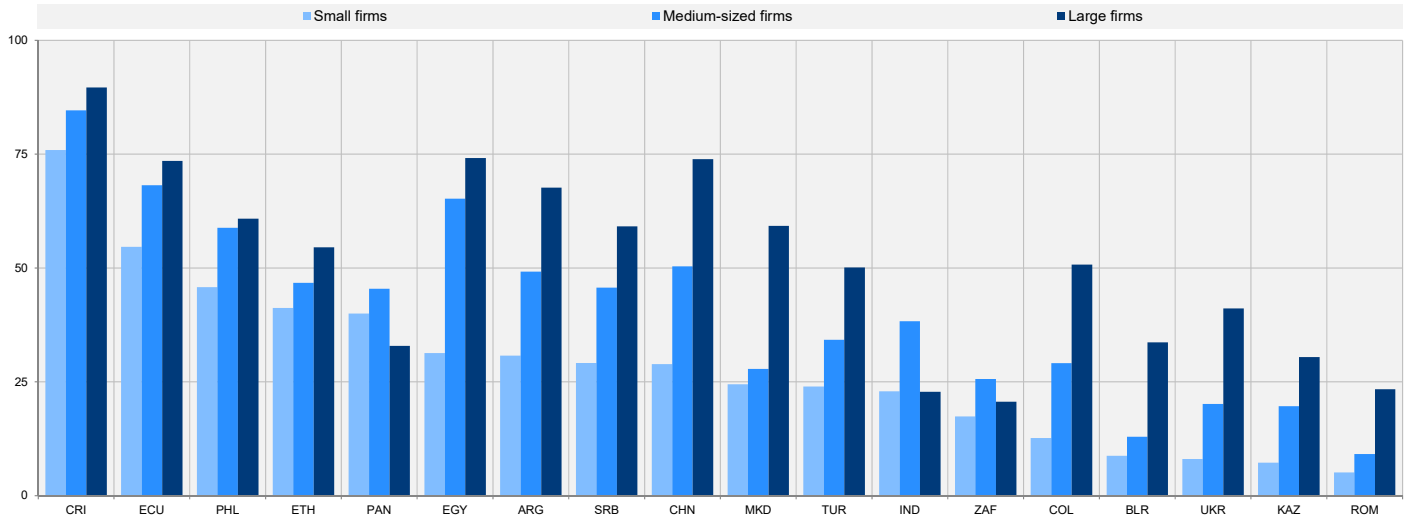
Figure 5. Product or process innovative firms in high-income countries by size class (as a percentage of manufacturing firms in each size class)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection and Eurostat

Figure 6. Product or process innovative firms in low- and middle-income countries by size class (as a percentage of manufacturing firms in each size class)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection and Eurostat

Section 3. Innovation activities

When attempting to innovate, firms engage in a set of efforts which are defined as innovation activities. Innovation activities can be of three kinds: abandoned, ongoing or successful. Ongoing innovation activities represent work in progress and have not yet resulted in the implementation of an innovation. Abandoned innovation activities were terminated before the implementation of an innovation.

Successful innovation activities in turn refer to activities that resulted in the implementation of an innovation. Contrary to assumptions, success here does not imply commercial success. It basically refers to the ability of a firm to implement innovations. Firms that engaged in any kind of innovation activity – ongoing, abandoned or successful – are innovation-active firms.

In national innovation surveys, questions about innovation activities are usually addressed to product or process innovation-active firms. In some countries, however, all innovators respond to the questions[4]. **Table 1** presents the percentage of innovation-active manufacturing firms that engaged in different types of innovation activities in both groups of countries.

[4] Further information on methodological issues, including the variations on the definition of innovation-active firms, can be found in Annexes I and II.

The predominant innovation activity in 55% of high-income countries is the acquisition of machinery, equipment and software. The share of innovation-active firms that engaged in such activity varies from 8% in Hong Kong Special Administrative Region of China to 91.5% in Cyprus. In about 80% of these countries, the shares of firms that engaged in this innovation activity lies above 50%.

Table 1. Firms that engaged in innovation activities (as a percentage of innovation-active manufacturing firms)

	In-house R&D	Contracted-out (external) R&D	Acquisition of machinery, equipment and software	Acquisition of external knowledge	Training	Market introduction of innovations	Other preparations
High-income countries							
Australia	20.9	8.8	36.2	8.9	27.7	26.8	0.4
Austria	63.1	31.6	76.9	30.1	61.2	43.7	45.4
Belgium	64.1	39.5	67.8	18.0	49.9	34.9	29.0
Chile	31.3	10.1	64.5	6.5	28.2	14.1	30.3
China, Hong Kong SAR	90.4	2.7	8.0	:	7.1	5.5	10.0
Croatia	59.5	27.3	79.6	29.1	55.8	40.1	38.3
Cyprus	25.9	18.9	91.5	41.5	80.7	72.6	99.1
Czechia	53.6	24.0	72.6	13.2	50.0	37.9	41.0
Denmark	59.9	22.3	49.3	45.9	25.8	:	:
Estonia	55.7	26.8	83.7	83.7	44.2	44.0	36.2
Finland	83.3	58.0	72.5	44.9	40.7	46.2	41.1
France	71.2	34.8	66.1	21.4	55.8	45.7	40.6
Germany	59.4	23.9	67.9	20.3	55.1	34.3	82.4
Greece	34.4	19.1	73.7	28.1	39.9	32.7	41.3
Hungary	52.6	18.0	74.3	12.5	39.6	31.6	40.5
Ireland	77.6	34.2	66.0	24.5	:	:	:
Israel	43.0	28.0	61.4	10.0	37.4	41.7	44.2
Italy	42.3	12.3	72.1	14.3	32.1	29.7	18.2
Japan	55.9	23.2	49.1	52.2	53.7	37.0	38.3
Latvia	27.1	13.2	50.4	20.9	23.3	21.4	52.5
Lithuania	42.7	17.3	70.7	17.5	45.1	30.4	23.6
Luxembourg	66.9	30.9	61.1	14.9	66.3	32.6	40.6
Malta	48.1	5.8	50.0	9.6	34.6	27.9	26.0
Netherlands	81.3	45.6	60.5	23.6	48.7	40.8	56.4
New Zealand	34.5	:	48.8	15.8	31.4	32.9	57.2
Norway	78.9	40.1	55.4	26.6	58.9	40.6	47.2
Poland	33.1	20.1	73.2	17.6	48.0	32.6	40.0
Portugal	34.0	18.7	64.8	16.6	51.2	27.5	31.2
Republic of Korea	81.9	14.3	42.5	11.6	41.2	36.8	45.9
Slovakia	47.4	24.1	81.4	21.0	41.1	35.7	40.5
Spain	45.9	23.3	25.2	1.7	21.2	18.5	7.5
Sweden	71.5	31.6	78.6	51.1	24.9	31.3	29.1

Uruguay	38.6	9.3	85.2	12.2	35.9	10.1	27.1
Low- and middle-income countries							
Argentina	66.1	16.8	80.3	14.7	51.8	:	51.4
Azerbaijan	88.9	:	66.7	:	:	:	:
Belarus	12.7	16.0	58.5	2.2	10.8	10.3	62.9
	In-house R&D	**Contracted-out (external) R&D**	**Acquisition of machinery, equipment and software**	**Acquisition of external knowledge**	**Training**	**Market introduction of innovations**	**Other preparations**
Brazil	17.3	7.1	84.9	15.6	62.8	33.7	33.8
Bulgaria	:	6.4	66.8	15.8	32.9	23.3	31.4
China	58.9	12.2	57.8	4.8	43.5	23.4	27.7
Colombia	23.6	6.3	70.7	27.6	17.7	18.9	16.9
Costa Rica	76.2	28.3	82.6	38.9	81.2	:	75.9
Cuba	9.8	41.3	90.2	36.6	22.1	83.8	11.9
Ecuador	34.8	10.6	74.5	27.0	33.7	10.6	10.1
Egypt	29.7	6.7	80.8	35.0	74.9	47.2	94.4
El Salvador	41.6	6.7	:	:	:	82.7	:
Ethiopia	19.2	8.8	94.8	31.7	44.9	38.6	17.1
Ghana	49.6	23.7	75.9	36.6	80.4	59.8	45.5
India	35.5	11.4	67.6	16.1	39.2	16.7	14.8
Indonesia	58.4	6.2	47.8	27.0	46.5	59.3	94.2
Kazakhstan	37.1	13.3	62.1	17.1	21.2	26.1	48.6
Kenya	57.9	31.4	69.3	41.4	82.1	61.4	55.7
Malaysia	44.6	-	52.2	23.0	48.6	42.0	67.6
Mexico	74.5	25.5	:	:	:	69.0	:
Morocco	60.3	39.7	:	:	:	:	:
Nigeria	48.8	30.7	82.9	51.7	81.2	61.0	40.5
Panama	69.6	17.4	56.5	:	15.2	:	26.1
Romania	23.0	:	70.9	8.7	23.0	21.2	30.3
Russian Federation	50.1	22.6	94.6	10.7	19.3	74.5	24.4
Serbia	42.9	19.8	64.3	15.7	47.8	52.0	34.0
South Africa	54.1	22.4	71.2	24.8	69.6	42.6	47.7
TFYR of Macedonia	34.1	13.4	74.0	28.6	49.9	37.0	54.2
Turkey	44.4	18.5	76.5	26.6	34.3	43.9	41.3
Uganda	60.1	34.5	68.5	39.9	73.7	56.0	41.5
Ukraine	16.7	7.6	73.1	8.2	21.4	12.1	24.3
UR Tanzania	39.3	27.4	79.8	51.2	96.4	64.3	53.6

Notes: Please consult Annexes I and II.
":" Not available. "-" Nil.

Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD

Definition

Innovation activities are all scientific, technological, organizational, financial and commercial steps which actually lead, or are intended to lead, to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include research and development (R&D) that is not directly related to the development of a specific innovation (Oslo Manual §149).

Innovation activities include: intramural R&D; extramural R&D; acquisition of machinery, equipment and software; acquisition of other external knowledge; training; market introduction of innovations; and other preparations.

