Facoltà di Economia
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Corso:
**Economia della Regolamentazione e della Concorrenza**
(Economia e Politica Industriale)

Docente
Prof. Riccardo Cappellin

# LEZIONE 9

# I SISTEMI NAZIONALI DI INNOVAZIONE

**https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en**

https://op.europa.eu/en/publication-detail/-/publication/5d1b30d5-1ba9-11ee-806b-01aa75ed71a1/language-en/format-PDF/source-289021440

https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/04797497-25de-11ee-a2d3-01aa75ed71a1

https://voxdev.org/topic/public-economics/where-are-we-economics-industrial-policies

**https://research-and-innovation.ec.europa.eu/statistics/performance-indicators/european-innovation-scoreboard_en**

**European innovation scoreboard**

This provides a comparative analysis of innovation performance in EU countries, other European countries, and regional neighbours.

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## What is the EIS

The European Innovation Scoreboard provides a comparative assessment of the Research and Innovation performance of EU Member States, other European countries, and regional neighbours. It helps countries assess the relative strengths and weaknesses of their national innovation systems and identify challenges that they need to address. The European Innovation Scoreboard 2023 was released on 6 July 2023.

## European innovation scoreboard 2023

Based on their scores, EU countries fall into four performance groups: Innovation leaders, Strong innovators, Moderate innovators and Emerging innovators.

- Denmark is the new top innovator with the best performance in the EU, overtaking Sweden after a few years in leading position. Other Innovation Leaders are Sweden, Finland, the Netherlands, and Belgium.
- Austria, Germany, Luxembourg, Ireland, Cyprus, and France are Strong innovators, performing above the EU average.
- Estonia, Slovenia, Czechia, Italy, Spain, Malta, Portugal, Lithuania, Greece and Hungary are Moderate innovators.
- Croatia, Slovakia, Poland, Latvia, Bulgaria and Romania are Emerging Innovators.

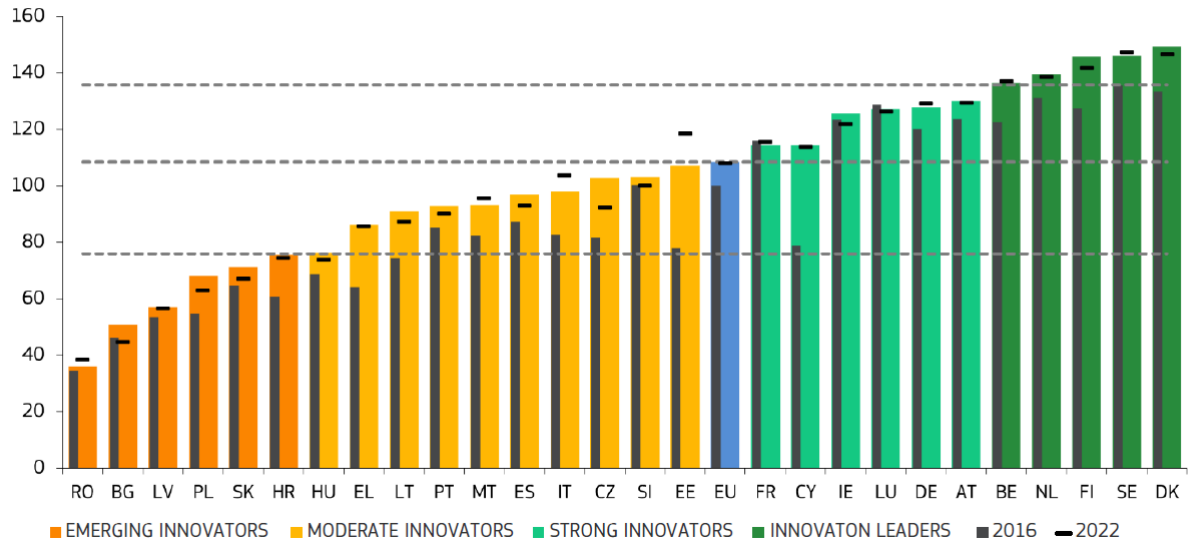
In the latest edition, the distribution of Member States across performance groups in the European Innovation Scoreboard remains largely unchanged compared to the previous year. However, Hungary has made significant strides and advanced to a higher performance group, earning the title of Moderate Innovator, while France and Luxembourg experienced a slight decrease in performance relative to the EU eight years ago. This highlights the need for continued efforts to enhance innovation capabilities in these regions.

Between 2016 and 2023, performance differences between the Member States have narrowed, most strongly within the groups of Strong Innovators and Moderate Innovators. However, the distribution of performance groups still exhibits geographic concentration. Northern and Western Europe are home to the Innovation Leaders and most Strong Innovators, while Southern and Eastern Europe house the majority of Moderate and Emerging Innovators.

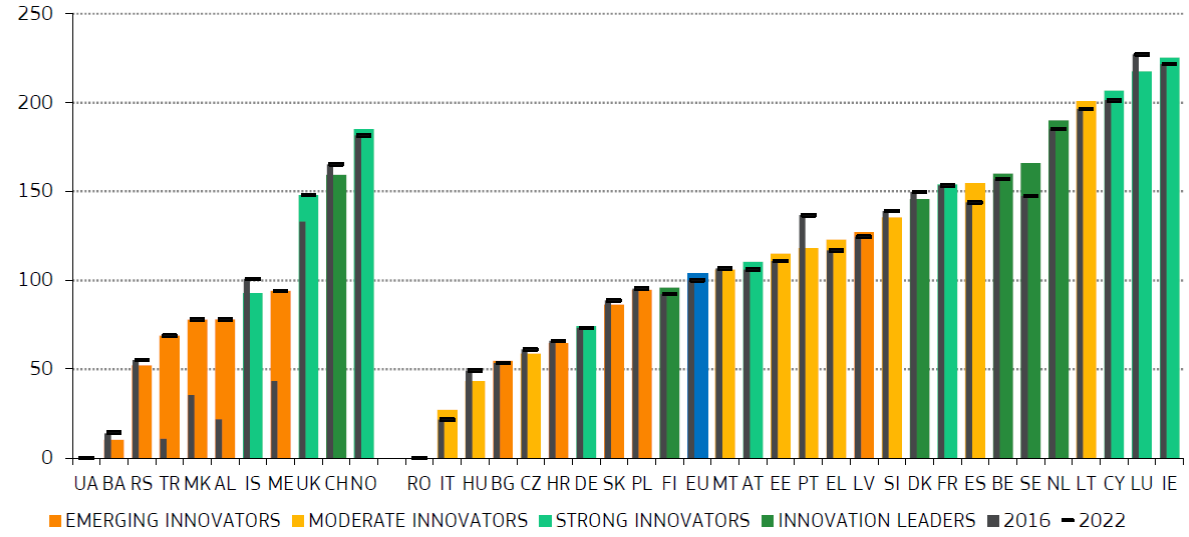
Since last year, the global positioning of the EU has not significantly changed. The EU has closed part of its performance gap with Australia. China’s performance level is almost at par with that of the EU

This year’s European Innovation Scoreboard is based on the same indicator framework as the 2021 edition, which consists of 32 indicators grouped under 12 dimensions such as: attractive research systems, firm investment in research and development, and use of information technologies.

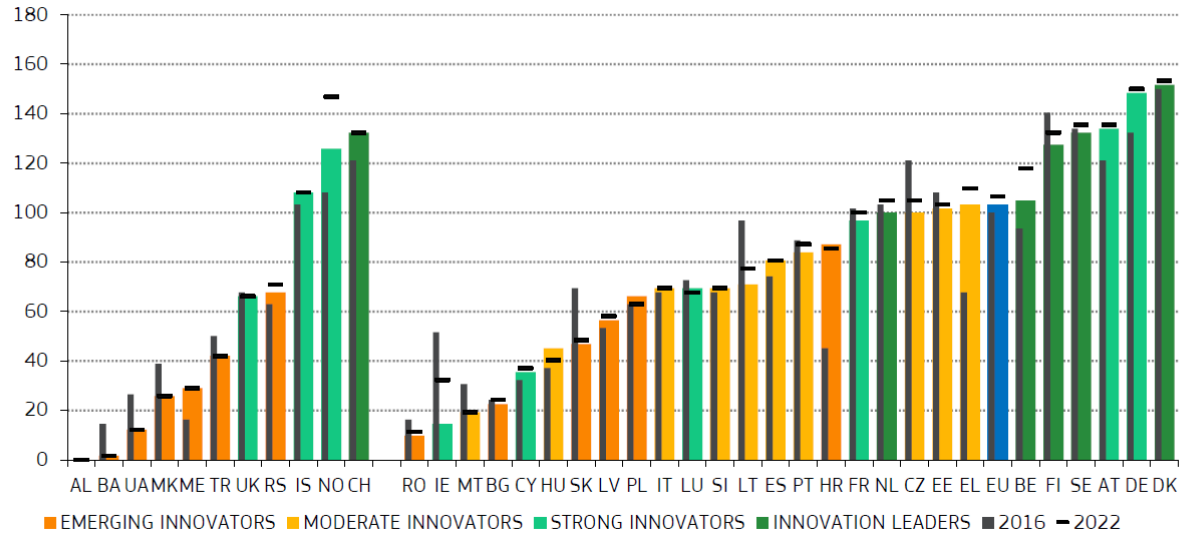
Figure 1: Performance of EU Member States' innovation systems



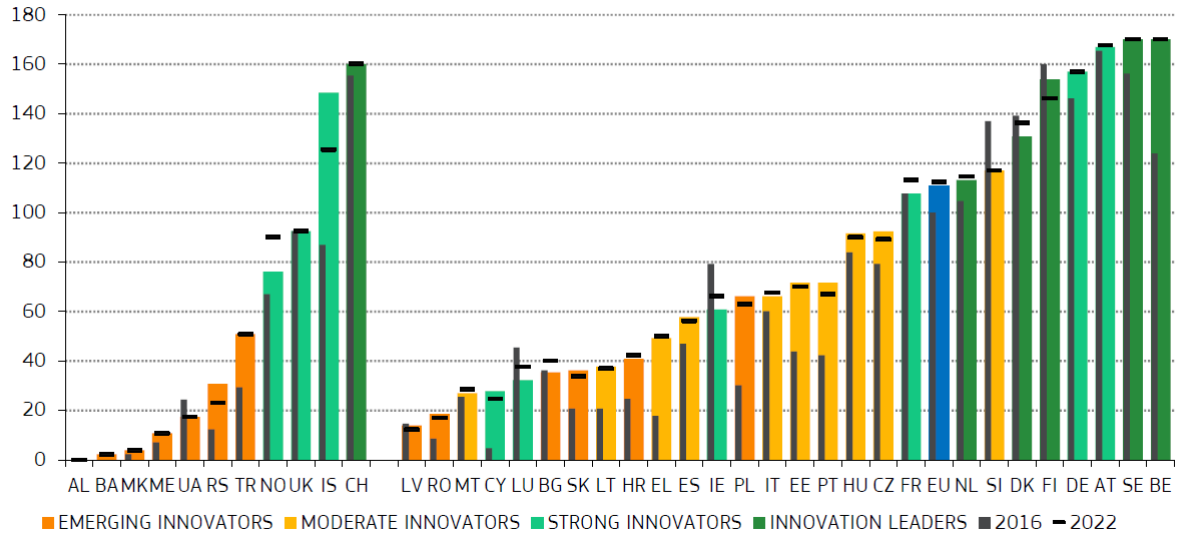

### 1.1.2 Percentage population aged 25-34 having completed tertiary education



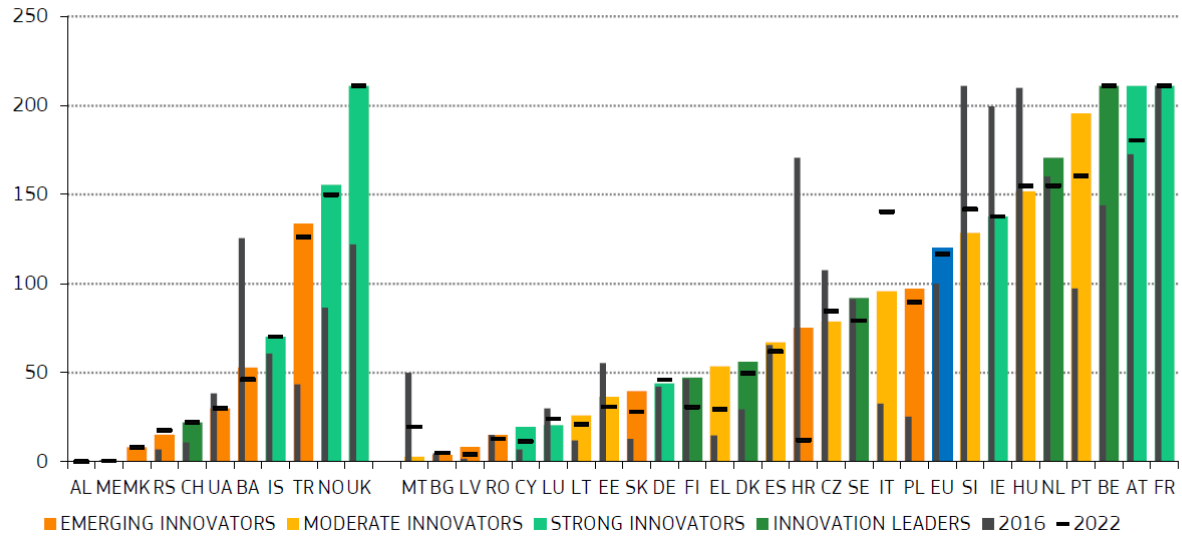
### 2.1.1 R&D expenditure in the public sector as percentage of GDP