In 33% of high-income countries, internal R&D is the predominant innovation activity. In Hong Kong Special Administrative Region of China, for instance, 90.4% of firms were internal R&D performers. In contrast, the acquisition of other external knowledge presents the lowest shares of engagement in 55% of high-income countries. In Spain, for instance, only 1.7% of innovation-active firms engaged in such activity.
In low- and middle-income countries, the acquisition of machinery, equipment and software is also predominant, with 62% of countries having the highest shares of firms engaged in this activity. The smallest share of innovation-active firms that engaged in this specific innovation activity is observed in Indonesia: 47.8%, a percentage that in fact should not be regarded as low.

External R&D, conversely, is the activity that presents the lowest shares of engagement in 72% of low- and middle-income countries. Overall, Cuba is the only exception where there is a higher share of firms that contracted out R&D (41.3%) than those that performed it internally (9.8%).

Lastly, the fact that many innovation-active firms were not R&D performers indicates that innovation is broader than R&D. Evidence shows that firms can and indeed do innovate without engaging in research and development activities, particularly in low- and middle-income countries.

Section 4. Linkages

Firms are the main focus of the innovation process. This however does not mean that they develop innovations single-handedly. When innovating, firms recurrently interact with other agents – such as government laboratories, universities, policy departments, regulators, competitors, suppliers and customers. Hence, understanding these linkages is crucial in order to effectively promote innovation in firms. Two types of linkages are usually measured in innovation surveys: sources of information and cooperation. They are both discussed in this section.

4.1 Sources of information

Table 2 presents the sources of information that are rated as 'highly important' for innovation by innovation-active firms. Internal sources of information are most frequently rated as highly important by firms from both groups of countries.

Definition

The innovative activities of a firm partly depend on the variety and structure of its links to sources of information, knowledge, technologies, practices, and human and financial resources (Oslo Manual §252). **Sources of information** are the sources that provide information for new innovation projects or contribute to the completion of existing innovation projects.

The enterprise or enterprise group is the source of information most frequently rated as highly important for 96% of high-income countries. Only in one country the predominance of a market source of information is observed: in Italy, 22.3% of firms rated suppliers as highly important sources.

Internal sources prevail as highly important sources of information for innovation in low- and middle-income countries. Market sources, particularly clients or customers, appear as runner-up, being the information source most frequently classified as highly important by firms in around 40% of countries. Moreover, the government or public research institutes – institutional sources of information – prevail as highly important source of information in Cuba (24.7%) and professional and industry associations – other type of information source – prevail in Romania (30.5%).

Table 2. Firms that rated sources of information as highly important (as a percentage of innovation-active manufacturing firms)

	Internal	Market				Institutional		Other		
	Within your enterprise or enterprise group	Suppliers of equipment, materials, components, or software	Clients or customers	Competitors or other enterprises in your sector	Consultants, commercial labs, or private R&D institutes	Universities or other higher education institutions	Government or public research institutes	Conferences, trade fairs, exhibitions	Scientific journals and trade/ technical publications	Professional and industry associations
High-income countries										
Australia	65.8	25.4	40.9	15.5	11.5	:	:	13.1	:	14.4
Austria	63.2	31.1	41.2	18.3	6.3	11.6	7.2	25.0	13.5	8.0
Belgium	58.0	32.2	27.0	10.6	4.5	6.3	3.8	11.8	7.5	5.4
Chile	43.4	19.1	25.2	11.2	8.1	2.8	2.1	14.1	7.5	3.6
Croatia	49.9	23.8	22.7	11.8	3.0	3.6	0.8	14.9	7.4	1.7
Cyprus	95.8	70.8	49.1	34.0	28.3	6.6	4.7	42.5	33.5	15.6
Estonia	33.3	22.5	8.8	6.1	5.6	4.0	2.0	10.8	2.7	2.6
Finland	66.6	20.4	24.6	9.7	3.5	7.0	7.0	12.4	4.4	3.3
Germany	51.7	13.5	38.2	14.9	5.8	7.0	2.5	16.7	7.4	4.0
Greece	28.8	24.9	18.9	12.0	7.0	5.2	2.0	15.1	7.8	4.1
Hungary	48.7	28.5	37.5	20.7	15.4	10.5	2.5	18.6	12.9	8.1
Israel	69.7	14.5	13.1	6.7	7.5	3.0	2.2	13.6	6.8	2.1
Italy	18.9	22.3	14.8	5.3	10.4	2.8	2.0	10.2	2.8	3.0
Japan	33.7	20.7	30.5	7.5	6.2	5.1	4.8	4.6	2.0	2.9
Lithuania	45.6	24.3	11.6	11.1	6.3	5.3	4.6	17.5	8.7	3.1
Luxembourg	45.7	19.4	23.4	5.7	6.9	2.9	2.3	14.9	8.0	4.0
Malta	54.8	42.3	40.4	19.2	14.4	5.8	4.8	22.1	9.6	6.7
Netherlands	52.9	29.3	30.5	10.9	6.0	5.1	2.6	8.4	4.0	6.8
New Zealand	86.4	51.0	76.3	43.1	43.4	10.2	16.0	45.9	48.3	21.4
Norway	64.8	36.6	43.3	19.4	13.7	8.4	10.2	22.8	11.3	12.1
Poland	46.3	21.9	10.1	8.3	7.2	8.0	8.6	15.2	9.0	5.1
Portugal	43.2	25.6	30.5	12.2	6.5	6.0	3.3	14.8	7.3	7.3
Republic of Korea	52.4	12.3	25.1	11.5	2.8	4.5	6.0	6.8	3.2	3.1
Slovakia	56.5	30.0	29.5	14.5	3.5	5.4	1.3	18.8	9.1	3.7
Spain	51.6	24.3	23.8	11.0	9.6	6.0	8.6	8.3	4.7	4.1
Sweden	38.0	22.5	28.9	:	:	:	:	7.8	:	:
Uruguay	44.5	20.6	33.3	10.9	:	:	:	26.6	17.6	:

	Internal	Market				Institutional		Other		
	Within your enterprise or enterprise group	Suppliers of equipment, materials, components, or software	Clients or customers	Competitors or other enterprises in your sector	Consultants, commercial labs, or private R&D institutes	Universities or other higher education institutions	Government or public research institutes	Conferences, trade fairs, exhibitions	Scientific journals and trade/ technical publications	Professional and industry associations
Low- and middle-income countries										
Argentina	25.0	51.8	35.0	17.9	27.9	37.9	39.7	:	:	:
Azerbaijan	66.7	33.3	44.4	55.6	11.1	11.1	22.2	11.1	11.1	11.1
Brazil	41.3	41.9	43.1	23.8	10.2	7.0	:	:	:	:
Bulgaria	30.0	22.0	22.7	:	5.9	3.3	:	:	9.7	5.0
China	46.9	19.6	48.3	24.8	6.9	7.5	20.6	20.7	3.9	18.0
Colombia	98.6	38.0	50.4	28.2	23.6	12.1	8.3	38.1	54.3	13.0
Cuba	13.6	:	11.5	5.1	:	19.6	24.7	:	:	:
Ecuador	67.0	34.9	59.0	27.1	10.7	2.0	2.2	22.2	42.5	6.3
Egypt	63.5	38.1	29.9	18.8	4.3	2.4	2.2	12.5	9.4	3.4
El Salvador	:	26.4	40.3	5.4	15.2	3.8	1.8	13.9	10.3	:
Ethiopia	61.8	33.6	58.9	26.8	7.9	4.9	4.4	17.1	6.6	4.3
India	58.5	43.3	59.0	32.6	16.8	7.9	11.0	29.7	15.1	24.5
Indonesia	4.4	35.4	58.8	35.8	13.3	5.3	5.3	15.5	13.3	14.6
Kazakhstan	47.3	40.4	16.6	11.3	6.9	3.6	3.1	13.0	9.0	4.6
Kenya	65.0	45.0	55.7	32.9	18.6	13.6	16.4	34.3	16.4	27.9
Malaysia	32.8	51.8	51.4	37.7	22.4	11.1	16.6	28.1	12.6	15.8
Morocco	:	51.3	56.4	15.4	17.9	6.4	12.8	43.6	34.6	25.6
Nigeria	51.7	39.3	51.7	30.0	14.6	6.8	4.1	11.5	7.1	20.2
Panama	47.8	19.6	76.1	43.5	23.9	37.0	:	4.3	2.2	4.3
Philippines	70.7	49.5	66.2	37.9	21.2	10.1	7.1	21.7	16.7	15.7
Romania	6.4	8.9	13.8	24.9	21.0	18.8	16.5	20.3	23.1	30.5
Russian Federation	34.2	15.4	36.4	13.2	3.1	2.0	8.8	26.3	14.6	10.2
Serbia	33.5	15.6	22.3	6.9	7.6	4.1	4.5	13.9	7.6	4.9
South Africa	44.0	17.9	41.8	11.6	6.9	3.1	2.3	12.9	16.7	8.4
TFYR of Macedonia	39.4	22.2	17.4	7.6	5.3	3.6	2.1	23.4	15.5	7.2
Turkey	29.0	26.8	31.2	14.8	5.4	4.1	2.8	18.3	7.6	6.4
Uganda	60.9	24.8	49.0	23.0	12.2	3.2	5.0	16.4	8.3	11.3
UR Tanzania	61.9	32.1	66.7	27.4	16.7	7.1	11.9	16.7	9.5	20.2

Notes: Please consult Annexes I and II. ":" Not available. *Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD*

4.2 Cooperation

In contract to the use of sources of information, innovation cooperation requires that collaborating parties play an active role in the work being undertaken. The percentage of innovation-active manufacturing firms that cooperated with partners in order to develop their innovation activities is presented in **Table 3**.

Definition

Cooperation is the active participation in joint innovation projects with other organizations. These may either be other firms or non-commercial institutions. The partners need not derive immediate commercial benefit from the venture. Pure contracting out of work, where there is no active collaboration, is not regarded as cooperation (Oslo Manual §271).

Innovation cooperation allows enterprises to access knowledge and technology that they would be unable to utilise on their own. There is also great potential for synergies in cooperation as partners learn from each other (Oslo Manual §271).

Evidence indicates that linkages with the market are more incident when it comes to the active collaboration in innovation projects in both groups of countries. In high-income countries, market-related linkages chiefly refer to the cooperation with suppliers, which prevail as cooperation partners in almost 80% of countries. Clients or customers also appear as the most frequent cooperation partners of firms in a few countries – for instance, Iceland (23.7%) and New Zealand (18.7%). Opposite to the indicator on sources of information, the enterprise or enterprise group prevails as a partner in only one high-income country: Hong Kong Special Administrative Region of China at 36.2%.

In more than 75% of high-income countries, suppliers predominate as innovation partners. This is also observed in 40% of low- and middle-income countries, followed by clients or customers, which prevail as partners in 28% of countries from this group. Moreover, competitors or other enterprises from the same industrial sector are the leading cooperation partners of firms in Ethiopia (16.1%) and Kenya (85%), while consultants prevail in Malaysia (29%).

Table 3. Firms that cooperated with partners (as a percentage of innovation-active manufacturing firms)

	Internal	Market				Other	
	Other enterprises within your enterprise group	Suppliers of equipment, materials, components, or software	Clients or customers	Competitors or other enterprises in your sector	Consultants, commercial labs, or private R&D institutes	Universities or other higher education institutions	Government or public research institutes
High-income countries							
Australia	5.6	10.5	13.7	0.8	5.2	0.05	1.2
Austria	21.9	26.1	23.3	12.1	17.7	24.7	15.6
Belgium	24.6	37.5	24.2	12.9	19.3	21.9	16.2
Chile	5.9	8.5	6.7	3.5	6.1	5.4	4.0
China, Hong Kong SAR	36.2	:	:	:	:	1.1	6.2
Croatia	11.6	29.3	22.9	16.7	15.8	16.0	12.2
Cyprus	6.6	44.8	33.5	29.2	23.6	5.2	3.8
Czechia	13.2	28.3	17.0	7.9	11.6	16.6	6.4
Denmark	19.0	34.1	23.2	11.2	28.2	18.5	11.7
Estonia	22.7	25.5	15.3	10.5	10.2	9.7	4.5
Finland	23.5	37.6	35.1	29.6	28.6	32.3	29.6
France	14.1	21.5	11.5	5.6	13.6	11.8	8.5
Germany	8.3	12.0	9.8	4.0	6.8	16.3	11.7
Greece	14.4	25.6	20.8	12.9	18.0	18.7	18.3
Hungary	18.1	25.6	19.5	11.7	20.7	18.8	5.2
Iceland	6.2	9.5	23.7	3.8	1.9	10.4	15.6
Ireland	17.9	20.9	17.8	4.9	16.0	17.0	7.7
Israel	8.2	10.2	9.6	6.1	8.9	7.6	5.3
Italy	2.3	5.7	4.1	3.0	5.0	5.2	2.3
Japan	:	31.7	31.5	19.9	16.9	15.7	14.4
Latvia	10.6	18.6	8.5	11.6	12.1	5.9	5.9
Lithuania	17.3	29.1	17.9	14.3	15.0	13.9	10.7
Luxembourg	10.9	17.7	16.0	11.4	12.6	8.6	9.1
Malta	8.7	9.6	9.6	3.8	5.8	7.7	1.0
Netherlands	16.8	26.4	19.0	9.7	14.1	12.7	8.5
New Zealand	:	18.2	18.7	16.6	:	7.2	5.9
Norway	16.6	21.5	20.2	10.4	19.6	15.5	17.0
Poland	12.2	21.6	:	7.6	9.3	11.6	10.7
Portugal	5.4	11.2	9.9	4.2	6.4	8.6	5.6

	Internal	Market				Other	
	Other enterprises within your enterprise group	Suppliers of equipment, materials, components, or software	Clients or customers	Competitors or other enterprises in your sector	Consultants, commercial labs, or private R&D institutes	Universities or other higher education institutions	Government or public research institutes
Republic of Korea	6.2	11.9	14.3	8.9	5.1	12.5	11.1
Slovakia	21.9	35.4	28.0	15.7	15.0	12.3	6.3
Spain	8.5	12.8	8.4	5.1	7.5	8.7	11.8
Sweden	16.7	28.4	27.0	18.2	18.2	16.9	12.2
United Kingdom & Northern Ireland	27.8	39.1	45.4	15.0	21.3	17.2	8.4
Low- and middle-income countries							
Argentina	8.0	7.8	3.8	3.8	4.9	11.2	9.2
Brazil	:	10.0	12.8	5.2	6.2	6.3	:
Bulgaria	:	9.7	:	4.7	:	:	:
China	19.4	27.2	34.3	13.3	7.1	24.6	16.1
Colombia	7.9	23.2	17.4	2.8	15.2	8.7	0.6
Costa Rica	:	63.9	61.1	16.5	49.6	35.3	8.1
Cuba	:	15.3	28.5	22.1	:	14.9	26.4
Ecuador	:	62.4	70.2	24.1	22.1	5.7	3.0
Egypt	2.0	4.6	1.3	2.0	1.0	1.2	1.1
El Salvador	:	36.9	42.1	1.3	15.3	5.5	3.4
Ethiopia	13.3	15.1	15.1	16.1	5.8	7.8	5.7
Indonesia	:	25.7	15.9	8.0	10.2	8.4	4.9
Kazakhstan	17.4	90.5	43.7	34.5	22.3	11.0	10.2
Kenya	42.1	32.9	61.4	85.0	66.4	61.4	75.7
Malaysia	14.5	18.8	19.0	17.1	29.0	13.9	13.6
Morocco	:	25.6	:	:	19.2	3.8	:
Panama	:	:	:	:	39.1	56.5	84.8
Philippines	91.2	92.6	94.1	67.6	64.7	47.1	50.0
Romania	7.3	20.9	12.3	2.8	10.6	5.0	7.5
Russian Federation	11.7	14.0	10.1	3.5	4.7	9.3	15.0
Serbia	18.8	0.1	0.1	-	0.1	-	-
South Africa	14.2	30.3	31.8	18.6	21.1	16.2	16.2
TFYR of Macedonia	15.0	17.7	14.1	11.0	8.8	5.0	6.0
Turkey	9.3	8.2	7.8	5.8	6.1	5.6	4.1
Ukraine	3.2	11.2	5.4	2.4	2.2	2.7	4.8

Notes: Please consult Annexes I and II. ":" Not available. "-" Nil. *Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD*

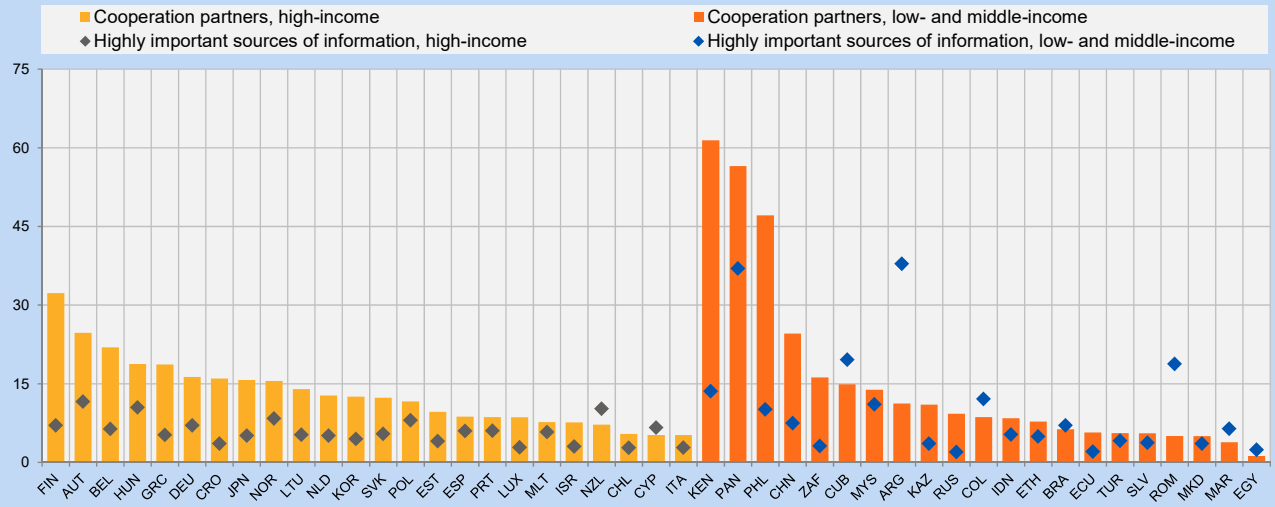
Box 2. Linkages with institutional sources and partners

In this report, the term 'institutional' covers interactions with two types of agents: i) universities or other higher education institutions; and ii) the government or public research institutes. Overall, linkages, particularly regarding active collaboration, with these institutions are relatively low, with just a few exceptions.

Cuba is the only country where an institutional source of information prevails: 24.7% of Cuban firms rated the government or public research institutes as a highly important source of information. Regarding cooperation, the government or public research institutes prevail as partners in Panama (84.8%) and the Russian Federation (15%). Moreover, universities and other higher educational institutions are the predominant innovation partners in two countries only, namely: Germany (16.3%) and Argentina (11.2%).

Figure 7 illustrates the percentages of firms that had linkages with universities or other higher education institutions. Except for New Zealand and Cyprus, high-income countries have higher shares of firms cooperating with these agents than rating them as highly important information sources. This is observed in 67% of low- and middle-income countries.

Figure 7. Firms that had linkages with universities or other higher education institutions (as a percentage of innovation-active manufacturing firms)



Notes: Please consult Annexes I and II.

Source: 2015 UIS innovation data collection and Eurostat

Section 5. Hampering factors

The obstacles that hinder innovation in firms, known as hampering factors, are discussed in this section. For this report, hampering factors have been divided into four categories: cost factors, knowledge factors, market factors and reasons not to innovate. The results are presented for innovation-active firms and non-innovative firms.