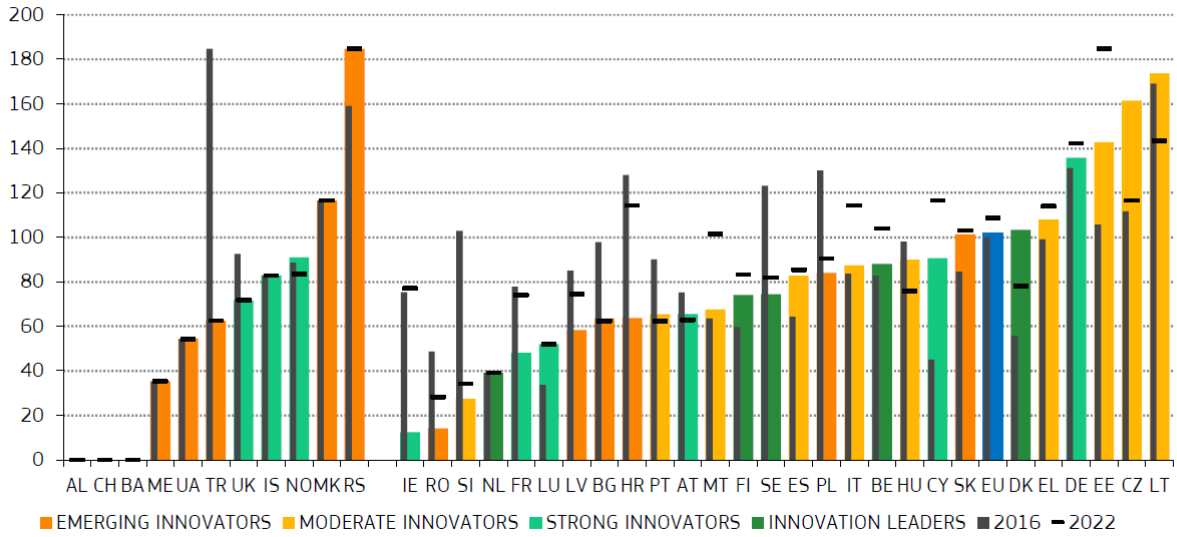

### 2.2.1 R&D expenditure in the business sector as percentage of GDP



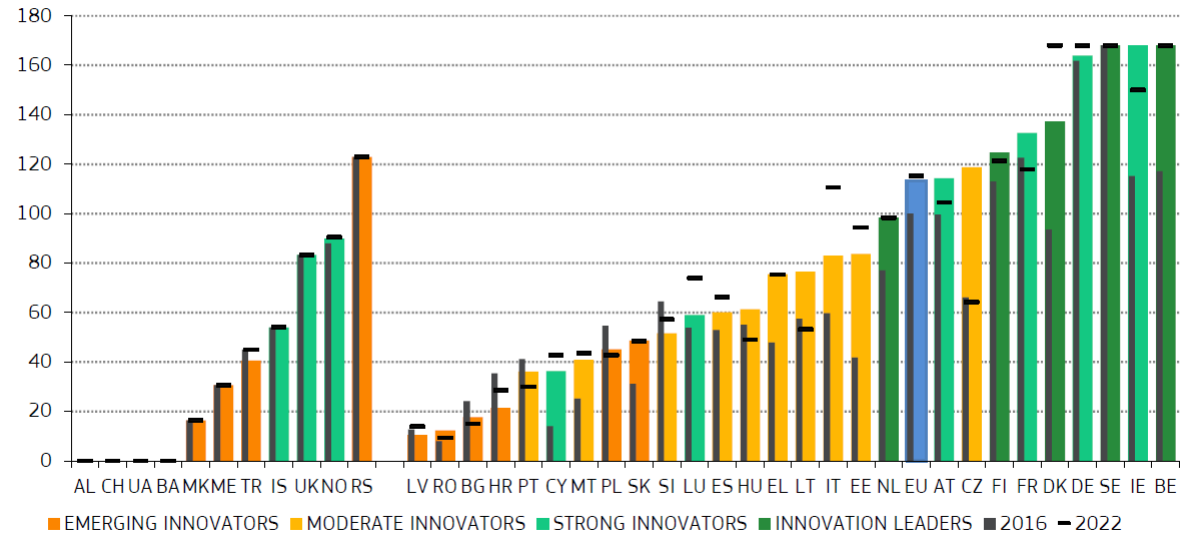
### 2.1.3 Direct government funding and government tax support for business R&D as percentage of GDP



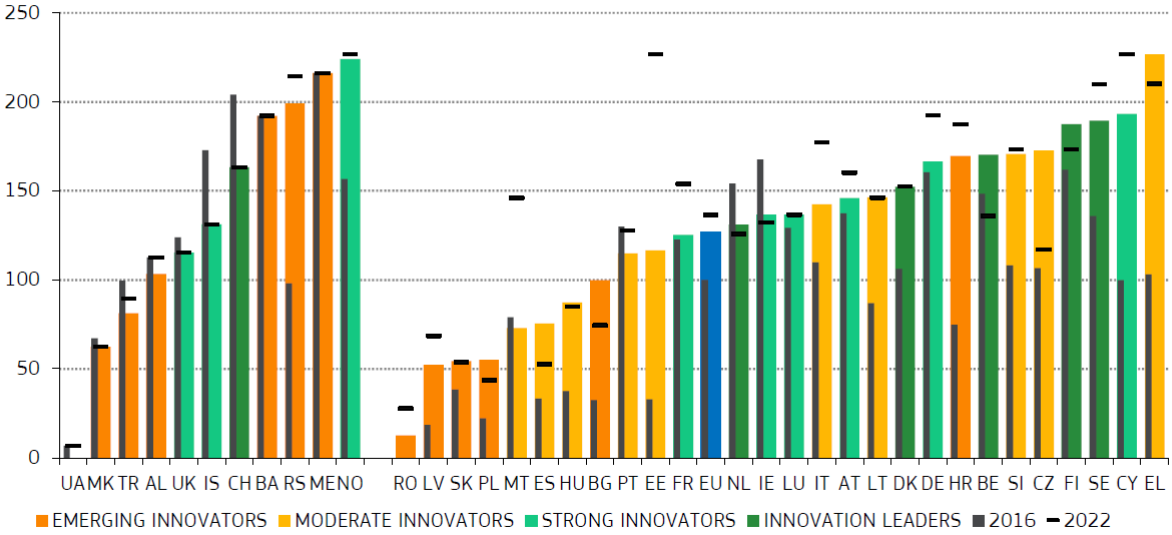

### 2.2.2 Non-R&D innovation expenditure as percentage of total turnover



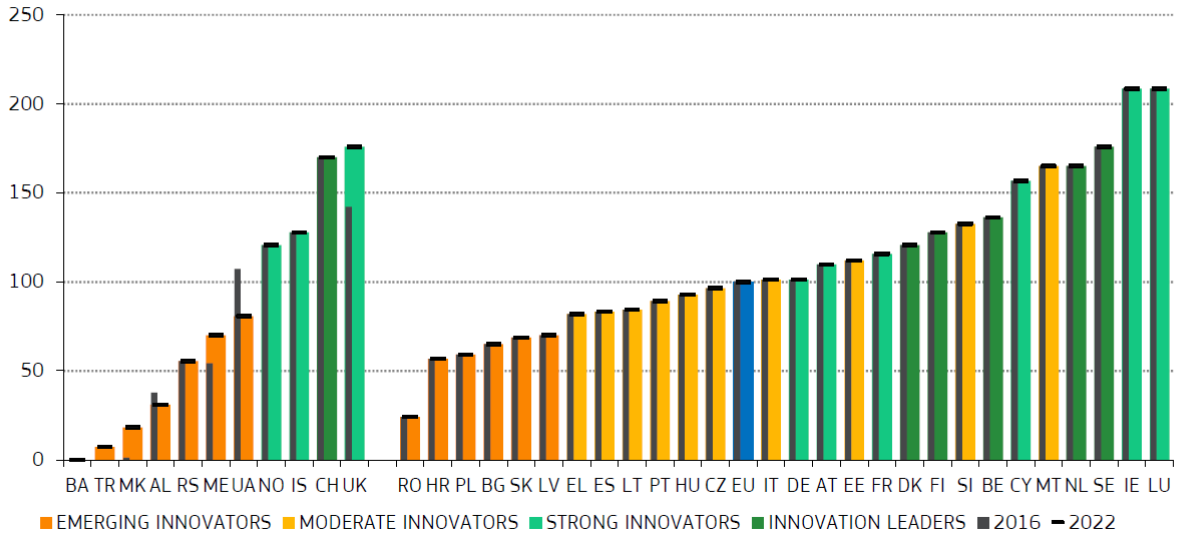
### 2.2.3 Innovation expenditures per person employed



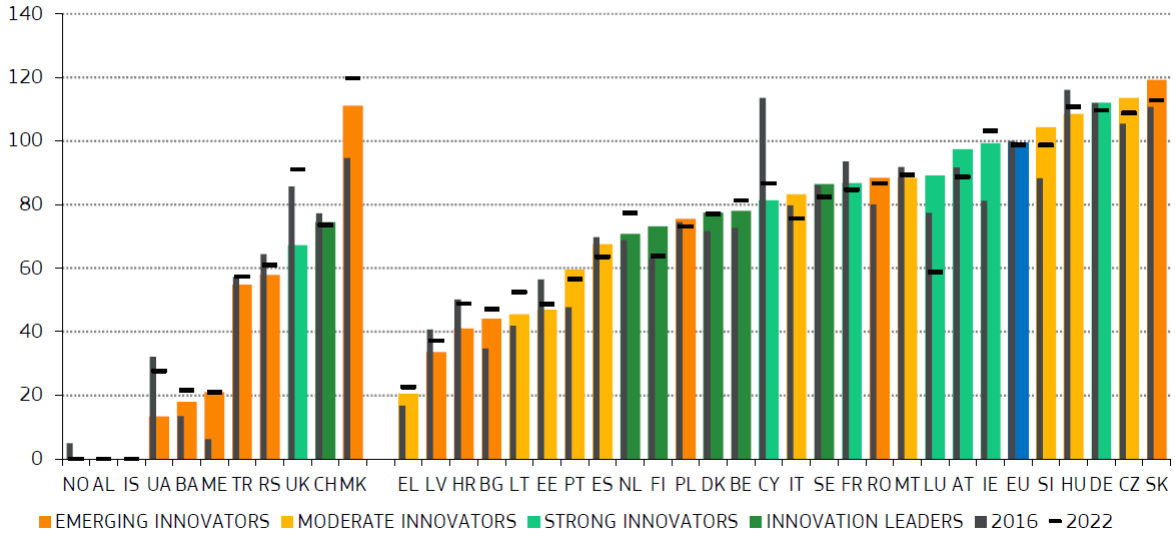

### 3.1.1 SMEs introducing product innovations as percentage of SMEs



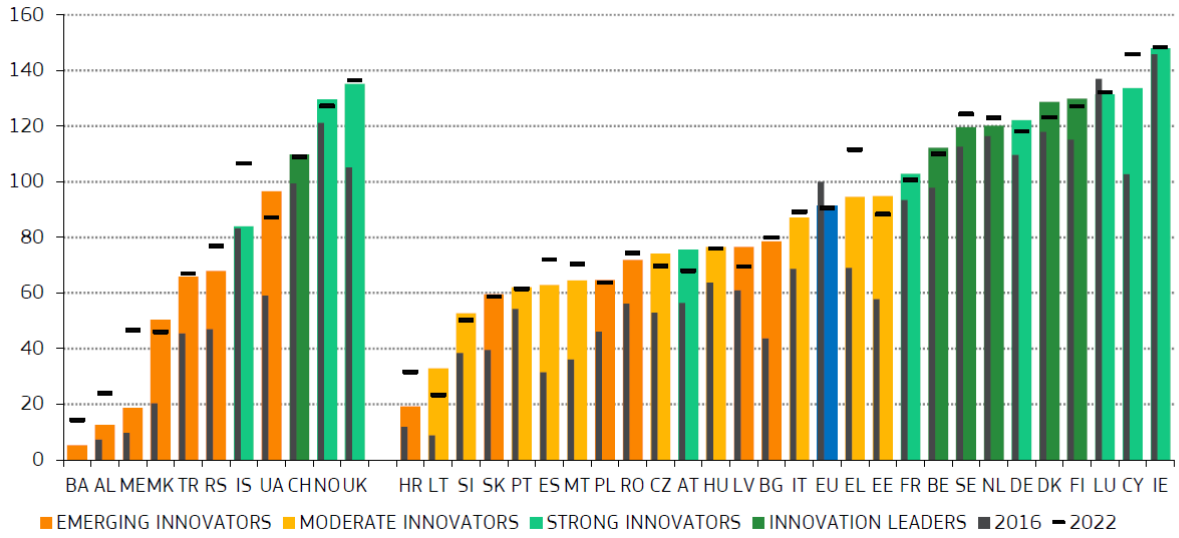
### 4.1.1 Employment in knowledge-intensive activities as percentage of total employment