Definition

Innovation activity may be hampered by a number of factors. There may be reasons for not starting innovation activities at all; there may be factors that slow innovation activity or have a negative effect on expected results (Oslo Manual §410).

These **hampering factors** include: economic factors, such as high costs or lack of demand; knowledge factors, such as lack of skilled personnel; market factors, such as uncertainty in the demand for innovative products; and other factors, such as regulations.

5.1 Hampering factors for innovation-active firms

Table 4 presents the hampering factors which were highly important for innovation-active firms. Cost factors are the prevailing obstacles in both groups of countries.

In the high-income group, the lack of funds within the enterprise or enterprise group was the cost factor rated as highly important by most of the firms in 45% of countries, followed by the high costs of innovation, which prevailed in 38% of countries. In addition, the lack of financing from outer sources was a problem for firms in Australia (34.7%). Altogether cost factors are the obstacles that were most frequently rated as highly important by innovation-active firms in 86% of high-income countries.

Moreover, in a few high-income countries the predominance of hampering factors of a different nature – in particular knowledge and institutional factors – is observed. The lack of qualified personnel was the knowledge hampering factor most frequently rated as highly important by the innovation-active firms in Japan (14.2%) and Uruguay (26.1%). Moreover, the difficulty in finding cooperation partners was the prevailing knowledge hampering factor for firms in Canada (27.4%). Additionally, the uncertain demand for innovative goods or services, a market hampering factor, prevailed in Luxembourg (16.8%).

Table 4. Innovation-active firms that rated hampering factors as highly important (as a percentage of innovation-active manufacturing firms)

	Cost factors			Knowledge factors				Market factors		Reasons not to innovate	
	Lack of funds within your enterprise or enterprise group	Lack of financing from sources outside the enterprise	Innovation costs are too high	Lack of qualified personnel	Lack of information on technology	Lack of information on markets	Difficulty in finding cooperation partners for innovation	Market dominated by established enterprises	Uncertain demand for innovative goods or services	No need due to prior innovations by your enterprise	No demand for innovations
High-income countries											
Australia	:	34.7	23.7	32.6	-	:	:	:	23.3	:	:
Belgium	16.8	10.7	19.2	16.2	5.6	5.0	6.2	14.0	10.2	1.9	3.1
Canada	21.5	12.9	:	25.8	:	:	27.4	:	22.5	:	:
Chile	23.2	16.4	30.3	21.0	11.4	12.4	18.4	20.7	21.9	5.6	4.9
China, Hong Kong SAR	5.5	4.3	69.7	3.4	1.8	:	:	2.5	3.0	:	:
Croatia	46.3	33.0	38.5	18.1	5.5	6.5	12.6	17.9	13.5	1.2	2.4
Cyprus	28.5	28.9	33.6	11.5	8.9	1.7	9.4	14.5	14.9	:	:
Czechia	35.7	20.0	24.8	11.9	2.5	2.5	4.1	19.4	12.7	2.9	4.4
Estonia	23.4	18.8	15.4	15.2	3.8	3.0	4.7	11.3	9.3	5.5	3.9
Finland	22.5	14.6	16.4	9.2	2.9	5.3	3.9	7.1	10.8	3.5	3.7
France	33.6	20.3	29.0	15.1	5.8	7.0	9.7	15.7	21.8	3.2	4.6
Hungary	31.1	20.4	29.3	14.2	4.0	4.2	7.0	13.4	22.5	2.3	4.9
Iceland	23.7	19.9	15.6	4.3	2.4	2.4	5.7	2.8	8.1	2.4	2.8
Ireland	27.6	22.9	18.8	10.9	3.6	5.8	7.8	15.7	18.8	3.4	5.1
Italy	27.6	28.4	32.0	9.2	3.6	4.7	12.5	16.9	23.0	0.1	1.9
Japan	11.0	5.2	12.0	14.2	9.0	7.6	6.4	5.3	8.8	3.8	6.9
Latvia	25.8	17.7	28.9	15.2	4.3	9.3	16.8	20.8	14.6	7.8	7.8
Lithuania	27.1	20.1	26.6	14.1	4.5	5.7	8.8	18.2	8.8	1.4	:
Luxembourg	10.2	4.8	9.6	10.2	3.0	5.4	10.8	15.6	16.8	1.8	4.2
Malta	23.0	22.0	31.0	8.0	4.0	12.0	10.0	24.0	25.0	4.0	5.0
New Zealand	:	:	30.3	12.1	:	:	2.4	:	:	:	:
Norway	19.8	18.3	27.7	14.2	3.4	4.1	6.9	9.5	11.5	1.3	3.5
Poland	32.0	26.0	34.5	8.2	6.2	6.1	9.6	17.9	17.0	5.0	6.3
Portugal	39.6	34.9	42.9	15.2	7.6	7.4	15.3	18.2	21.7	4.2	8.2
Republic of Korea	29.8	9.0	12.1	26.1	14.8	11.6	6.7	7.5	15.8	2.8	3.8
Slovakia	33.2	:	26.1	13.6	5.5	5.5	5.1	15.5	10.5	-	-

	Cost factors			Knowledge factors				Market factors		Reasons not to innovate	
	Lack of funds within your enterprise or enterprise group	Lack of financing from sources outside the enterprise	Innovation costs are too high	Lack of qualified personnel	Lack of information on technology	Lack of information on markets	Difficulty in finding cooperation partners for innovation	Market dominated by established enterprises	Uncertain demand for innovative goods or services	No need due to prior innovations by your enterprise	No demand for innovations
Spain	40.0	37.9	39.0	10.9	8.1	8.9	11.7	18.6	29.4	5.8	7.5
Sweden	21.2	11.8	12.4	12.0	2.3	4.2	3.4	12.6	8.3	1.3	2.6
Uruguay	:	:	:	26.1	6.2	9.9	:	:	:	:	:
Low- and middle-income countries											
Azerbaijan	22.2	22.2	22.2	11.1	66.7	22.2	-	:	22.2	22.2	:
Belarus	43.4	10.6	22.8	7.6	2.4	3.5	1.4	:	2.4	:	7.0
Brazil	:	20.1	25.0	23.7	8.1	6.5	10.6	:	:	:	:
Bulgaria	40.1	31.2	40.6	18.1	:	:	21.4	21.4	27.9	:	7.8
China	29.8	60.8	55.8	71.6	47.7	26.5	18.5	7.4	37.5	39.4	:
Colombia	27.3	16.1	13.7	10.6	7.1	8.7	14.7	:	19.9	:	:
Costa Rica	:	27.2	17.6	26.9	9.2	12.9	23.2	23.8	:	:	:
Cuba	55.3	39.1	10.6	26.8	54.0	33.2	:	:	27.2	:	:
Ecuador	28.2	23.9	37.9	23.8	22.5	17.8	15.5	20.9	16.7	:	:
Egypt	30.6	35.5	48.9	24.4	16.0	15.9	24.0	26.0	24.1	22.8	14.8
El Salvador	55.6	:	:	50.7	28.9	:	:	:	41.4	:	34.7
Ethiopia	46.3	39.2	34.4	25.9	23.4	15.8	21.4	22.2	17.9	3.1	1.5
India	58.7	32.0	36.0	53.3	31.2	34.8	:	24.3	19.7	:	:
Indonesia	38.9	13.7	5.3	33.6	13.3	4.4	1.8	36.3	13.3	:	:
Kenya	40.7	32.1	42.9	17.9	8.6	11.4	14.3	32.9	22.9	8.6	7.1
Malaysia	46.7	42.4	54.8	31.3	33.3	29.4	29.6	36.0	31.3	8.7	9.2
Nigeria	51.0	45.9	48.5	13.7	15.6	14.4	23.4	22.7	22.0	11.5	9.3
Panama	:	:	:	:	89.1	87.0	67.4	21.7	:	:	:
Philippines	19.1	10.2	20.9	11.7	8.2	10.0	5.6	14.7	9.9	:	:
Romania	39.3	26.4	30.4	8.5	2.4	4.7	7.1	22.2	19.6	5.8	5.7
Russian Federation	37.4	17.1	29.0	6.6	2.6	3.5	2.1	:	:	:	8.3
Serbia	56.4	38.3	45.1	9.7	5.7	5.4	16.6	22.0	21.7	5.4	6.6
South Africa	38.1	23.5	33.5	23.0	11.9	11.7	13.1	17.5	15.5	3.0	2.9
Uganda	50.3	40.2	51.1	13.3	19.7	15.2	26.3	28.3	26.1	5.8	7.6
UR Tanzania	52.4	48.8	42.9	33.3	20.2	13.1	16.7	21.4	19.0	7.1	3.6

Notes: Please consult Annexes I and II. ":" Not available. "-" Nil. *Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD*

The predominance of hampering factors that are cost-related is also observed is the group of low- and middle-income countries. Cost factors are the obstacles most frequently rated as highly important by innovation-active firms in 88% of countries from this group, a proportion that is similar to the one of high-income countries. The lack of internal funds is the prevailing obstacle for innovation-active firms in 52% of low- and middle-income countries, while the high costs of innovation and the lack of external funds prevail in 32% and 4% of countries, respectively.

Knowledge factors are the predominant obstacles for innovation-active firms in three low- and middle-income countries. The lack of information on technology was a highly important hampering factor for 66.7% of firms in Azerbaijan and for 89.1% of firms in Panama. In China, 71.6% of innovation-active firms rated the lack of qualified personnel as a highly important barrier to innovation.

5.2 Hampering factors for non-innovative firms

Table 5 presents the hampering factors which were highly important for non-innovative firms. Similar to what was observed in the case of innovation-active firms, cost factors are the obstacles that hinder innovation most in non-innovative firms.

In 46% of high-income countries, high costs of innovation are the hampering factor most frequently rated as highly important by firms that did not innovate. The lack of demand for innovations prevailed as an important barrier in more than 20% of countries. In Hong Kong Special Administrative Region of China, for instance, 90.9% of firms rated this factor as highly important.

In the group of low- and middle-income countries, the lack of funds within the enterprise or enterprise group was the factor most frequently rated as highly important by firms in half of these countries. In India, for instance, 67.2% of non-innovative firms classified the lack of internal funds as a highly important obstacle to innovation. As observed in the case of innovation-active firms, high costs of innovation appear in second place for non-innovative firms, being the predominant hampering factor in 32% of the low- and middle-income countries.

The knowledge factors lack of qualified personnel and lack of information on markets are the obstacles that prevailed in Serbia (29.7%) and Cuba (66.7%), respectively. Another remark worth mentioning is that in four countries most non-innovative firms claimed that there was no need to innovate due to prior innovations. These countries are: Brazil (13.6%), China (19.1%), Ecuador (20.6%) and Panama (57.1%).

Table 5. Non-innovative firms that rated hampering factors as highly important (as a percentage of non-innovative manufacturing firms)

	Cost factors			Knowledge factors				Market factors		Reasons not to innovate	
	Lack of funds within your enterprise or enterprise group	Lack of financing from sources outside the enterprise	Innovation costs are too high	Lack of qualified personnel	Lack of information on technology	Lack of information on markets	Difficulty in finding cooperation partners for innovation	Market dominated by established enterprises	Uncertain demand for innovative goods or services	No need due to prior innovations by your enterprise	No demand for innovations
High-income countries											
Australia	:	10.5	7.9	17.0	-	:	:	:	18.1	:	:
Belgium	13.4	10.3	19.0	12.4	4.4	4.3	6.8	13.9	14.8	12.1	22.9
Chile	39.9	32.9	52.6	35.9	23.2	22.6	36.7	37.2	38.9	16.3	17.5
China, Hong Kong SAR	4.2	2.5	10.6	5.0	4.4	0.3	:	3.0	7.4	0.5	90.9
Croatia	28.3	21.4	29.2	9.8	3.8	3.3	8.4	13.1	11.5	4.0	5.6
Cyprus	63.3	56.0	64.2	19.3	13.0	8.9	13.9	42.1	52.2	43.0	43.7
Czechia	27.3	15.8	23.7	7.1	2.5	2.5	6.0	16.5	12.9	10.2	29.1
Estonia	23.7	21.2	16.6	8.6	2.2	2.1	5.2	13.6	9.7	6.4	7.8
Finland	15.1	8.8	14.0	7.3	5.4	5.0	7.6	8.9	13.5	8.2	7.4
France	21.2	12.2	21.5	11.3	4.8	5.1	7.7	12.9	17.4	12.9	24.5
Hungary	26.2	18.4	28.0	11.0	5.0	5.1	8.7	16.1	22.8	5.3	11.9
Iceland	7.0	12.4	4.3	:	:	:	:	2.7	:	5.4	2.7
Ireland	25.9	22.4	24.8	7.0	2.7	3.6	4.8	13.0	16.0	14.7	17.2
Italy	36.4	27.5	35.1	8.8	4.0	4.7	12.9	19.1	24.3	2.1	15.1
Japan	10.8	4.1	9.0	11.1	7.8	6.5	5.7	5.3	7.1	4.0	7.6
Latvia	28.4	23.8	35.7	13.3	7.1	8.4	18.2	25.9	21.4	9.6	16.3
Lithuania	34.6	28.2	35.3	14.5	9.2	9.9	15.5	26.6	22.0	25.3	21.8
Luxembourg	2.8	-	3.7	1.9	-	-	0.9	0.9	1.9	6.5	24.3
Malta	8.5	3.5	12.7	4.9	2.8	2.1	2.1	8.5	5.6	3.5	7.0
New Zealand	:	:	17.4	7.2	:	:	2.0	:	:	:	:
Norway	6.8	6.7	7.7	3.8	1.5	1.7	2.7	3.5	6.5	1.2	2.2
Poland	31.4	26.6	33.4	16.4	14.0	13.5	18.4	21.7	22.7	16.7	16.8
Portugal	34.7	30.8	45.0	11.2	7.6	9.2	18.3	23.6	34.1	10.3	19.4
Republic of Korea	14.1	4.3	4.3	7.2	4.5	3.2	1.7	2.4	8.2	1.7	19.3
Slovakia	23.9	:	31.6	9.7	4.5	4.6	12.8	12.4	16.9	11.8	16.8
Spain	36.7	31.0	38.1	18.3	14.3	13.1	15.2	18.8	28.5	11.2	24.5
Sweden	8.5	4.9	7.5	4.7	2.7	1.7	2.4	7.1	6.1	3.9	7.9

	Cost factors			Knowledge factors				Market factors		Reasons not to innovate	
	Lack of funds within your enterprise or enterprise group	Lack of financing from sources outside the enterprise	Innovation costs are too high	Lack of qualified personnel	Lack of information on technology	Lack of information on markets	Difficulty in finding cooperation partners for innovation	Market dominated by established enterprises	Uncertain demand for innovative goods or services	No need due to prior innovations by your enterprise	No demand for innovations
Uruguay	:	:	:	18.1	6.1	11.0	:	:	:	:	:
Low- and middle-income countries											
Azerbaijan	25.1	13.3	9.5	6.1	6.9	3.2	0.9	:	2.3	1.2	:
Belarus	41.0	12.4	28.1	10.5	4.5	4.8	4.3	:	4.5	:	6.2
Brazil	:	7.9	11.5	8.4	2.8	2.1	2.6	:	:	13.6	2.1
Bulgaria	39.6	28.1	36.4	14.4	8.9	8.9	18.7	20.7	23.9	5.5	10.4
China	9.8	18.3	14.4	18.6	13.3	7.6	6.0	2.3	11.6	19.1	:
Colombia	2.6	1.6	1.0	0.7	0.5	0.6	1.2	:	1.6	:	:
Costa Rica	:	37.7	26.4	34.0	15.1	26.4	22.6	37.7	:	:	:
Cuba	60.0	26.7	:	33.3	53.3	66.7	:	:	40.0	:	:
Ecuador	6.8	5.9	11.5	10.3	7.0	6.2	5.0	7.1	4.7	20.6	14.9
Egypt	45.8	41.4	57.0	36.3	27.3	15.1	28.7	35.3	26.1	9.2	20.9
Ethiopia	34.3	29.0	28.8	24.2	20.5	15.4	15.3	18.0	11.8	6.9	5.0
India	67.2	43.8	28.5	44.2	32.1	35.0	:	23.7	20.3	:	:
Indonesia	39.3	38.3	40.3	34.1	35.6	33.3	36.2	36.2	35.3	:	:
Kazakhstan	45.3	3.3	3.8	2.1	1.2	0.6	1.8	1.6	5.2	7.5	27.6
Kenya	40.4	28.1	42.1	15.8	7.0	8.8	12.3	31.6	19.3	7.0	5.3
Nigeria	55.2	47.1	41.6	20.8	22.6	18.6	21.7	20.4	18.6	9.5	12.2
Panama	:	42.9	42.9	:	:	:	:	:	:	57.1	:
Philippines	23.9	14.5	26.0	9.5	13.3	8.2	8.6	16.0	12.1	7.4	13.0
Romania	39.2	26.3	34.6	12.9	7.0	6.6	14.5	19.9	19.0	:	:
Russian Federation	28.7	14.8	22.9	7.7	3.8	4.0	3.2	:	:	:	7.5
Serbia	11.5	15.2	22.9	29.7	26.5	18.0	22.2	24.8	24.9	23.0	27.6
South Africa	31.0	20.2	24.6	16.7	8.8	3.9	8.8	28.3	19.1	11.0	54.6
Turkey	26.0	19.3	38.5	14.7	9.1	6.6	11.0	19.0	19.6	10.0	23.6
Uganda	41.7	25.5	29.8	11.9	14.9	10.6	19.3	40.5	22.3	13.6	8.8
Ukraine	28.1	17.7	:	4.2	:	:	4.7	17.9	5.2	9.5	15.1
URTanzania	30.2	26.4	26.4	20.8	15.1	11.3	13.2	20.8	9.4	3.8	1.9

Notes: Please consult Annexes I and II. ":" Not available. "-" Nil.

Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD

Section 6. Final remarks

This report describes the main findings of the 2015 UIS innovation data collection and examines key features of the innovation process in high- and low- and middle-income countries. The idea was to identify commonalities and variations in their innovation processes between these two groups of countries.

First, all countries had high shares of manufacturing firms which introduced innovations. Marketing was the type of innovation most frequently implemented by firms in high-income countries, while process and organizational innovations prevailed amongst firms in low- and middle-income countries.

The extensiveness of innovation was also observed size-wise. The results showed that firms from all size classes were innovative in terms of product or process innovations and that – with few exceptions that call for further research – larger classes had higher shares of innovators. Furthermore, when looking at the level of innovativeness, the role of abandoned and ongoing innovation activities in the shares of innovation-active firms should not be disregarded.

In terms of innovation activities, the acquisition of machinery, equipment and software was the activity performed by most firms in both groups of countries. In addition, evidence pointed to higher shares of firms performing R&D activities in high-income countries than in low- and middle-income countries. The fact that not all innovation-active firms engage in research and development is an indication that innovation can and does take place without R&D.

Evidence showed that most of the innovation-active firms in both groups mostly relied on internal sources of information – meaning, the enterprise or enterprise group – to develop their innovation activities or projects. Italy was an exception amongst high-income countries, with the predominance of suppliers – a market-related source of information – as being highly important. Market sources, chiefly clients or customers, played a relevant role as a source of information for firms in low- and middle-income countries.

The situation is different when it comes to cooperation for innovation. Overall, internal linkages prevailed only in Hong Kong Special Administrative Region of China. In addition, linkages with the market are more common when it comes to active participation in innovation activities. Suppliers were the predominant cooperation partners of innovation-active firms in both groups of countries.

Lastly, regarding hampering factors for innovation activities, cost factors – in particular the lack of funds within the enterprise or enterprise group – were the main obstacle faced by innovation-active firms. This was observed in high- as well as low- and middle-income countries. Cost factors also prevailed as an obstacle for non-innovative firms. However, a different cost factor stood out in high-income countries, namely the high costs of innovation. Moreover, in this same group of countries, the lack of demand for innovations was regarded as an important barrier to innovation by non-innovative firms.