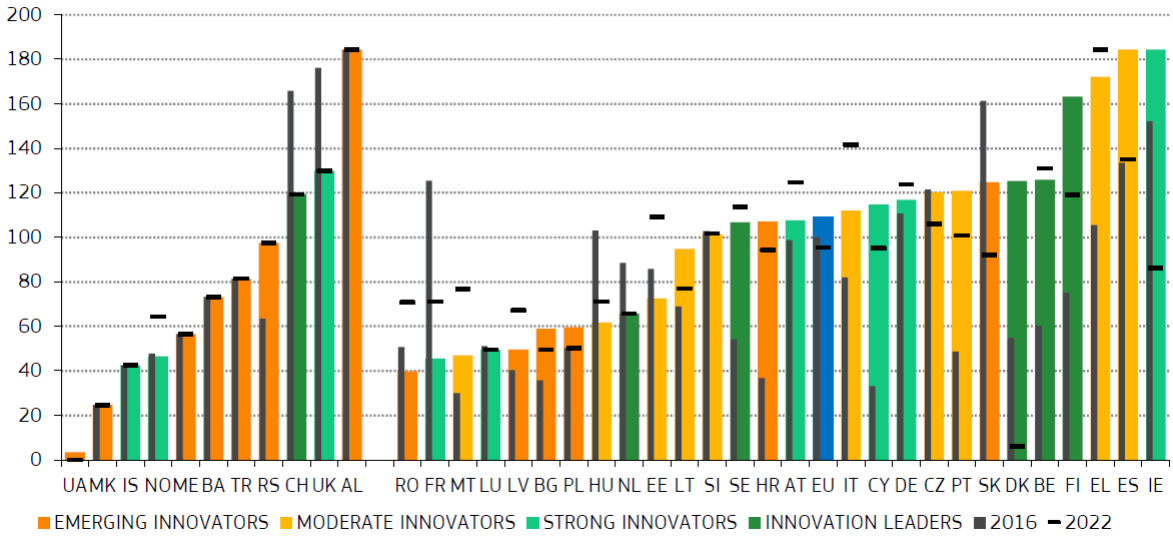

### 4.2.1 Exports of medium and high technology products as a share of total product exports

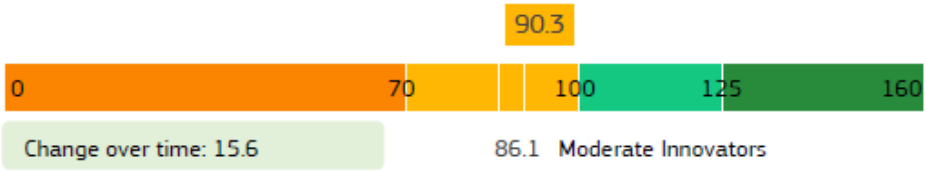


### 4.2.2 Knowledge-intensive services exports as percentage of total services exports




### 4.2.3 Sales of new-to-market and new-to-enterprise innovations as percentage of turnover






Change over time: 15.6

86.1 Moderate Innovators

## Italy

| | Performance relative to EU in 2023 | Performance change 2016-2023 | Performance change 2022-2023 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **90.3** | **15.6** | **-5.6** |
| **Human resources** | **62.1** | **-4.0** | **0.9** |
| Doctorate graduates | 85.2 | -11.4 | 0.0 |
| Population with tertiary education | 26.0 | 5.4 | 5.4 |
| Lifelong learning | 77.5 | -3.3 | -3.3 |
| **Attractive research systems** | **106.2** | **25.9** | **6.5** |
| International scientific co-publications | 88.2 | 46.7 | 0.8 |
| Most cited publications | 126.4 | 18.9 | 11.0 |
| Foreign doctorate students | 87.9 | 22.4 | 1.5 |
| **Digitalisation** | **77.9** | **19.5** | **10.8** |
| Broadband penetration | 74.7 | 38.3 | 21.2 |
| People with above basic overall digital skills | 82.4 | 0.0 | 0.0 |
| **Finance and support** | **66.0** | **20.9** | **-14.1** |
| R&D expenditures in the public sector | 67.2 | 1.6 | 0.0 |
| Venture capital expenditures | 56.6 | 5.9 | -3.7 |
| Government support for business R&D | 79.8 | 63.2 | -44.6 |
| **Firm investments** | **72.3** | **11.3** | **-18.5** |
| R&D expenditure in the business sector | 59.7 | 6.2 | -1.5 |
| Non-R&D Innovation expenditures | 85.9 | 3.7 | -27.0 |
| Innovation expenditures per employee | 73.3 | 23.4 | -27.4 |
| **Use of information technologies** | **79.5** | **23.6** | **13.6** |
| Enterprises providing ICT training | 82.2 | 44.6 | 24.2 |
| Employed ICT specialists | 76.7 | 3.4 | 3.4 |
| **Innovators** | **115.2** | **47.2** | **-37.6** |
| Product innovators (SMEs) | 112.3 | 32.5 | -35.0 |
| Business process innovators (SMEs) | 117.8 | 62.8 | -40.4 |
| **Linkages** | **92.0** | **51.7** | **-5.1** |
| Innovative SMEs collaborating with others | 113.9 | 79.2 | -16.2 |
| Public-private co-publications | 148.0 | 71.1 | 5.7 |
| Job-to-job mobility of HRST | 50.0 | 17.6 | 0.0 |
| **Intellectual assets** | **107.6** | **2.1** | **0.0** |
| PCT patent applications | 77.6 | 0.1 | -1.2 |
| Trademark applications | 106.1 | 17.5 | -2.8 |
| Design applications | 152.7 | -7.4 | 3.7 |
| **Employment impacts** | **107.0** | **10.0** | **-13.1** |
| Employment in knowledge-intensive activities | 101.2 | 0.0 | 0.0 |
| Employment in innovative enterprises | 111.7 | 19.4 | -25.6 |
| **Sales impacts** | **92.8** | **15.4** | **-5.4** |
| Medium and high-tech goods exports | 83.8 | 3.6 | 7.6 |
| Knowledge-intensive services exports | 95.2 | 18.4 | -2.1 |
| Sales of innovative products | 102.8 | 30.0 | -29.6 |
| **Environmental sustainability** | **113.4** | **1.2** | **-5.1** |
| Resource productivity | 170.2 | 23.6 | -13.9 |
| Air emissions by fine particulate matter | 106.2 | 4.6 | -0.8 |
| Environment-related technologies | 67.2 | -17.9 | -4.4 |

The second column shows performance relative to that of the EU in 2023. Colours next to the column show matching colour codes: dark green: above 125% of the performance of the EU in 2023; light green: between 100% and 125%; light orange: between 70% and 100%; dark orange: below 70%. The next columns show performance change over time between 2016 and 2023 and between 2022 and 2023, with scores relative to those of the EU in 2016. Positive (negative) performance changes are shown in green (red).

**ITALY** is a **Moderate Innovator** with performance at 90.3% of the EU average. Performance is above the average of the Moderate Innovators. Performance is increasing at a rate higher than that of the EU (8.5%-points). The country's performance gap to the EU is becoming smaller.

**Relative strengths**

Resource productivity
Design applications

Public-private co-publications
Most cited publications
Business process innovators

**Relative weaknesses**

Population with tertiary education
Job-to-job mobility of HRST
Venture capital expenditures
R&D expenditure in the business sector
Environment-related technologies

**Strong increases since 2016**

Innovative SMEs collaborating with others
Public-private co-publications
Government support for business R&D

**Strong decreases since 2016**

Environment-related technologies
Doctorate graduates
Design applications

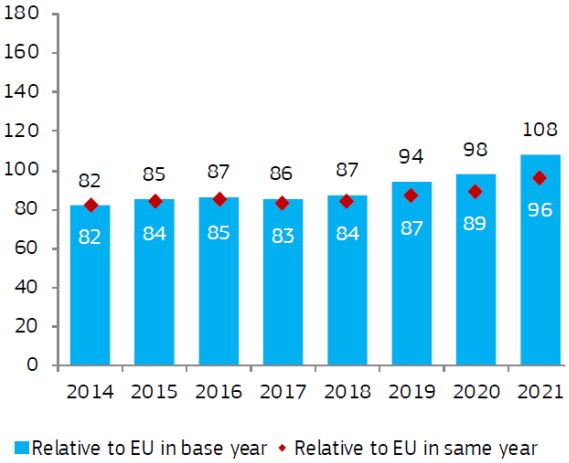
**Strong increases since 2022**

Enterprises providing ICT training
Broadband penetration
Most cited publications

**Strong decreases since 2022**

Government support for business R&D
Business process innovators
Product innovators

**Italy** is a **Moderate Innovator**.
Over time, performance relative to the EU has increased strongly.




**Structural differences** with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

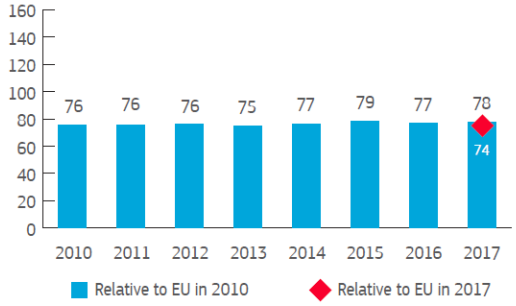
| | IT | EU |
|---|---|---|
| **Performance and structure of the economy** | | |
| GDP per capita (PPS) | 29,800 | 30,800 |
| Average annual GDP growth (%) | -4.1 | -2.5 |
| Employment share Manufacturing (NACE C) (%) | 18.6 | 16.5 |
| of which High and Medium high-tech (%) | 33.8 | 37.9 |
| Employment share Services (NACE G-N) (%) | 45.0 | 41.2 |
| of which Knowledge-intensive services (%) | 37.3 | 35.1 |
| Turnover share SMEs (%) | 41.9 | 36.5 |
| Turnover share large enterprises (%) | 31.0 | 45.7 |
| Foreign-controlled enterprises – share of value added (%) | 6.7 | 11.8 |
| **Business and entrepreneurship** | | |
| Enterprise births (10+ employees) (%) | 1.1 | 1.0 |
| Total Entrepreneurial Activity (TEA) (%) | 3.8 | 6.7 |
| FDI net inflows (% GDP) | 1.1 | 2.0 |
| Top R&D spending enterprises per 10 million population | 6.4 | 16.2 |
| Buyer sophistication (1 to 7 best) | 3.8 | 3.7 |
| **Innovation profiles** | | |
| In-house product innovators with market novelties | 10.0 | 10.7 |
| In-house product innovators without market novelties | 22.3 | 12.3 |
| In-house business process innovators | 16.0 | 11.0 |
| Innovators that do not develop innovations themselves | 8.4 | 11.6 |
| Innovation active non-innovators | 5.2 | 3.3 |
| Non-innovators with potential to innovate | 7.4 | 19.9 |
| Non-innovators without disposition to innovate | 30.8 | 31.3 |
| **Governance and policy framework** | | |
| Ease of starting a business (0 to 100 best) | 73.0 | 76.5 |
| Basic school entrepreneurial education and training | 2.0 | 2.0 |
| Govt. procurement of advanced tech. products | 2.9 | 3.5 |
| Rule of law (-2.5 to 2.5 best) | 0.3 | 1.1 |
| **Climate change indicators** | | |
| Circular material use rate | 18.8 | 11.7 |
| Greenhouse gas emissions intensity of energy consumption | 84.9 | 86.6 |
| Eco-Innovation Index | 112.0 | 100.0 |
| **Demography** | | |
| Population size | 60.0 | 446.7 |
| Average annual population growth (%) | -0.7 | 0.1 |
| Population density | 202.6 | 108.8 |

Italy's strengths are in *Innovators*, *Employment impacts* and *Environmental sustainability*. The top-3 indicators include Resource productivity, Sales of innovative products, and Design applications.
The strong increase between 2019 and 2021 is due to improved performance on the indicators using innovation survey data and Broadband penetration.
Italy has above average shares of In-house product innovators without market novelties and In-house business process innovators. Italy is showing above average scores on the Climate change related indicators.