Official international guidelines for measuring innovation were defined in 1992, with the publication of the first edition of the Oslo Manual. More than two decades later, international innovation statistics are still maturing. The production of reliable innovation statistics for international appraisals remains a challenge, mainly due to variations in methodological procedures applied by countries in their national innovation surveys.

Therefore, caution is required when using the indicators presented in this report – in particular for comparisons. This is especially important when dealing with countries that do not have grossed up results. Likewise, the drafting of policy recommendations should not be based uniquely on the results presented here.

Annex I. Notes

Abandoned or ongoing innovation activities include activities that were abandoned before the implementation of an innovation or activities that were in progress during the survey observation period and had not yet resulted in the implementation of an innovation. Unless otherwise specified, the term covers product or process innovations, regardless of organizational or marketing innovations.

Differences are observed in the following countries:

- Argentina, Azerbaijan, Belarus, Canada, Chile, Costa Rica, Indonesia, Kazakhstan, Morocco, Russian Federation, Uruguay, United States of America: firms with abandoned or ongoing innovation activities are not covered in the national innovation survey – no data available; and

- Australia, Colombia, Cuba, Malaysia, Panama: coverage refers to product, process, organizational or marketing innovations.

Innovation-active firms include firms that implemented product or process innovations or had abandoned or ongoing innovation activities to develop product or process innovations, regardless of organizational or marketing innovations.

Differences are observed in the following countries:

- Colombia, Kenya (as denominator for indicators for innovation activities, sources of information, cooperation and hampering factors), Malaysia, Panama: coverage refers to firms that implemented product or process innovations, regardless of organizational or marketing innovations or had abandoned or ongoing innovation activities for product, process, organizational or marketing innovations;

- Australia, Cuba, El Salvador (as denominator for indicators for innovation activities, sources of information, cooperation and hampering factors): coverage refers to firms that implemented product, process, organizational or marketing innovation or had abandoned or ongoing innovation activities for product, process, organizational or marketing innovations;

- Nigeria, United Republic of Tanzania: coverage is not specified; and

- Argentina, Azerbaijan, Belarus, Canada, Chile, Costa Rica, Indonesia, Kazakhstan, Morocco, Russian Federation, United States of America, Uruguay: innovation-active firms are not identified, as firms with abandoned or ongoing innovation activities are not covered in the national innovation survey. Where applicable, innovative firms are used as denominator instead.

Innovative firms include all firms that have implemented product or process innovations during the observation period covered by the national innovation survey. Unless otherwise specified, the term covers product or process innovations, regardless of organizational or marketing innovations.

Differences are observed in the following countries:

- Canada: data cover firms that implemented product, process, organizational or marketing innovations; and

- United States of America: data cover firms that implemented only product or process innovations.

The degree of importance of sources of information for innovation is measured differently across countries, which is generally but not uniquely done with the use of a scale of importance – high, medium, low, not used. The indicators about sources of information presented in this report cover sources rated as highly important.

Differences are observed in the following countries:

- Argentina, Australia, Colombia, El Salvador, New Zealand: use of a dichotomous ("Yes/No") question;

- Azerbaijan: data cover main and decisive as well as significant degrees of importance;

- China: data cover the highest, second highest and third highest degrees of importance;

- Morocco: data cover good and excellent degrees of importance; and

- Indonesia, Nigeria, United Republic of Tanzania: the degree of importance, which data refer to, is not identified.

Cooperation covers the active participation with other firms or public institutions in innovation activities, as well as non-active collaboration in Cuba, El Salvador and Republic of Korea.

The degree of importance of factors hampering innovation is measured differently across countries which is generally but not uniquely done with the use of a scale of importance – high, medium, low, not important. The indicators about hampering factors presented in this report cover factors rated as highly important.

Differences are observed in the following countries:

- Australia, Canada, El Salvador, Kazakhstan: use of a dichotomous ("Yes/No") question;

- China: data cover the highest, second highest and third highest degrees of importance;

- Panama: data for hampering factors for innovation-active firms cover high and irrelevant degrees of importance, while for non-innovative firms data cover the lowest and second lowest degrees of importance; and

- Indonesia, Nigeria, United Republic of Tanzania: the degree of importance, which data refer to, is not identified.

Data are population estimates, except for the following countries that submitted survey data: Argentina, Costa Rica, Cuba, Ghana, India, Indonesia, Kenya, Malaysia, Morocco, Nigeria, Panama, Philippines and United Republic of Tanzania. Use of survey data in comparisons is not recommended.

Eurostat countries (Community Innovation Survey 2012, 2010-2012): Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom of Great Britain and Northern Ireland. Metadata information is available at: http://ec.europa.eu/eurostat/cache/metadata/en/inn_cis8_esms.htm

Annex II. Methodological procedures of the national innovation surveys

Table A1. Basic methodological procedures of the national innovation surveys for high-income countries

	Observation period	Statistical unit	Sampling frame	Cut-off point criterion/criteria	Survey method	Type of data	Other remarks
Australia	2012-2013	Kind of activity unit (KAU)	National statistical business register	Number of employees	Sample survey	Grossed up data (population estimates)	Occasional differences in some indicators may be due to independent rounding
Canada	2010-2012	Enterprise	National statistical business register	Number of employees and revenues	Sample survey	Grossed up data (population estimates)	:
Chile	2011-2012	Enterprise	National statistical business register, ad hoc lists, census directory of enterprises	Turnover	Sample survey	Grossed up data (population estimates)	ISIC Rev. 3.1 D32 and D37 are not covered
China, Hong Kong Special Administrative Region	2013	Kind of activity unit (KAU)	National statistical business register, alternative admin/ commercial sources, ad hoc lists	Number of employees	Sample survey	Grossed up data (population estimates)	:
Israel	2010-2012	Establishment	National statistical business register	Number of employees	Sample survey	Grossed up data (population estimates)	Percentage of manufacturing firms that cooperated with consultants, commercial laboratories or private R&D institutes does not cover private R&D institutes
Japan	2009-2011	Enterprise	National statistical business register	Number of employees	Sample survey	Grossed up data (population estimates)	ISIC Rev. 4 C12 is not covered
New Zealand	2011/12-2012/13	Enterprise	National statistical business register	Number of employees and turnover	Sample survey	Grossed up data (population estimates)	Occasional differences in some indicators may be due to independent rounding

	Observation period	Statistical unit	Sampling frame	Cut-off point criterion/criteria	Survey method	Type of data	Other remarks
Republic of Korea	2011-2013	Enterprise	National statistical business register	Number of employees	Sample survey	Grossed up data (population estimates)	ISIC Rev. 4 C12 is not covered; ISIC Rev. 4 C33 is dispersed into a couple of other categories; Occasional differences in some indicators may be due to independent rounding
United States of America	2009-2011	Enterprise group	National statistical business register	Number of employees	Sample survey	Grossed up data (population estimates)	:
Uruguay	2010-2012	Enterprise	National statistical business register, alternative administrative/commercial sources	Number of employees	Sample survey	Grossed up data (population estimates)	:

Notes: ":" Not available. For information on Eurostat countries please visit the Community Innovation Survey database at http://ec.europa.eu/eurostat/data/database.

Source: 2015 UIS innovation data collection

Table A2. Basic methodological procedures of the national innovation surveys for low- and middle-income countries

	Observation period	Statistical unit	Sampling frame	Cut-off point criterion/criteria	Survey method	Type of data	Other remarks
Argentina	2008	Enterprise	National statistical business register	Turnover	Sample survey	Survey data (use in comparisons is not recommended)	ISIC Rev. 3.1 D37 is not covered; Occasional differences in some indicators may be due to independent rounding
Azerbaijan	2014	Enterprise	National statistical business register	Number of employees and turnover	Census	Survey data	Data cover only large enterprises
Belarus	2014	Enterprise	National statistical business register	Number of employees	Census	Survey data	:
Brazil	2009-2011	Enterprise	National statistical business register	Number of employees	Combined (Sample survey: firms with 10-499 employees; Census: firms with 500 or more employees)	Grossed up data (population estimates)	Occasional differences in some indicators may be due to independent rounding; Cut off point: at least 10 employees
China	2013-2014	Enterprise	National statistical business register	Number of employees and turnover	Combined (Census: mining, manufacturing, electricity and construction enterprises; Sample survey: service enterprises)	Grossed up data (population estimates)	:
Colombia	2011-2012	Enterprise	National statistical business register	Number of employees	Census	Survey data	ISIC Rev. 3.1 D37 is not covered
Costa Rica	2010-2011	Enterprise	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	:
Cuba	2003-2005	Enterprise	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Data cover only large enterprises
Ecuador	2009-2011	Enterprise	National statistical business register	Number of employees and turnover	Sample survey	Grossed up data (population estimates)	:
Egypt	2012-2014	Enterprise	A random sample of enterprises was selected by using the Egypt Economic Census	Number of employees	Sample survey	Grossed up data (population estimates)	ISIC Rev. 4 C12 is not covered

	Observation period	Statistical unit	Sampling frame	Cut-off point criterion/criteria	Survey method	Type of data	Other remarks
El Salvador	2010-2012	Enterprise	National statistical business register, alternative admin/commercial sources and ad hoc lists	Number of employees and turnover	Sample survey	Grossed up data (population estimates)	ISIC Rev. 4 C12 and C33 are not covered
Ethiopia	2012-2014	Enterprise group and Enterprise	List of observation units from Central Statistics Agency, Ministry of Industry, Ministry of Trade, and Federal Micro and Small Enterprises Development Agency	Number of employees	Combined (Sample survey: small and medium-sized enterprises; Census: large enterprises)	Grossed up data (population estimates)	:
Ghana	2008-2010	Enterprise	List of registered enterprises of the Association of Ghana Industries (AGI) and list of the Ghana Chamber of Commerce	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Industries covered: Material engineering, Other engineering and technologies, Economic and business, Basic medicine, Media and communication, Environmental engineering, etc.; Source: AU/NEPAD
India	2007/08-2009/10	Enterprise	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	:
Indonesia	2009-2010	Establishment	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Data cover only medium-sized and large enterprises
Kazakhstan	2014	Enterprise	National statistical business register	Number of employees	Combined (Sample survey: small enterprises; Census: medium-sized and large enterprises)	Grossed up data (population estimates)	:
Kenya	2012-2014	Enterprise	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Occasional differences in some indicators may be due to independent rounding