| Italy | Relative to EU 2021 in 2021 | Relative to EU 2014 in 2014 | Relative to EU 2014 in 2021 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **96.0** | **82.0** | **108.1** |
| **Human resources** | **56.2** | **51.9** | **59.6** |
| Doctorate graduates | 74.0 | 77.0 | 65.5 |
| Population with tertiary education | 25.0 | 3.3 | 32.2 |
| Lifelong learning | 72.7 | 63.3 | 80.0 |
| **Attractive research systems** | **99.6** | **86.7** | **112.0** |
| International scientific co-publications | 91.5 | 85.0 | 120.0 |
| Most cited publications | 113.9 | 97.6 | 112.0 |
| Foreign doctorate students | 86.0 | 66.2 | 102.1 |
| **Digitalisation** | **68.7** | **71.4** | **95.1** |
| Broadband penetration | 75.2 | 70.7 | 114.0 |
| People with above basic overall digital skills | 59.1 | 72.2 | 72.2 |
| **Finance and support** | **82.5** | **56.5** | **98.2** |
| R&D expenditures in the public sector | 60.0 | 63.2 | 57.9 |
| Venture capital expenditures | 50.9 | 75.0 | 85.7 |
| Government support for business R&D | 140.2 | 34.5 | 162.2 |
| **Firm investments** | **77.7** | **66.3** | **93.8** |
| R&D expenditure in the business sector | 61.0 | 61.4 | 67.7 |
| Non-R&D Innovation expenditures | 107.0 | 78.6 | 121.6 |
| Innovation expenditures per employee | 97.9 | 61.3 | 129.3 |
| **Use of information technologies** | **76.9** | **62.2** | **88.8** |
| Enterprises providing ICT training | 66.7 | 33.3 | 66.7 |
| Employed ICT specialists | 85.7 | 95.2 | 114.3 |
| **Innovators** | **144.2** | **149.3** | **197.3** |
| Product innovators (SMEs) | 134.5 | 139.9 | 189.7 |
| Business process innovators (SMEs) | 153.3 | 157.6 | 204.0 |
| **Linkages** | **86.2** | **64.4** | **116.2** |
| Innovative SMEs collaborating with others | 118.9 | 47.6 | 174.3 |
| Public-private co-publications | 119.3 | 104.5 | 133.7 |
| Job-to-job mobility of HRST | 42.9 | 46.2 | 61.5 |
| **Intellectual assets** | **110.4** | **89.3** | **95.6** |
| PCT patent applications | 68.1 | 57.8 | 59.1 |
| Trademark applications | 109.3 | 93.7 | 114.7 |
| Design applications | 159.2 | 113.0 | 109.1 |
| **Employment impacts** | **126.5** | **110.3** | **128.8** |
| Employment in knowledge-intensive activities | 104.9 | 101.3 | 114.7 |
| Employment in innovative enterprises | 143.9 | 116.6 | 138.9 |
| **Sales impacts** | **93.2** | **83.3** | **95.0** |
| Medium and high tech goods exports | 85.3 | 91.3 | 93.5 |
| Knowledge-intensive services exports | 61.8 | 75.7 | 65.5 |
| Sales of innovative products | 151.7 | 81.7 | 131.9 |
| **Environmental sustainability** | **124.6** | **103.5** | **129.8** |
| Resource productivity | 196.1 | 161.0 | 290.4 |
| Air emissions by fine particulate matter | 104.0 | 100.8 | 110.6 |
| Environment-related technologies | 78.6 | 72.7 | 59.0 |

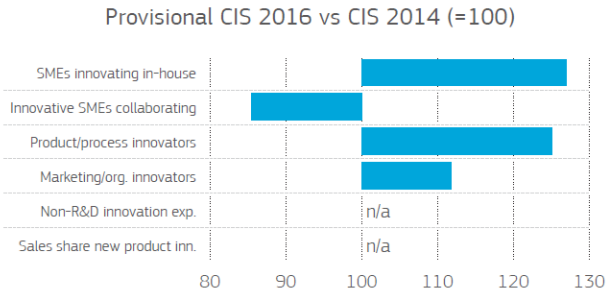
*The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.*

**Italy** is a **Moderate Innovator**. Over time, performance has increased relative to that of the EU in 2010.




Innovators and Intellectual assets are the strongest innovation dimensions. Human resources and Finance and support are the weakest innovation dimensions.

**Provisional CIS 2016 data** show improved performance for three indicators and reduced performance for one indicator. There are no fast-track data for the other two indicators.




**Structural differences** with the EU are shown in the table below. The turnover share of large enterprises and the value added share of foreign-controlled enterprises are well below the EU average.

https://ec.europa.eu/docsroom/documents/30688

| Italy | Performance relative to EU 2010 in | | Relative to EU 2017 in |
|---|---|---|---|
| | 2010 | 2017 | 2017 |
| **SUMMARY INNOVATION INDEX** | **75.9** | **77.9** | **73.6** |
| **Human resources** | **55.1** | **65.2** | **54.7** |
| New doctorate graduates | 107.7 | 101.6 | 72.9 |
| Population with tertiary education | 3.0 | 23.1 | 20.4 |
| Lifelong learning | 53.1 | 70.8 | 69.4 |
| **Attractive research systems** | **73.4** | **99.4** | **87.5** |
| International scientific co-publications | 119.4 | 202.2 | 124.3 |
| Most cited publications | 89.7 | 102.3 | 98.6 |
| Foreign doctorate students | 34.4 | 59.8 | 54.0 |
| **Innovation-friendly environment** | **99.2** | **84.6** | **63.2** |
| Broadband penetration | 55.6 | 77.8 | 43.8 |
| Opportunity-driven entrepreneurship | 125.1 | 88.7 | 82.3 |
| **Finance and support** | **58.1** | **59.4** | **55.1** |
| R&D expenditure in the public sector | 66.4 | 61.1 | 63.3 |
| Venture capital expenditures | 47.4 | 57.2 | 46.9 |
| **Firm investments** | **58.6** | **64.5** | **57.7** |
| R&D expenditure in the business sector | 52.8 | 61.6 | 55.3 |
| Non-R&D innovation expenditures | 84.6 | 77.1 | 70.5 |
| Enterprises providing ICT training | 42.9 | 57.1 | 50.0 |
| **Innovators** | **101.7** | **90.8** | **105.6** |
| SMEs product/process innovations | 84.3 | 89.4 | 109.3 |
| SMEs marketing/organisational innovations | 102.3 | 81.8 | 98.8 |
| SMEs innovating in-house | 117.6 | 101.3 | 108.5 |
| **Linkages** | **57.8** | **57.1** | **56.5** |
| Innovative SMEs collaborating with others | 48.0 | 55.4 | 55.1 |
| Public-private co-publications | 82.9 | 74.4 | 73.7 |
| Private co-funding of public R&D exp. | 40.2 | 40.0 | 39.4 |
| **Intellectual assets** | **98.0** | **104.3** | **103.4** |
| PCT patent applications | 52.9 | 58.5 | 61.1 |
| Trademark applications | 95.5 | 119.9 | 106.1 |
| Design applications | 142.1 | 135.5 | 140.4 |
| **Employment impacts** | **71.3** | **74.8** | **74.4** |
| Employment in knowledge-intensive activities | 102.6 | 103.9 | 94.1 |
| Employment fast-growing enterprises | 48.9 | 54.0 | 57.7 |
| **Sales impacts** | **80.6** | **77.0** | **74.0** |
| Medium and high tech product exports | 88.7 | 93.7 | 88.5 |
| Knowledge-intensive services exports | 68.3 | 67.6 | 64.4 |
| Sales of new-to-market/firm innovations | 85.5 | 68.4 | 67.6 |

*Dark green: normalised performance above 120% of EU; light green: normalised performance between 90% and 120% of EU, yellow: normalised performance between 50% and 90% of EU; orange: normalised performance below 50% of EU. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.*

*Data in red show a decline in performance compared to 2010.*

| | IT | EU |
|---|---|---|
| **Performance and structure of the economy** | | |
| GDP per capita (PPS) | 27,500 | 28,600 |
| Average annual GDP growth (%) | 1.1 | 2.2 |
| Employment share Manufacturing (NACE C) (%) | 18.4 | 15.5 |
| of which High and Medium high-tech (%) | 33.0 | 37.2 |
| Employment share Services (NACE G-N) (%) | 44.8 | 41.6 |
| of which Knowledge-intensive services (%) | 37.1 | 35.0 |
| Turnover share SMEs (%) | 44.1 | 38.0 |
| Turnover share large enterprises (%) | 31.4 | 44.4 |
| Foreign-controlled enterprises – share of value added (%) | 6.5 | 12.5 |
| **Business and entrepreneurship** | | |
| Enterprise births (10+ employees) (%) | 1.2 | 1.5 |
| Total Entrepreneurial Activity (TEA) (%) | 4.5 | 6.6 |
| FDI net inflows (% GDP) | 0.8 | 3.6 |
| Top R&D spending enterprises per 10 mln population | 7.1 | 19.7 |
| Buyer sophistication (1 to 7 best) | 3.7 | 3.7 |
| **Governance and policy framework** | | |
| Ease of starting a business (0 to 100 best) | 72.1 | 76.9 |
| Basic-school entrepren. education and training (1 to 5 best) | 1.8 | 1.9 |
| Govt. procurement of advanced tech products (1 to 7 best) | 2.8 | 3.5 |
| Rule of law (-2.5 to 2.5 best) | 0.3 | 1.2 |
| **Demography** | | |
| Population size (millions) | 60.7 | 510.1 |
| Average annual population growth (%) | -0.2 | 0.3 |
| Population density (inhabitants/km$^2$) | 201.9 | 117.1 |

**EU targets for 2020**

| Indicator | 2013 | Latest | Target[1] |
|---|---|---|---|
| Gross domestic expenditure on R&D (% of GDP) | 1.31 | 1.29 | 1.53 |
| Tertiary educational attainment (% of population aged 30-34) | 22.5 | 26.5 | 26.0 |

*1 Sources are provided in the introduction to the country profiles.*

**RIO country report:**

https://rio.jrc.ec.europa.eu/en/country-analysis/Italy

**European Semester country report:**

https://ec.europa.eu/info/sites/info/files/2018-european-semester-country-report-italy-en.pdf

**European Innovation Scoreboard: Innovation performance keepsimproving in EU Member States and regions**

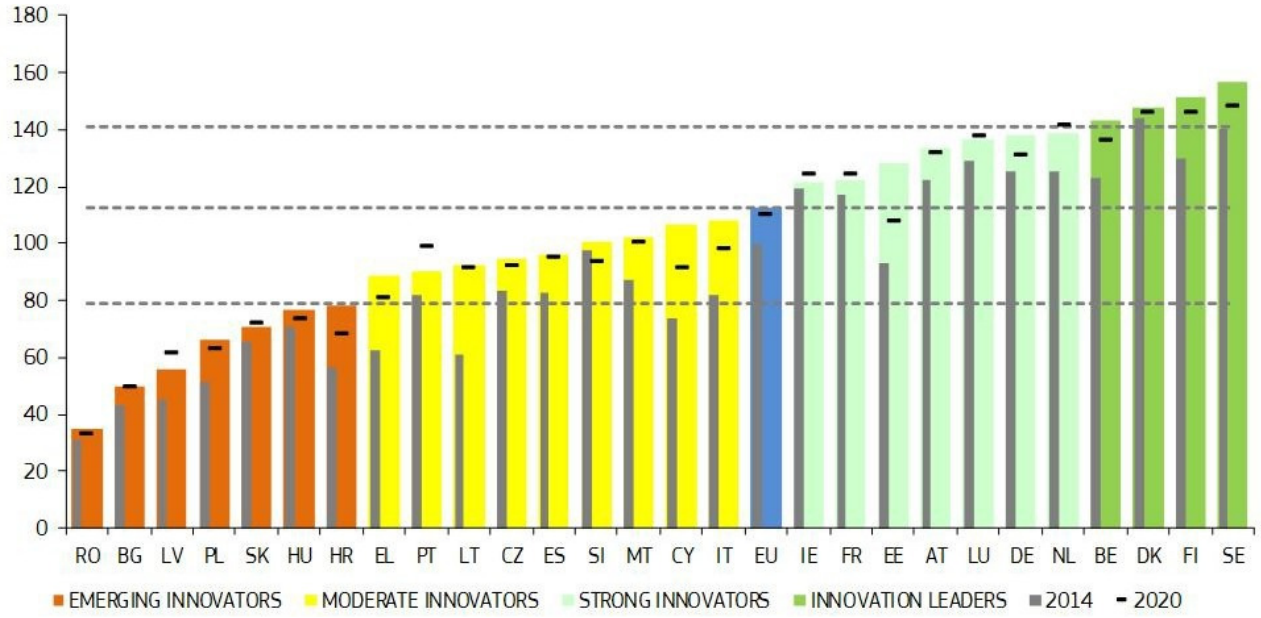
Brussels, 21 June 2021

The Commission has today released the European Innovation Scoreboard 2021, which shows that Europe's innovation performance continues to improve across the EU. On average, **innovation performance has increased by 12.5% since 2014.** There is continued convergence within the EU, with lower performing countries growing faster than higher performing ones, therefore **closing the innovation gap among them**. According to the 2021 Regional Innovation Scoreboard also published today, **this trend applies to innovation across EU regions**. In the global landscape, **the EU is performing better than its competitors** like China, Brazil, South Africa, Russia, and India, while **South Korea, Canada, Australia, the United States, and Japan have a performance lead over the EU**. This year's European Innovation Scoreboard is based on a revised framework, which includes new indicators on digitalisation and environmental sustainability, bringing the scoreboard more in line with the EU political priorities.

**Key findings**

Based on their scores, **EU countries fall into four performance groups**: Innovation leaders, Stronginnovators, Moderate innovators and Emerging innovators.

- Sweden continues to be the EU Innovation Leader, followed by Finland, Denmark and Belgium, all with innovation performance well above the EU average.
- The performance groups tend to be geographically concentrated, with the Innovation Leaders and **most Strong Innovators being located in Northern and Western Europe, and most of the Moderate and Emerging Innovators in Southern and Eastern Europe.**
- On average, the innovation performance of the **EU has increased by 12.5 percentage points**since 2014. **Performance has increased the most in Cyprus, Estonia, Greece, Italy and Lithuania.**
- **Five Member States witnessed an improvement in performance of 25 percentage points or more (Cyprus, Estonia, Greece, Italy and Lithuania).** Four Member States had a performanceimprovement of between 15 and 25 percentage points (Belgium, Croatia, Finland, and Sweden). For eight Member States, performance improved between 10 and 15 percentage points (Austria, Czechia, Germany, Latvia Malta, Netherlands, Poland and Spain). The remaining 10 Member States witnessed an improvement in performance of up to ten percentage points.




- Comparing the EU average to a selection of global competitors, **South Korea is the most innovative country, performing 36% above the score of the EU in 2014 and 21% above the EUin 2021**. **The EU is ahead of China**, Brazil, South Africa, Russia, and India in this year's EIS, while **Canada, Australia, the United States, and Japan have a performance lead over the EU**.
- Innovation performance has increased for 225 regions out of the total of 240 regions over the period since 2014. There has been a process of convergence in regional performance over time,with decreasing performance differences between regions.
- **The most innovative region in Europe is Stockholm in Sweden, followed by Etelä-Suomi in Finland, and Oberbayern in Germany. Hovedstaden in Denmark is in fourth place, and Zürich inSwitzerland is in fifth place.**

**Members of the College said:**

Thierry **Breton**, Commissioner for Internal Market, said: *"European innovations like the technologies at the heart of new COVID-19 vaccines have been crucial to fighting and overcoming the current pandemic. The EU's improved innovation performance is a very positive signal. Investing in innovation is investing in our ability to be at the technological forefront for a sustainable, digital andresilient economy and society."*

Mariya **Gabriel**, Commissioner for Innovation, Research, Culture, Education and Youth, said: "*Europe's commitment to innovation is shown by its continuous improvement in innovation performance. All EU Member States and regions are investing more on innovation and the innovation gap in the EU is decreasing. In support of Europe's innovation capacity, Horizon Europe will promote excellence and support top researchers and innovators to drive the systemic changes needed to ensure a green, healthy and resilient Europe."*

Elisa **Ferreira**, Commissioner for Cohesion and Reforms, said: "*Innovation is increasingly one of the deciding factors to promote development and convergence across the European. While these important reports highlight the progress made in much of Europe, a significant innovation divide still remains, particularly for less developed and peripheral regions. Addressing the innovation divide is critical for economic, social and territorial cohesion. Cohesion funds will continue to promote smartand place based innovation strategies.*"

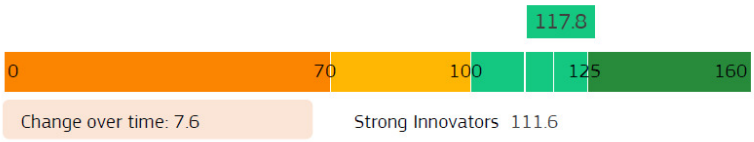
## Background

The European innovation scoreboard provides a comparative analysis of innovation performance in EUcountries, other European countries and regional neighbors. It assesses relative strengths and weaknesses of national innovation systems and helps countries identify areas they need to address. **The first European innovation scoreboard was released in 2001.** The European Innovation Scoreboard demonstrates the commitment of the EU and its Member States to research and innovation that is based on excellence and that it is competitive, open and talent-driven. It also supports the development of policies to enhance innovation in Europe and inform policy makers in the rapidly evolving global context. Moreover, research and innovation is an essential part of the coordinated EUresponse to the coronavirus crisis, supporting also Europe's sustainable and inclusive recovery. Measuring innovation performance is a key element in achieving this goal.

About two-thirds of Europe's productivity growth over the last decades has been driven by innovation, according to the report 'Science, Research and Innovation performance of the EU, 2020 (SRIP)'.

Research and innovation boost the resilience of our production sectors, the competitiveness of our economies and the digital and ecological transformations of our societies. They also ensure preparedness for the future and are critical to deliver on the European Green Deal and on the Digital Compass. Horizon Europe, the EU's research and innovation programme for the years 2021-2027 with a budget of €95.5 billion, will help accelerate Europe's environmental and digital transformations. Over the same period, cohesion policy will invest over €56.8 billion in research and innovation capacities, digitalisation and skills to support the innovative and green economic transformation of the European regions. These aims also lie at the core of the EU's updated Industrial Strategy, which proposes new measures to strengthen the resilience of our Single Market. The Strategy also proposes measures to respond to our dependencies in key strategic areas as well as accelerate the green and digital transitions – all of which will be instrumental in boosting the EU's performance in innovation. In addition, the European Research Area (ERA) will create a single and borderless market for research, innovation and technology, based on excellence, while at the same time boosting the market uptake of research and innovation results across the EU.

https://ec.europa.eu/growth/industry/policy/innovation/scoreboards_en




| Germany | Performance relative to EU in 2023 | Performance change 2016-2023 | Performance change 2022-2023 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **117.8** | **7.6** | **-1.3** |
| **Human resources** | **99.8** | **-3.4** | **-3.4** |
| Doctorate graduates | 159.3 | -11.4 | -11.4 |
| Population with tertiary education | 71.7 | 1.2 | 1.2 |
| Lifelong learning | 62.7 | 4.4 | 4.4 |
| **Attractive research systems** | **109.0** | **1.0** | **-1.3** |
| International scientific co-publications | 94.1 | 29.3 | -2.6 |
| Most cited publications | 106.5 | -10.1 | -1.4 |
| Foreign doctorate students | 131.9 | 0.0 | 0.0 |
| **Digitalisation** | **86.5** | **19.8** | **10.8** |
| Broadband penetration | 101.3 | 38.9 | 21.2 |
| People with above basic overall digital skills | 66.1 | 0.0 | 0.0 |
| **Finance and support** | **91.8** | **23.3** | **-0.2** |
| R&D expenditures in the public sector | 143.8 | 16.1 | -1.6 |
| Venture capital expenditures | 87.0 | 53.1 | 3.3 |
| Government support for business R&D | 36.6 | 1.7 | -2.0 |
| **Firm investments** | **140.4** | **5.9** | **-3.4** |
| R&D expenditure in the business sector | 141.7 | 10.8 | 0.0 |
| Non-R&D Innovation expenditures | 133.5 | 4.6 | -6.3 |
| Innovation expenditures per employee | 144.7 | 2.2 | -4.1 |
| **Use of information technologies** | **120.9** | **-6.0** | **12.7** |
| Enterprises providing ICT training | 128.2 | -15.9 | 22.3 |
| Employed ICT specialists | 113.3 | 3.4 | 3.4 |
| **Innovators** | **141.1** | **53.4** | **-11.5** |
| Product innovators (SMEs) | 131.4 | 6.1 | -25.9 |
| Business process innovators (SMEs) | 149.5 | 103.7 | 3.9 |
| **Linkages** | **141.9** | **26.6** | **-7.6** |
| Innovative SMEs collaborating with others | 117.8 | 42.1 | -19.2 |
| Public-private co-publications | 188.6 | 53.1 | -1.0 |
| Job-to-job mobility of HRST | 141.7 | 0.0 | 0.0 |
| **Intellectual assets** | **122.0** | **-18.6** | **-6.9** |
| PCT patent applications | 137.6 | -11.5 | -2.8 |
| Trademark applications | 105.7 | 7.4 | -3.6 |
| Design applications | 117.1 | -48.1 | -14.8 |
| **Employment impacts** | **128.4** | **4.2** | **-2.6** |
| Employment in knowledge-intensive activities | 101.2 | 0.0 | 0.0 |
| Employment in innovative enterprises | 150.8 | 8.1 | -5.0 |
| **Sales impacts** | **117.5** | **5.8** | **0.5** |
| Medium and high-tech goods exports | 112.8 | 0.2 | 2.4 |
| Knowledge-intensive services exports | 133.6 | 12.6 | 4.1 |
| Sales of innovative products | 107.3 | 6.2 | -6.9 |
| **Environmental sustainability** | **121.2** | **7.5** | **-0.7** |
| Resource productivity | 126.2 | 45.3 | 5.5 |
| Air emissions by fine particulate matter | 124.0 | 2.4 | -0.6 |
| Environment-related technologies | 112.2 | -11.9 | -5.2 |

The second column shows performance relative to that of the EU in 2023. Colours next to the column show matching colour codes: dark green: above 125% of the performance of the EU in 2023; light green: between 100% and 125%; light orange: between 70% and 100%; dark orange: below 70%. The next columns show performance change over time between 2016 and 2023 and between 2022 and 2023, with scores relative to those of the EU in 2016. Positive (negative) performance changes are shown in green (red).

**GERMANY** is a **Strong Innovator** with performance at 117.8% of the EU average. Performance is above the average of the Strong Innovators. Performance is increasing at a rate lower than that of the EU (8.5%-points). The country's performance lead over the EU is becoming smaller.

**Relative strengths**

Public-private co-publications
Doctorate graduates
Employment in innovative enterprises
Business process innovators
Innovation expenditures per employee

**Relative weaknesses**

Government support for business R&D
Lifelong learning
People with above basic overall digital skills
Population with tertiary education
Venture capital expenditures

**Strong increases since 2016**

Business process innovators
Public-private co-publications
Venture capital expenditures

**Strong decreases since 2016**

Design applications
Enterprises providing ICT training
Environment-related technologies

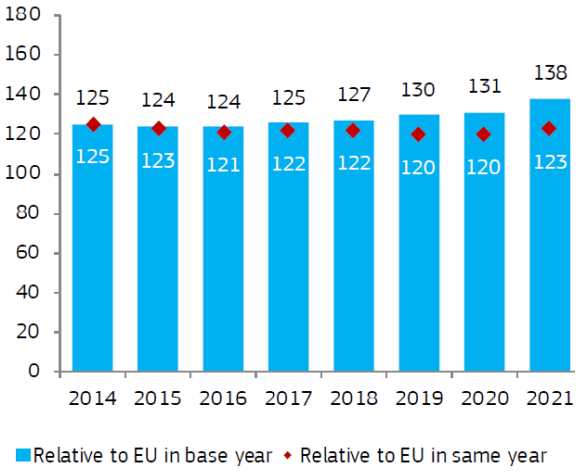
**Strong increases since 2022**

Enterprises providing ICT training
Broadband penetration
Resource productivity

**Strong decreases since 2022**

Product innovators
Innovative SMEs collaborating with others
Design applications

**Germany** is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.




**Structural differences** with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

| | DE | EU |
|---|---|---|
| **Performance and structure of the economy** | | |
| GDP per capita (PPS) | 37,800 | 30,800 |
| Average annual GDP growth (%) | -2.3 | -2.5 |
| Employment share Manufacturing (NACE C) (%) | 19.4 | 16.5 |
| of which High and Medium high-tech (%) | 52.0 | 37.9 |
| Employment share Services (NACE G-N) (%) | 39.6 | 41.2 |
| of which Knowledge-intensive services (%) | 35.7 | 35.1 |
| Turnover share SMEs (%) | 34.1 | 36.5 |
| Turnover share large enterprises (%) | 54.9 | 45.7 |
| Foreign-controlled enterprises – share of value added (%) | 12.6 | 11.8 |
| **Business and entrepreneurship** | | |
| Enterprise births (10+ employees) (%) | 0.7 | 1.0 |
| Total Entrepreneurial Activity (TEA) (%) | 6.0 | 6.7 |
| FDI net inflows (% GDP) | 3.2 | 2.0 |
| Top R&D spending enterprises per 10 million population | 26.1 | 16.2 |
| Buyer sophistication (1 to 7 best) | 4.6 | 3.7 |
| **Innovation profiles** | | |
| In-house product innovators with market novelties | 9.9 | 10.7 |
| In-house product innovators without market novelties | 15.4 | 12.3 |
| In-house business process innovators | 13.2 | 11.0 |
| Innovators that do not develop innovations themselves | 25.2 | 11.6 |
| Innovation active non-innovators | 4.0 | 3.3 |
| Non-innovators with potential to innovate | 17.9 | 19.9 |
| Non-innovators without disposition to innovate | 14.2 | 31.3 |
| **Governance and policy framework** | | |
| Ease of starting a business (0 to 100 best) | 79.5 | 76.5 |
| Basic school entrepreneurial education and training | 2.0 | 2.0 |
| Govt. procurement of advanced tech. products | 4.6 | 3.5 |
| Rule of law (-2.5 to 2.5 best) | 1.6 | 1.1 |
| **Climate change indicators** | | |
| Circular material use rate | 11.9 | 11.7 |
| Greenhouse gas emissions intensity of energy consumption | 92.3 | 86.6 |
| Eco-Innovation Index | 123.0 | 100.0 |
| **Demography** | | |
| Population size | 83.0 | 446.7 |
| Average annual population growth (%) | 0.2 | 0.1 |
| Population density | 234.6 | 108.8 |

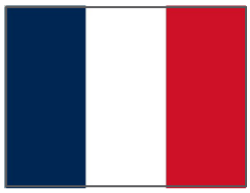
Germany's strengths are in *Intellectual assets*, *Innovators* and *Employment impacts*. The top-3 indicators include PCT patent applications, Employment in innovative enterprises, and Design applications.