	Observation period	Statistical unit	Sampling frame	Cut-off point criterion/criteria	Survey method	Type of data	Other remarks
Malaysia	2012-2014	Establishment	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Organizational and marketing innovations cover new or significantly changed
Mexico	2012-2013	Enterprise	National statistical business register	Number of employees	Sample survey	Grossed up data (population estimates)	ISIC Rev. 3.1 D37 is not covered
Morocco	2009-2010	Enterprise	National statistical business register and Statistics Directorate, Min of Com, Ind and New Technologies	Turnover	Sample survey	Survey data (use in comparisons is not recommended)	:
Nigeria	2008-2010	Enterprise	NBS Frame, Stock Market Trade List, Business Association Lists (e.g. LCCI, MAN)	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Cut off point: at least 10 employees; - Data cover manufacturing and services; Source: AU/NEPAD
Panama	2012-2013	Enterprise	National statistical business register	Turnover	Sample survey	Survey data (use in comparisons is not recommended)	ISIC Rev. 4 C12, C14, C15, C18, C27, C28, C29, C31 and C33 are not covered
Philippines	Jan 2009-Jun 2010	Establishment	National statistical business register	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Industries covered: Food manufacturing, Electronics, IT manuf, ICT trade, SW publishing, Telecom serv, HW consultancy, Other SW, Consultancy and Supply
Russian Federation	2013	Enterprise	National statistical business register	Number of employees and turnover	Census	Survey data	Data cover only medium-sized and large enterprises
South Africa	2005-2007	Enterprise	National statistical business register	Turnover	Sample survey	Grossed up data (population estimates)	Organizational and marketing innovations cover new or significantly changed

	Observation period	Statistical unit	Sampling frame	Cut-off point criterion/criteria	Survey method	Type of data	Other remarks
The former Yugoslav Republic of Macedonia	2010-2012	Enterprise	National statistical business register	Number of employees	Combined (Sample survey: small enterprises; Census: large and medium-sized enterprises)	Grossed up data (population estimates)	:
Uganda	2008-2010	Enterprise	National statistical business register	Number of employees and turnover	Sample survey	Grossed up data (population estimates)	Cut off point: at least 5 employees and turnover of at least 10 million Shillings; Data cover mining, manufacturing and services; Source: AU/NEPAD
Ukraine	2012-2014	Enterprise	National statistical business register	Number of employees	Census	Survey data	Occasional differences in some indicators may be due to independent rounding
United Republic of Tanzania	2008-2010	Enterprise	:	Number of employees	Sample survey	Survey data (use in comparisons is not recommended)	Cut off point: at least 5 employees; Industrial coverage: manufacturing, processing, engineering, services and printing; Source: AU/NEPAD

Notes: ":" Not available. For information on Eurostat countries please visit the Community Innovation Survey database at http://ec.europa.eu/eurostat/data/database.

Source: 2015 UIS innovation data collection

Table A3. Size classes for high-income countries

	Micro firms	Small firms	Medium-sized firms	Large firms
Australia	0-4 employees	5-19 employees	20-199 employees	200 or more employees
Canada	Not covered	20-99 employees and revenues of at least $250,000 Canadian dollars (CAD)	100-249 employees and revenues of at least CAD $250,000	250 employees or more and revenues of at least CAD $250,000
Chile	Not covered	2,400.1-25,000.0 Chilean Pesos (CP)	25,000.1-100,000.0 CP	100,000.1 CP or more
China, Hong Kong Special Administrative Region	Not applicable	0-9 employees	10-99 employees	100 or more employees
Israel	Not covered	10-49 employees	50-249 employees	250 or more employees
Japan	Not covered	10-49 employees	50-249 employees	250 or more employees
New Zealand	6-19 employees and a turnover of at least 30,000 NZ dollars	20-49 employees and a turnover of at least 30,000 NZ dollars	50-99 employees and a turnover of at least 30,000 NZ dollars	100 or more employees and a turnover of at least 30,000 NZ dollars
Republic of Korea	10-49 employees	50-99 employees	100-299 employees	300 or more employees
United States of America	Not covered	5-499 employees	500-24,999 employees	25,000 or more employees
Uruguay	Not covered	5-19 employees	20-99 employees	100 or more employees

Notes: For information on Eurostat countries please visit the Community Innovation Survey database at http://ec.europa.eu/eurostat/data/database.

Source: 2015 UIS innovation data collection

Table A4. Size classes for low- and middle-income countries

	Micro firms	Small firms	Medium-sized firms	Large firms
Argentina	Not covered	1-73 million Argentinian Pesos (AP)	74-296 million AP	297 million AP or more
Azerbaijan	Not covered	Not covered	Not covered	51 or more employees / 501,000 Azerbaijani Manats or more
Belarus	Not covered	16-100 employees	101-250 employees	251 or more employees
Brazil	:	At least 10 employees (cut-off point)	:	:
China	0-19 employees / 0-2,999.999 thousands Chinese Yuans (CY)	20-299 employees / 3,000-19,999.999 thousands CY	300-999 employees / 20,000-399,999.999 thousands CY	1,000 or more employees / 400,000 thousands CY or more
Colombia	Not covered	10-50 employees	51-200 employees	201 or more employees
Costa Rica	Not covered	6-25 employees	26-100 employees	101 or more employees
Cuba	Not covered	Not covered	Not covered	200 or more employees
Ecuador	Not covered	10-49 employees / 100,000.50-1,000,000.49 US dollars (USD)	50-199 employees / 1,000,000.50-2,000,000.49 USD	200-1,000,000 employees / 2,000,000.49-99,999,999,999 USD
Egypt	Not covered	10-49 employees	50-249 employees	250 or more employees
El Salvador	Not covered	10-50 employees / 100,001-1,000,000 USD	51-100 employees / 1,000,001-7,000,000 USD	101 or more employees / 7,000,001 USD or more
Ethiopia	Not covered	10-49 employees	50-249 employees	250 or more employees
Ghana	:	10-29 employees	30-99 employees	100 or more employees
India	0-99 employees	100-499 employees	500-999 employees	1,000 or more employees
Indonesia	Not covered	Not covered	20-99 employees	100 or more employees
Kazakhstan	Not covered	10-100 employees	101-250 employees	251 or more employees
Kenya	1-4 employees	5-49 employees	50-99 employees	100 or more employees
Malaysia	Not covered	5-75 employees	76-200 employees	201 or more employees

	Micro firms	Small firms	Medium-sized firms	Large firms
Mexico	Not covered	20-50 employees	51-250 employees	251 or more employees
Morocco	1-3 million Dirhams	3-10 million Dirhams	10-175 million Dirhams	More than 175 million Dirhams
Nigeria	:	At least 10 employees (cut-off point)	:	:
Panama	0-150,000 US Dollars	150,001-1,000,000 US Dollars	1,000,001-2,500,000 US Dollars	2,500,001 US Dollars or more
Philippines	1-9 employees	10-99 employees	100-199 employees	200 or more employees
Russian Federation	Not covered	Not covered	101-250 employees / 401-1,000 million Roubles	251 or more employees / More than 1,000 million Roubles
South Africa	Less than 5 million South African Rands (ZAR)	5-13 million ZAR	13-51 million ZAR	More than 51 million ZAR
The former Yugoslav Republic of Macedonia	Not covered	10-49 employees	50-249 employees	250 or more employees
Uganda	:	At least 10 employees and a turnover of at least 10 million Shillings (cut-off point)	:	:
Ukraine	Not covered	10-49 employees	50-249 employees	250 or more employees
United Republic of Tanzania	:	At least 5 employees (cut-off point)	:	:

Notes: ":" Not available. For information on Eurostat countries please visit the Community Innovation Survey database at http://ec.europa.eu/eurostat/data/database.

Source: 2015 UIS innovation data collection

Annex III. Basic innovation indicators

1. Percentage of product innovators in manufacturing

$$\frac{(N) = \text{Number of manufacturing firms that implemented product innovation}}{(D) = \text{Total number of manufacturing firms}} *100$$

2. Percentage of process innovators in manufacturing

$$\frac{(N) = \text{Number of manufacturing firms that implemented process innovation}}{(D) = \text{Total number of manufacturing firms}} *100$$

3. Percentage of innovative firms in manufacturing by size class

$$\frac{(N) = \text{Number of manufacturing firms that implemented product or process innovation (in each size class)}}{(D) = \text{Total number of manufacturing firms (in each size class)}} *100$$

4. Percentage of innovation-active firms in manufacturing

$$\frac{(N) = \text{Number of manufacturing firms that implemented or had abandoned or ongoing innovation activities for product or process innovation, regardless of organizational or marketing innovation}}{(D) = \text{Total number of manufacturing firms}} *100$$

5. Percentage of non-innovative firms in manufacturing

(N) =	Number of manufacturing firms that did not implement nor have abandoned or ongoing innovation activities for product or process innovation, regardless of organizational or marketing innovation	*100
(D) =	Total number of manufacturing firms	

6. Percentage of manufacturing firms with only abandoned or ongoing innovation activities

(N) =	Number of manufacturing firms with only abandoned or ongoing innovation activities for product or process innovation, regardless of organizational or marketing innovation	*100
(D) =	Total number of manufacturing firms	

7. Percentage of manufacturing firms that engaged in innovation activities

(N) =	Number of innovation-active manufacturing firms that engaged in a specific innovation activity	*100
(D) =	Total number of innovation-active manufacturing firms	

8. Percentage of manufacturing firms for which sources of information were highly important

(N) =	Number of innovation-active manufacturing firms for which a specific source of information was highly important	*100
(D) =	Total number of innovation-active manufacturing firms	