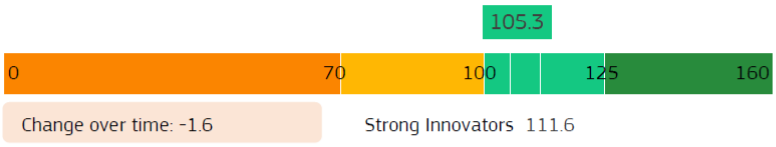
The most recent performance increase is due to improved performance on the indicators using innovation survey data, and most strongly for Innovative SMEs collaborating with others, and Product and Business process innovators.

Germany has an above average share of Innovators that do not develop innovations themselves and is showing close to average scores on the Climate change related indicators.

| Germany | Relative to EU 2021 in 2021 | Relative to EU 2014 in 2014 | Relative to EU 2014 in 2021 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **122.6** | **125.2** | **137.9** |
| **Human resources** | **98.2** | **91.4** | **104.1** |
| Doctorate graduates | 151.9 | 134.5 | 134.5 |
| Population with tertiary education | 60.9 | 38.0 | 78.5 |
| Lifelong learning | 73.7 | 77.8 | 81.1 |
| **Attractive research systems** | **91.6** | **94.5** | **103.1** |
| International scientific co-publications | 92.2 | 102.1 | 120.9 |
| Most cited publications | 107.4 | 115.2 | 105.6 |
| Foreign doctorate students | 63.3 | 41.4 | 75.1 |
| **Digitalisation** | **111.9** | **117.3** | **154.8** |
| Broadband penetration | 95.6 | 94.9 | 144.9 |
| People with above basic overall digital skills | 136.4 | 144.4 | 166.7 |
| **Finance and support** | **92.2** | **94.2** | **109.9** |
| R&D expenditures in the public sector | 147.3 | 133.3 | 142.1 |
| Venture capital expenditures | 81.1 | 69.3 | 136.4 |
| Government support for business R&D | 40.8 | 58.3 | 47.2 |
| **Firm investments** | **141.4** | **151.1** | **170.8** |
| R&D expenditure in the business sector | 151.8 | 150.4 | 168.5 |
| Non-R&D Innovation expenditures | 141.5 | 152.5 | 160.8 |
| Innovation expenditures per employee | 141.3 | 150.8 | 186.5 |
| **Use of information technologies** | **114.3** | **145.8** | **132.0** |
| Enterprises providing ICT training | 126.7 | 173.3 | 126.7 |
| Employed ICT specialists | 103.6 | 114.3 | 138.1 |
| **Innovators** | **152.0** | **143.3** | **208.0** |
| Product innovators (SMEs) | 147.3 | 180.2 | 207.9 |
| Business process innovators (SMEs) | 156.5 | 110.9 | 208.2 |
| **Linkages** | **137.8** | **136.0** | **185.8** |
| Innovative SMEs collaborating with others | 124.6 | 136.4 | 182.7 |
| Public-private co-publications | 148.5 | 149.4 | 166.5 |
| Job-to-job mobility of HRST | 141.1 | 125.6 | 202.6 |
| **Intellectual assets** | **153.1** | **160.5** | **132.7** |
| PCT patent applications | 208.6 | 222.4 | 181.0 |
| Trademark applications | 110.2 | 116.8 | 115.7 |
| Design applications | 155.8 | 148.9 | 106.7 |
| **Employment impacts** | **143.0** | **140.4** | **145.6** |
| Employment in knowledge-intensive activities | 113.4 | 128.0 | 124.0 |
| Employment in innovative enterprises | 166.7 | 149.2 | 161.0 |
| **Sales impacts** | **123.3** | **121.6** | **125.6** |
| Medium and high tech goods exports | 125.9 | 134.5 | 138.0 |
| Knowledge-intensive services exports | 114.3 | 126.6 | 121.0 |
| Sales of innovative products | 131.8 | 98.7 | 114.6 |
| **Environmental sustainability** | **118.6** | **118.5** | **123.4** |
| Resource productivity | 122.3 | 117.2 | 181.2 |
| Air emissions by fine particulate matter | 123.3 | 128.0 | 131.1 |
| Environment-related technologies | 105.6 | 107.2 | 79.3 |

*The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.*






## France

| | Performance relative to EU in 2023 | Performance change 2016-2023 | Performance change 2022-2023 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **105.3** | **-1.6** | **-1.3** |
| **Human resources** | **126.3** | **-8.2** | **1.6** |
| Doctorate graduates | 114.8 | -34.3 | -11.4 |
| Population with tertiary education | 148.6 | 0.6 | 0.6 |
| Lifelong learning | 113.7 | 25.3 | 25.3 |
| **Attractive research systems** | **117.1** | **-8.9** | **-0.8** |
| International scientific co-publications | 76.3 | 13.2 | -4.9 |
| Most cited publications | 89.3 | -15.7 | 0.8 |
| Foreign doctorate students | 221.2 | -13.9 | -0.5 |
| **Digitalisation** | **112.3** | **0.0** | **0.0** |
| Broadband penetration | 105.8 | 0.0 | 0.0 |
| People with above basic overall digital skills | 121.3 | 0.0 | 0.0 |
| **Finance and support** | **132.7** | **11.3** | **4.3** |
| R&D expenditures in the public sector | 93.8 | -4.8 | -3.2 |
| Venture capital expenditures | 134.9 | 43.1 | 18.3 |
| Government support for business R&D | 176.0 | 0.0 | 0.0 |
| **Firm investments** | **89.7** | **-5.8** | **-4.8** |
| R&D expenditure in the business sector | 97.2 | 0.0 | -5.4 |
| Non-R&D Innovation expenditures | 47.4 | -29.7 | -25.9 |
| Innovation expenditures per employee | 117.1 | 10.1 | 14.9 |
| **Use of information technologies** | **73.8** | **-3.5** | **-3.5** |
| Enterprises providing ICT training | 58.0 | 0.0 | 0.0 |
| Employed ICT specialists | 90.0 | -6.9 | -6.9 |
| **Innovators** | **104.5** | **8.4** | **-0.5** |
| Product innovators (SMEs) | 98.9 | 2.8 | -28.5 |
| Business process innovators (SMEs) | 109.5 | 14.5 | 29.3 |
| **Linkages** | **120.9** | **39.8** | **-5.3** |
| Innovative SMEs collaborating with others | 137.2 | 28.2 | 25.2 |
| Public-private co-publications | 109.2 | 9.1 | -6.9 |
| Job-to-job mobility of HRST | 112.5 | 64.7 | -32.4 |
| **Intellectual assets** | **80.6** | **-10.7** | **-3.5** |
| PCT patent applications | 97.7 | -15.7 | -8.8 |
| Trademark applications | 69.7 | 0.2 | 0.0 |
| Design applications | 67.6 | -12.8 | 0.3 |
| **Employment impacts** | **110.1** | **-5.3** | **3.8** |
| Employment in knowledge-intensive activities | 115.7 | 0.0 | 0.0 |
| Employment in innovative enterprises | 105.5 | -10.3 | 7.5 |
| **Sales impacts** | **81.7** | **-20.7** | **-5.2** |
| Medium and high-tech goods exports | 87.3 | -6.7 | 2.1 |
| Knowledge-intensive services exports | 112.5 | 9.5 | 2.2 |
| Sales of innovative products | 41.8 | -79.9 | -25.7 |
| **Environmental sustainability** | **118.3** | **9.2** | **-0.1** |
| Resource productivity | 149.5 | 50.8 | 4.2 |
| Air emissions by fine particulate matter | 109.3 | 4.8 | -1.0 |
| Environment-related technologies | 100.1 | -13.5 | -2.1 |

The second column shows performance relative to that of the EU in 2023. Colours next to the column show matching colour codes: dark green: above 125% of the performance of the EU in 2023; light green: between 100% and 125%; light orange: between 70% and 100%; dark orange: below 70%. The next columns show performance change over time between 2016 and 2023 and between 2022 and 2023, with scores relative to those of the EU in 2016. Positive (negative) performance changes are shown in green (red).

**FRANCE** is a **Strong Innovator** with performance at 105.3% of the EU average. Performance is below the average of the Strong Innovators. Performance is decreasing and is lower than the rate of increase of the EU (8.5%-points). The country's performance lead over the EU is becoming smaller.

**Relative strengths**
- Foreign doctorate students
- Government support for business R&D
- Resource productivity
- Population with tertiary education
- Innovative SMEs collaborating with others

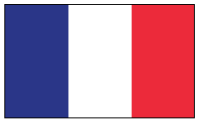
**Relative weaknesses**
- Sales of innovative products
- Non-R&D Innovation expenditures
- Enterprises providing ICT training
- Design applications
- Trademark applications

**Strong increases since 2016**
- Job-to-job mobility of HRST
- Resource productivity
- Venture capital expenditures

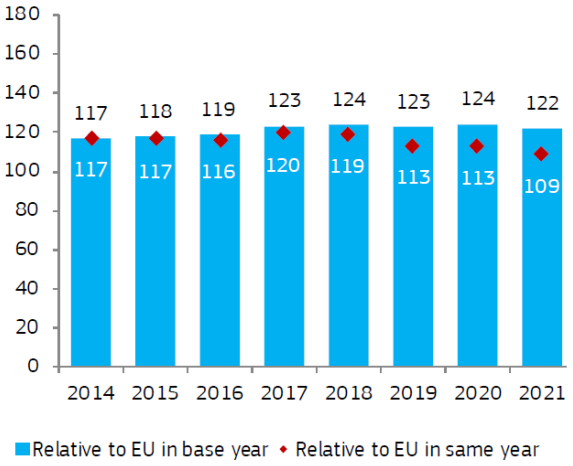
**Strong decreases since 2016**
- Sales of innovative products
- Doctorate graduates
- Non-R&D Innovation expenditures

**Strong increases since 2022**
- Business process innovators
- Lifelong learning
- Innovative SMEs collaborating with others

**Strong decreases since 2022**
- Job-to-job mobility of HRST
- Product innovators
- Non-R&D Innovation expenditures



**France** is a **Strong Innovator**.
Over time, performance relative to the EU has decreased.




**Structural differences** with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

| | FR | EU |
|---|---|---|
| **Performance and structure of the economy** | | |
| GDP per capita (PPS) | 32,300 | 30,800 |
| Average annual GDP growth (%) | -3.7 | -2.5 |
| Employment share Manufacturing (NACE C) (%) | 11.8 | 16.5 |
| of which High and Medium high-tech (%) | 35.7 | 37.9 |
| Employment share Services (NACE G-N) (%) | 41.2 | 41.2 |
| of which Knowledge-intensive services (%) | 38.4 | 35.1 |
| Turnover share SMEs (%) | 29.1 | 36.5 |
| Turnover share large enterprises (%) | 52.2 | 45.7 |
| Foreign-controlled enterprises – share of value added (%) | 7.1 | 11.8 |
| **Business and entrepreneurship** | | |
| Enterprise births (10+ employees) (%) | 0.5 | 1.0 |
| Total Entrepreneurial Activity (TEA) (%) | 5.0 | 6.7 |
| FDI net inflows (% GDP) | 1.8 | 2.0 |
| Top R&D spending enterprises per 10 million population | 16.7 | 16.2 |
| Buyer sophistication (1 to 7 best) | 4.1 | 3.7 |
| **Innovation profiles** | | |
| In-house product innovators with market novelties | 20.2 | 10.7 |
| In-house product innovators without market novelties | 6.2 | 12.3 |
| In-house business process innovators | 8.9 | 11.0 |
| Innovators that do not develop innovations themselves | 12.0 | 11.6 |
| Innovation active non-innovators | 3.8 | 3.3 |
| Non-innovators with potential to innovate | 12.9 | 19.9 |
| Non-innovators without disposition to innovate | 36.0 | 31.3 |
| **Governance and policy framework** | | |
| Ease of starting a business (0 to 100 best) | 76.5 | 76.5 |
| Basic school entrepreneurial education and training | 1.7 | 2.0 |
| Govt. procurement of advanced tech. products | 3.8 | 3.5 |
| Rule of law (-2.5 to 2.5 best) | 1.4 | 1.1 |
| **Climate change indicators** | | |
| Circular material use rate | 19.5 | 11.7 |
| Greenhouse gas emissions intensity of energy consumption | 81.4 | 86.6 |
| Eco-Innovation Index | 107.0 | 100.0 |
| **Demography** | | |
| Population size | 67.2 | 446.7 |
| Average annual population growth (%) | 0.2 | 0.1 |
| Population density | 105.9 | 108.8 |

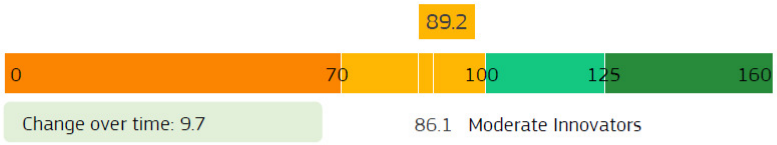
France's strengths are in *Human resources*, *Finance and support* and *Attractive research systems*. The top-3 indicators include Foreign doctorate students, Lifelong learning, and Government support for business R&D.

The recent decline in innovation performance is due to reduced performance on Doctorate graduates, Enterprises providing ICT training, Business process innovators, Trademark and Design applications, Employment in innovative enterprises, Sales of innovative products, and Environment-related technologies.

France has an above average share of In-house product innovators with market novelties and is showing above average scores on the Climate change related indicators.

| France | Relative to EU 2021 in 2021 | Relative to EU 2014 in 2014 | Relative to EU 2014 in 2021 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **108.7** | **117.2** | **122.3** |
| **Human resources** | **148.6** | **155.3** | **157.5** |
| Doctorate graduates | 113.0 | 123.0 | 100.0 |
| Population with tertiary education | 155.8 | 169.4 | 200.8 |
| Lifelong learning | 187.9 | 194.4 | 206.7 |
| **Attractive research systems** | **116.4** | **139.3** | **131.0** |
| International scientific co-publications | 85.9 | 96.7 | 112.6 |
| Most cited publications | 89.9 | 103.3 | 88.4 |
| Foreign doctorate students | 205.2 | 269.3 | 243.7 |
| **Digitalisation** | **85.1** | **97.2** | **117.7** |
| Broadband penetration | 75.2 | 94.9 | 114.0 |
| People with above basic overall digital skills | 100.0 | 100.0 | 122.2 |
| **Finance and support** | **150.0** | **158.2** | **178.7** |
| R&D expenditures in the public sector | 98.2 | 100.0 | 94.7 |
| Venture capital expenditures | 174.1 | 192.7 | 292.8 |
| Government support for business R&D | 184.4 | 213.4 | 213.4 |
| **Firm investments** | **90.0** | **97.0** | **108.7** |
| R&D expenditure in the business sector | 98.6 | 109.4 | 109.4 |
| Non-R&D Innovation expenditures | 56.9 | 52.3 | 64.7 |
| Innovation expenditures per employee | 104.4 | 120.3 | 137.8 |
| **Use of information technologies** | **90.3** | **103.6** | **104.4** |
| Enterprises providing ICT training | 66.7 | 106.7 | 66.7 |
| Employed ICT specialists | 110.7 | 100.0 | 147.6 |
| **Innovators** | **105.1** | **118.2** | **143.8** |
| Product innovators (SMEs) | 114.6 | 101.4 | 161.7 |
| Business process innovators (SMEs) | 96.2 | 133.0 | 128.0 |
| **Linkages** | **113.5** | **119.0** | **153.0** |
| Innovative SMEs collaborating with others | 110.3 | 135.4 | 161.7 |
| Public-private co-publications | 113.0 | 125.2 | 126.7 |
| Job-to-job mobility of HRST | 116.1 | 102.6 | 166.7 |
| **Intellectual assets** | **83.2** | **90.6** | **72.1** |
| PCT patent applications | 119.6 | 118.4 | 103.8 |
| Trademark applications | 64.7 | 78.8 | 68.0 |
| Design applications | 70.2 | 77.8 | 48.1 |
| **Employment impacts** | **109.5** | **108.5** | **111.6** |
| Employment in knowledge-intensive activities | 113.4 | 110.7 | 124.0 |
| Employment in innovative enterprises | 106.4 | 107.0 | 102.7 |
| **Sales impacts** | **90.2** | **103.9** | **91.9** |
| Medium and high tech goods exports | 100.0 | 109.7 | 109.7 |
| Knowledge-intensive services exports | 90.9 | 98.3 | 96.3 |
| Sales of innovative products | 72.9 | 103.0 | 63.4 |
| **Environmental sustainability** | **114.9** | **113.5** | **119.6** |
| Resource productivity | 143.8 | 153.8 | 213.1 |
| Air emissions by fine particulate matter | 104.5 | 110.6 | 111.2 |
| Environment-related technologies | 99.8 | 93.1 | 75.0 |

*The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.*




## Spain

| | Performance relative to EU in 2023 | Performance change 2016-2023 | Performance change 2022-2023 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **89.2** | **9.7** | **4.0** |
| **Human resources** | **127.2** | **5.9** | **5.9** |
| Doctorate graduates | 100.0 | 0.0 | 0.0 |
| Population with tertiary education | 149.1 | 10.8 | 10.8 |
| Lifelong learning | 133.3 | 9.9 | 9.9 |
| **Attractive research systems** | **96.1** | **11.6** | **0.9** |
| International scientific co-publications | 91.6 | 40.7 | -1.0 |
| Most cited publications | 92.5 | -4.1 | -0.9 |
| Foreign doctorate students | 108.5 | 20.5 | 6.9 |
| **Digitalisation** | **144.9** | **20.8** | **8.2** |
| Broadband penetration | 140.0 | 41.0 | 16.2 |
| People with above basic overall digital skills | 151.7 | 0.0 | 0.0 |
| **Finance and support** | **81.1** | **20.1** | **5.7** |
| R&D expenditures in the public sector | 78.1 | 6.5 | 0.0 |
| Venture capital expenditures | 103.2 | 55.4 | 13.6 |
| Government support for business R&D | 55.9 | 1.7 | 5.1 |
| **Firm investments** | **61.0** | **11.9** | **-2.5** |
| R&D expenditure in the business sector | 52.1 | 10.8 | 1.5 |
| Non-R&D Innovation expenditures | 81.3 | 18.4 | -2.6 |
| Innovation expenditures per employee | 53.0 | 7.1 | -6.3 |
| **Use of information technologies** | **90.1** | **0.4** | **5.4** |
| Enterprises providing ICT training | 90.2 | -6.4 | 3.8 |
| Employed ICT specialists | 90.0 | 6.9 | 6.9 |
| **Innovators** | **50.1** | **19.4** | **20.6** |
| Product innovators (SMEs) | 59.6 | 42.3 | 22.9 |
| Business process innovators (SMEs) | 41.8 | -4.9 | 18.1 |
| **Linkages** | **88.2** | **37.9** | **-9.6** |
| Innovative SMEs collaborating with others | 57.0 | 7.5 | 3.6 |
| Public-private co-publications | 115.6 | 52.4 | 0.7 |
| Job-to-job mobility of HRST | 102.1 | 58.8 | -26.5 |
| **Intellectual assets** | **80.1** | **-2.4** | **0.3** |
| PCT patent applications | 61.2 | -5.0 | -1.6 |
| Trademark applications | 112.6 | 7.7 | 0.1 |
| Design applications | 72.2 | -6.8 | 3.0 |
| **Employment impacts** | **59.7** | **-5.8** | **5.5** |
| Employment in knowledge-intensive activities | 83.1 | 0.0 | 0.0 |
| Employment in innovative enterprises | 40.5 | -11.3 | 10.7 |
| **Sales impacts** | **97.5** | **22.8** | **11.6** |
| Medium and high-tech goods exports | 67.9 | -2.2 | 4.0 |
| Knowledge-intensive services exports | 68.7 | 31.4 | -9.3 |
| Sales of innovative products | 169.2 | 50.8 | 49.3 |
| **Environmental sustainability** | **100.4** | **-14.5** | **-2.0** |
| Resource productivity | 139.1 | 7.8 | 13.5 |
| Air emissions by fine particulate matter | 85.5 | -7.6 | -2.2 |
| Environment-related technologies | 83.5 | -37.6 | -12.2 |

The second column shows performance relative to that of the EU in 2023. Colours next to the column show matching colour codes: dark green: above 125% of the performance of the EU in 2023; light green: between 100% and 125%; light orange: between 70% and 100%; dark orange: below 70%. The next columns show performance change over time between 2016 and 2023 and between 2022 and 2023, with scores relative to those of the EU in 2016. Positive (negative) performance changes are shown in green (red).

**SPAIN** is a **Moderate Innovator** with performance at 89.2% of the EU average. Performance is above the average of the Moderate Innovators. Performance is increasing at a rate higher than that of the EU (8.5%-points). The country's performance gap to the EU is becoming smaller.

**Relative strengths**

Sales of innovative products
People with above basic overall digital skills
Population with tertiary education
Broadband penetration
Resource productivity

**Relative weaknesses**

Employment in innovative enterprises
Business process innovators
R&D expenditure in the business sector
Innovation expenditures per employee
Government support for business R&D

**Strong increases since 2016**

Job-to-job mobility of HRST
Venture capital expenditures
Public-private co-publications

**Strong decreases since 2016**

Environment-related technologies
Employment in innovative enterprises
Air emissions by fine particulate matter

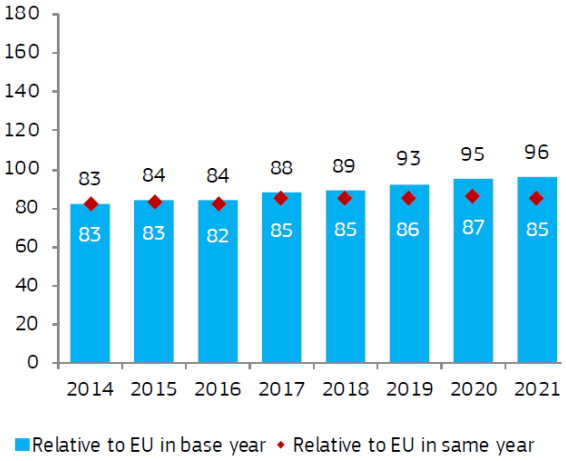
**Strong increases since 2022**

Sales of innovative products
Product innovators
Business process innovators

**Strong decreases since 2022**

Job-to-job mobility of HRST
Environment-related technologies
Knowledge-intensive services exports

**Spain** is a **Moderate Innovator**.
Over time, performance relative to the EU has increased.




**Structural differences** with the EU are shown in the table below including, compared to the EIS 2020, new information on different types of (innovating) enterprises (Innovation profiles) and environmental indicators.

| | ES | EU |
|---|---|---|
| **Performance and structure of the economy** | | |
| GDP per capita (PPS) | 28,300 | 30,800 |
| Average annual GDP growth (%) | -5.3 | -2.5 |
| Employment share Manufacturing (NACE C) (%) | 12.6 | 16.5 |
| of which High and Medium high-tech (%) | 31.8 | 37.9 |
| Employment share Services (NACE G-N) (%) | 48.5 | 41.2 |
| of which Knowledge-intensive services (%) | 31.4 | 35.1 |
| Turnover share SMEs (%) | 38.4 | 36.5 |
| Turnover share large enterprises (%) | 40.0 | 45.7 |
| Foreign-controlled enterprises – share of value added (%) | 9.8 | 11.8 |
| **Business and entrepreneurship** | | |
| Enterprise births (10+ employees) (%) | 1.4 | 1.0 |
| Total Entrepreneurial Activity (TEA) (%) | 6.2 | 6.7 |
| FDI net inflows (% GDP) | 2.7 | 2.0 |
| Top R&D spending enterprises per 10 million population | 4.4 | 16.2 |
| Buyer sophistication (1 to 7 best) | 3.5 | 3.7 |
| **Innovation profiles** | | |
| In-house product innovators with market novelties | 6.2 | 10.7 |
| In-house product innovators without market novelties | 7.1 | 12.3 |
| In-house business process innovators | 10.6 | 11.0 |
| Innovators that do not develop innovations themselves | 3.5 | 11.6 |
| Innovation active non-innovators | 2.8 | 3.3 |
| Non-innovators with potential to innovate | 43.2 | 19.9 |
| Non-innovators without disposition to innovate | 26.6 | 31.3 |
| **Governance and policy framework** | | |
| Ease of starting a business (0 to 100 best) | 77.8 | 76.5 |
| Basic school entrepreneurial education and training | 2.0 | 2.0 |
| Govt. procurement of advanced tech. products | 3.2 | 3.5 |
| Rule of law (-2.5 to 2.5 best) | 1.0 | 1.1 |
| **Climate change indicators** | | |
| Circular material use rate | 9.6 | 11.7 |
| Greenhouse gas emissions intensity of energy consumption | 83.8 | 86.6 |
| Eco-Innovation Index | 104.0 | 100.0 |
| **Demography** | | |
| Population size | 47.0 | 446.7 |
| Average annual population growth (%) | 0.7 | 0.1 |
| Population density | 93.2 | 108.8 |