9. Percentage of manufacturing firms that cooperated with partners

$$\frac{(N) = \text{Number of innovation-active manufacturing firms that cooperated with a specific partner}}{(D) = \text{Total number of innovation-active manufacturing firms}} *100$$

10. Percentage of innovation-active manufacturing firms for which hampering factors were highly important

$$\frac{(N) = \text{Number of innovation-active manufacturing firms for which a specific hampering factor was highly important}}{(D) = \text{Total number of innovation-active manufacturing firms}} *100$$

11. Percentage of non-innovative manufacturing firms for which hampering factors were highly important

$$\frac{(N) = \text{Number of non-innovative manufacturing firms for which a specific hampering factor was highly important}}{(D) = \text{Total number of non-innovative manufacturing firms}} *100$$

12. Percentage of organizational innovators in manufacturing

$$\frac{(N) = \text{Number of manufacturing firms that implemented organizational innovation}}{(D) = \text{Total number of manufacturing firms}} *100$$

13. Percentage of marketing innovators in manufacturing

$$\frac{(N) = \text{Number of manufacturing firms that implemented marketing innovation}}{(D) = \text{Total number of manufacturing firms}} *100$$

Annex IV. Statistical tables

Table A5. Innovators in high-income countries (as a percentage of manufacturing firms)

	Product innovators	Process innovators	Organizational innovators	Marketing innovators
Australia	31.5	23.9	21.1	22.2
Austria	29.4	33.2	33.2	29.0
Belgium	36.1	36.9	31.9	24.2
Canada	46.0	48.0	46.9	32.8
Chile	19.3	22.8	18.4	17.1
China, Hong Kong SAR	0.6	0.5	2.0	5.9
Croatia	19.3	20.4	22.8	23.7
Cyprus	23.7	28.6	19.9	29.0
Czechia	30.0	26.6	21.6	24.4
Denmark	26.1	25.0	33.3	30.1
Estonia	23.8	27.4	20.3	21.3
Finland	36.5	35.1	29.2	28.1
France	28.3	27.9	34.0	23.8
Germany	43.8	31.0	34.4	35.2
Greece	20.8	27.3	29.2	38.2
Hungary	11.5	9.3	14.7	19.3
Iceland	40.6	36.1	31.3	26.0
Ireland	35.2	33.4	25.9	38.7
Israel	24.1	23.8	35.5	36.2
Italy	32.0	35.0	32.4	31.5
Japan	19.6	20.2	28.8	22.9
Latvia	13.9	14.1	12.4	16.9
Lithuania	14.4	14.9	13.9	21.9
Luxembourg	32.8	42.1	46.9	36.3
Malta	28.6	36.9	34.9	34.9
Netherlands	36.9	28.5	28.9	22.0
New Zealand	31.6	23.2	25.6	25.2
Norway	22.0	14.2	22.7	23.3
Poland	11.9	12.3	10.3	10.6
Portugal	24.9	32.6	27.1	27.9
Republic of Korea	17.1	7.4	16.4	12.1
Slovakia	15.5	13.6	17.5	17.2
Slovenia	:	:	28.1	30.1
Spain	13.8	18.6	19.5	14.4
Sweden	31.4	28.8	23.4	27.7
United Kingdom of Great Britain and Northern Ireland	28.4	17.2	35.8	14.4
United States of America	21.7	20.6	:	:
Uruguay	13.0	15.8	8.0	5.0

Notes: ":" Not available.

Source: 2015 UIS innovation data collection and Eurostat

Table A6. Innovators in low- and middle-income countries (as a percentage of manufacturing firms)

	Product innovators	Process innovators	Organizational innovators	Marketing innovators
Argentina	28.4	29.6	12.7	8.4
Azerbaijan	1.1	1.4	:	:
Belarus	19.1	7.0	2.8	4.7
Brazil	17.5	32.0	57.8	42.9
Bulgaria	14.6	11.1	12.0	14.4
China	26.1	26.1	30.7	29.1
Colombia	11.9	12.4	6.5	5.4
Costa Rica	67.5	62.1	40.4	43.0
Cuba	44.0	48.4	64.8	23.2
Ecuador	45.8	47.1	21.0	29.0
Egypt	25.9	33.4	20.6	25.5
El Salvador	23.3	18.9	9.6	10.7
Ethiopia	29.2	36.7	41.1	55.4
India	12.1	12.1	38.0	35.5
Indonesia	20.2	18.1	39.0	55.0
Kazakhstan	8.0	6.6	2.7	3.0
Kenya	47.2	52.8	66.5	67.0
Malaysia	47.3	56.8	40.2	46.0
Mexico	6.3	3.9	2.4	1.3
Nigeria	50.1	58.6	:	:
Panama	13.7	34.7	45.3	48.4
Philippines	37.6	43.9	57.8	50.4
Romania	3.9	5.6	15.6	15.3
Russian Federation	8.0	6.5	3.7	3.0
Serbia	30.4	24.8	35.6	33.9
South Africa	16.8	13.1	52.6	23.3
TFYR of Macedonia	15.6	22.7	28.2	21.5
Turkey	19.5	22.2	31.5	38.1
Uganda	61.1	63.1	:	:
Ukraine	9.3	10.5	4.8	8.2
UR Tanzania	61.3	27.0	:	:

Notes: ":" Not available.

Source: 2015 UIS innovation data collection, Eurostat and AU/NEPAD

Table A7. Innovation-active and innovative firms in high-income countries (as a percentage of manufacturing firms)

	Innovation-active firms	Innovative firms
Australia	45.2	39.0
Austria	43.9	41.6
Belgium	53.4	50.0
China, Hong Kong SAR	4.3	0.8
Croatia	27.9	26.0
Cyprus	31.4	31.4
Czechia	40.4	37.6
Denmark	41.5	38.0
Estonia	43.3	39.7
Finland	52.3	48.8
France	42.7	39.1
Germany	63.3	52.1
Greece	35.5	32.2
Hungary	17.6	15.1
Iceland	50.7	50.7
Ireland	52.4	46.1
Israel	36.6	33.0
Italy	45.9	43.6
Japan	33.0	28.5
Latvia	20.9	19.6
Lithuania	21.2	19.7
Luxembourg	56.3	52.1
Malta	43.2	41.5
Netherlands	50.3	46.5
New Zealand	49.4	41.7
Norway	35.0	27.0
Poland	17.8	16.6
Portugal	39.8	37.6
Republic of Korea	25.3	19.4
Slovakia	20.3	19.5
Spain	28.5	24.1
Sweden	49.3	44.1
United Kingdom of Great Britain and Northern Ireland	39.3	33.6

Source: 2015 UIS innovation data collection and Eurostat

Table A8. Innovation-active and innovative firms in low- and middle-income countries (as a percentage of manufacturing firms)

	Innovation-active firms	Innovative firms
Brazil	38.2	35.9
Bulgaria	22.1	18.9
China	35.4	32.3
Colombia	24.7	19.2
Cuba	94.0	81.2
Ecuador	62.7	58.6
Egypt	36.7	35.5
Ethiopia	46.0	44.0
India	35.6	18.5
Malaysia	68.9	64.0
Mexico	9.8	6.8
Panama	48.4	36.8
Philippines	54.4	50.2
Romania	7.6	7.0
Serbia	35.9	34.9
TFYR of Macedonia	27.5	26.4
Turkey	29.8	26.9
Ukraine	14.7	13.6

Source: 2015 UIS innovation data collection and Eurostat

Table A9. Innovative firms in high-income countries by size class (as a percentage of manufacturing firms in each size class)

	Small	Medium-sized	Large
Australia	47.5	52.4	72.5
Austria	30.6	63.9	86.1
Belgium	44.1	62.1	75.8
Canada	73.6	78.7	80.4
Chile	13.7	30.3	43.4
China, Hong Kong SAR	0.4	1.4	8.3
Croatia	20.5	36.9	69.3
Cyprus	29.9	44.6	37.5
Czechia	29.7	50.3	75.0
Denmark	31.4	51.1	84.7
Estonia	32.0	57.1	71.2
Finland	43.6	56.4	83.5
France	32.1	58.0	78.9
Germany	45.9	63.0	82.3
Greece	30.6	39.9	58.0
Hungary	9.5	25.7	51.9
Iceland	44.7	67.1	78.3
Ireland	37.5	64.5	78.6
Israel	23.9	52.7	75.0
Italy	39.9	64.7	80.7
Japan	24.1	38.0	56.3
Latvia	14.8	31.5	47.3
Lithuania	13.6	30.2	58.8
Luxembourg	47.1	52.4	92.0
Malta	32.6	61.2	85.7
New Zealand	43.5	54.5	58.6
Norway	21.7	40.7	61.7
Poland	9.7	30.4	56.8
Portugal	32.8	53.2	83.2
Republic of Korea	26.0	31.2	54.6
Slovakia	12.8	27.4	47.8
Spain	18.5	49.1	75.4
Sweden	39.5	56.5	70.6
United Kingdom of Great Britain and Northern Ireland	30.0	43.3	50.0
Uruguay	12.7	33.5	52.8

Source: 2015 UIS innovation data collection and Eurostat

Table A10. Innovative firms in low- and middle-income countries by size class (as a percentage of manufacturing firms in each size class)

	Small	Medium-sized	Large
Argentina	30.7	49.2	67.6
Belarus	8.7	12.9	33.7
China	28.9	50.4	73.9
Colombia	12.6	29.1	50.7
Costa Rica	75.9	84.6	89.7
Ecuador	54.7	68.2	73.5
Egypt	31.3	65.2	74.1
Ethiopia	41.2	46.7	54.5
India	22.9	38.3	22.8
Kazakhstan	7.2	19.6	30.4
Panama	40.0	45.5	32.9
Philippines	45.8	58.8	60.8
Romania	5.1	9.1	23.4
Serbia	29.1	45.7	59.1
South Africa	17.4	25.6	20.6
TFYR of Macedonia	24.4	27.8	59.3
Turkey	23.9	34.2	50.1
Ukraine	8.0	20.1	41.1

Source: 2015 UIS innovation data collection and Eurostat