Spain's strengths are in *Human resources*, *Digitalisation*, and *Environmental sustainability*. The top-3 indicators include Doctorate graduates, Resource productivity, and Sales of innovative products.
Recent performance has not changed. Improvements for Tertiary education, Non-R&D innovation expenditures, Innovation expenditures per employee, Product innovators, and Job-to-job mobility of HRST, have been offset by reduced performance for Business process innovators, PCT patent, Trademark and Design applications, and Environment-related technologies.
Spain has an above average share of Non-innovators with potential to innovate and is showing close to average scores on the Climate change related indicators.

| Spain | Relative to EU 2021 in 2021 | Relative to EU 2014 in 2014 | Relative to EU 2014 in 2021 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **85.3** | **82.6** | **96.0** |
| **Human resources** | **139.8** | **103.9** | **148.1** |
| Doctorate graduates | 164.9 | 77.0 | 146.0 |
| Population with tertiary education | 145.5 | 146.3 | 187.6 |
| Lifelong learning | 98.0 | 102.2 | 107.8 |
| **Attractive research systems** | **90.9** | **103.8** | **102.3** |
| International scientific co-publications | 88.4 | 88.5 | 115.9 |
| Most cited publications | 92.7 | 93.1 | 91.1 |
| Foreign doctorate students | 91.5 | 145.5 | 108.6 |
| **Digitalisation** | **127.2** | **107.6** | **176.0** |
| Broadband penetration | 130.2 | 100.0 | 197.5 |
| People with above basic overall digital skills | 122.7 | 116.7 | 150.0 |
| **Finance and support** | **72.6** | **81.3** | **86.5** |
| R&D expenditures in the public sector | 65.5 | 75.4 | 63.2 |
| Venture capital expenditures | 102.6 | 85.3 | 172.5 |
| Government support for business R&D | 50.1 | 86.6 | 58.0 |
| **Firm investments** | **52.1** | **49.0** | **62.9** |
| R&D expenditure in the business sector | 46.1 | 50.4 | 51.2 |
| Non-R&D Innovation expenditures | 71.0 | 42.4 | 80.6 |
| Innovation expenditures per employee | 57.8 | 52.9 | 76.3 |
| **Use of information technologies** | **94.2** | **102.7** | **108.9** |
| Enterprises providing ICT training | 100.0 | 113.3 | 100.0 |
| Employed ICT specialists | 89.3 | 90.5 | 119.0 |
| **Innovators** | **30.5** | **33.4** | **41.8** |
| Product innovators (SMEs) | 28.9 | 13.0 | 40.8 |
| Business process innovators (SMEs) | 32.0 | 51.4 | 42.6 |
| **Linkages** | **88.5** | **91.2** | **119.3** |
| Innovative SMEs collaborating with others | 52.1 | 63.9 | 76.4 |
| Public-private co-publications | 108.0 | 95.3 | 121.1 |
| Job-to-job mobility of HRST | 103.6 | 107.7 | 148.7 |
| **Intellectual assets** | **79.9** | **78.7** | **69.2** |
| PCT patent applications | 43.3 | 49.4 | 37.5 |
| Trademark applications | 112.0 | 115.5 | 117.6 |
| Design applications | 72.3 | 68.4 | 49.5 |
| **Employment impacts** | **54.5** | **65.5** | **55.5** |
| Employment in knowledge-intensive activities | 80.5 | 86.7 | 88.0 |
| Employment in innovative enterprises | 33.6 | 50.5 | 32.4 |
| **Sales impacts** | **74.4** | **70.5** | **75.8** |
| Medium and high tech goods exports | 72.7 | 79.1 | 79.7 |
| Knowledge-intensive services exports | 28.0 | 27.4 | 29.6 |
| Sales of innovative products | 144.4 | 110.3 | 125.5 |
| **Environmental sustainability** | **114.3** | **105.8** | **119.0** |
| Resource productivity | 159.3 | 142.5 | 236.0 |
| Air emissions by fine particulate matter | 94.0 | 93.2 | 100.0 |
| Environment-related technologies | 98.3 | 100.2 | 73.8 |

*The colours show normalised performance in 2021 relative to that of the EU in 2021: dark green: above 125%; light green: between 100% and 125%; yellow: between 70% and 100%; orange: below 70%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data.*

2014 2015

# La misura del potenziale di innovazione

I ritardi dell'Italia nello sviluppo della "**economia della conoscenza**" sono dimostrati da una serie, ormai ben nota, di statistiche a scala internazionale (cfr. European Commission, Science, Technology and Innovation: Key Figures 2002).

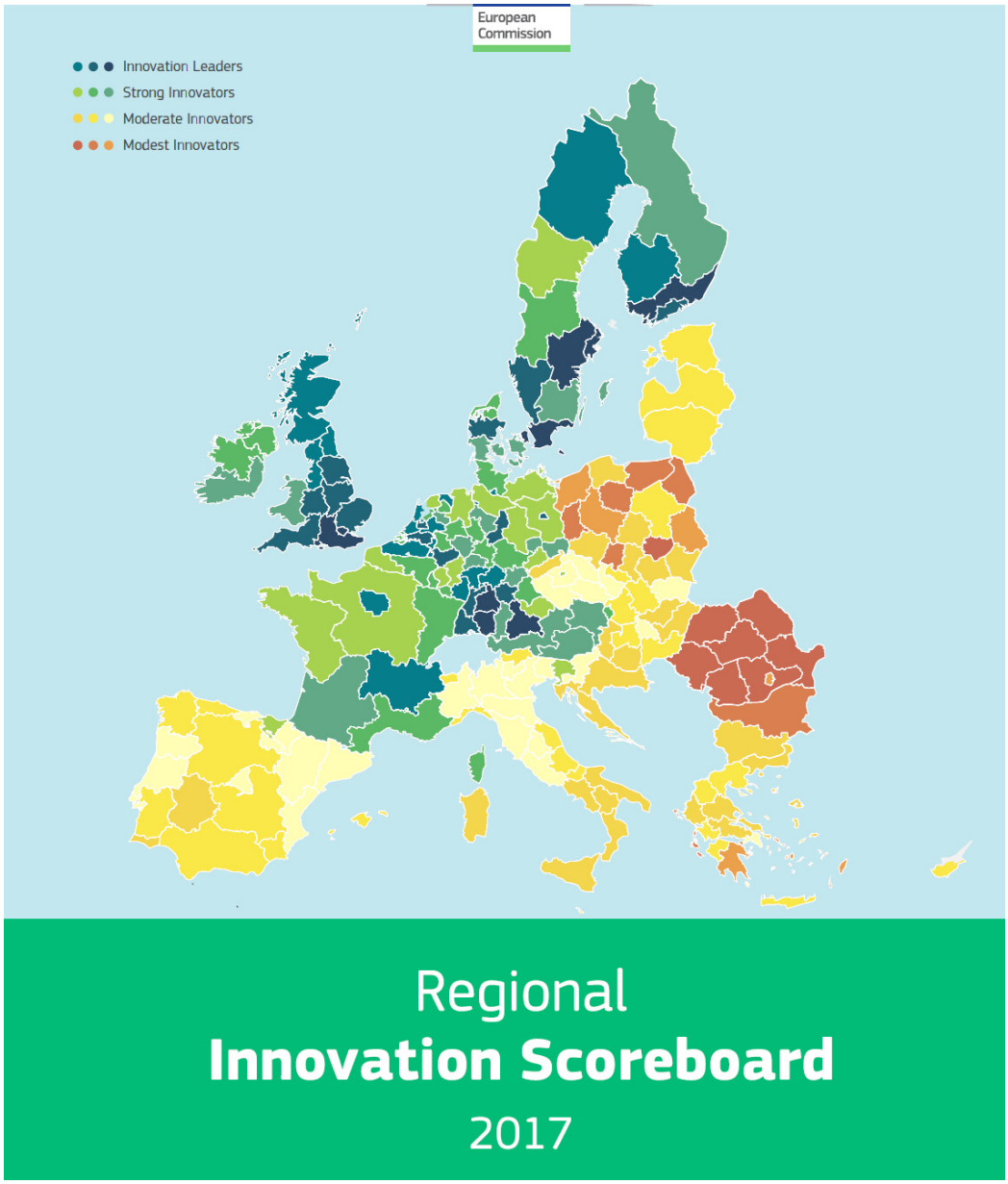
Solo il 43% della **spesa nazionale in R&S** è finanziata in Italia dalle imprese private, contro il 56,3% a scala comunitaria, il 54,1% in Francia, il 66,9% in Germania, il 72,4% in Giappone e il 68,2% negli USA.

Il numero dei **ricercatori** per migliaia di forza lavoro è pari al 2,8 ‰ in Italia, contro il 5,4‰ a scala comunitaria, il 6,20 ‰ in Francia, il 6,45 ‰ in Germania, il 9,26 ‰ in Giappone e l'8,08 ‰ negli USA.

Il numero di **laureati** in tutti i campi di studio è stato nel 1998 pari a 179.431 in Italia, contro 497.188 in Germania e 322.487 in Francia e 465.895 nel Regno Unito.

La percentuale della spesa privata e pubblica nell'**istruzione universitaria** è pari all'0,84% del PIL in Italia, contro l' 1,09% nella Comunità e l'1,04% in Germania, 1,11% nel Regno Unito e 1,13 %in Francia, l'1,02% in Giappone e il 2,29% negli USA.

**Cfr. http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009_en.pdf**




**http://ec.europa.eu/DocsRoom/documents/24177**


| NUTS | Region | RII 2017 | Rank | Group | Change |
|---|---|---|---|---|---|
| ITC1 | Piemonte | 79.8 | 125 | Moderate + | 0.6 |
| ITC2 | Valle d'Aosta/ Vallée d'Aoste | 59.0 | 168 | Moderate | -1.3 |
| ITC3 | Liguria | 69.6 | 145 | Moderate | 4.1 |
| ITC4 | Lombardia | 79.6 | 127 | Moderate + | -0.8 |
| ITH1 | Provincia Autonoma Bolzano/ Bozen | 69.4 | 147 | Moderate | 2.6 |
| ITH2 | Provincia Autonoma Trento | 78.4 | 129 | Moderate + | 1.3 |
| ITH3 | Veneto | 79.4 | 128 | Moderate + | 0.2 |
| ITH4 | Friuli-Venezia Giulia | 87.8 | 117 | Moderate + | 3.6 |
| ITH5 | Emilia-Romagna | 79.9 | 124 | Moderate + | -1.6 |
| ITI1 | Toscana | 75.5 | 133 | Moderate + | 6.6 |
| ITI2 | Umbria | 74.3 | 137 | Moderate + | 5.7 |
| ITI3 | Marche | 69.4 | 148 | Moderate | 0.8 |
| ITI4 | Lazio | 73.6 | 138 | Moderate + | -2.9 |
| ITF1 | Abruzzo | 64.5 | 158 | Moderate | 3.2 |
| ITF2 | Molise | 61.0 | 164 | Moderate | 4.9 |
| ITF3 | Campania | 57.8 | 173 | Moderate - | -1.5 |
| ITF4 | Puglia | 58.5 | 170 | Moderate - | -0.6 |
| ITF5 | Basilicata | 57.9 | 172 | Moderate - | 0.0 |
| ITF6 | Calabria | 57.8 | 174 | Moderate - | 7.7 |
| ITG1 | Sicilia | 51.3 | 194 | Moderate - | -1.9 |
| ITG2 | Sardegna | 52.4 | 190 | Moderate - | -1.1 |

*RII 2017 shows performance in 2017 relative to that of the EU in 2017. Rank shows the rank performance in 2017 across all regions. Group shows the respective performance group. Change shows the performance change over time calculated as the difference between the performance in 2017 (RII 2017) relative to that of the EU in 2011 and performance in 2011 (RII 2011) relative to that of the EU in 2011.*

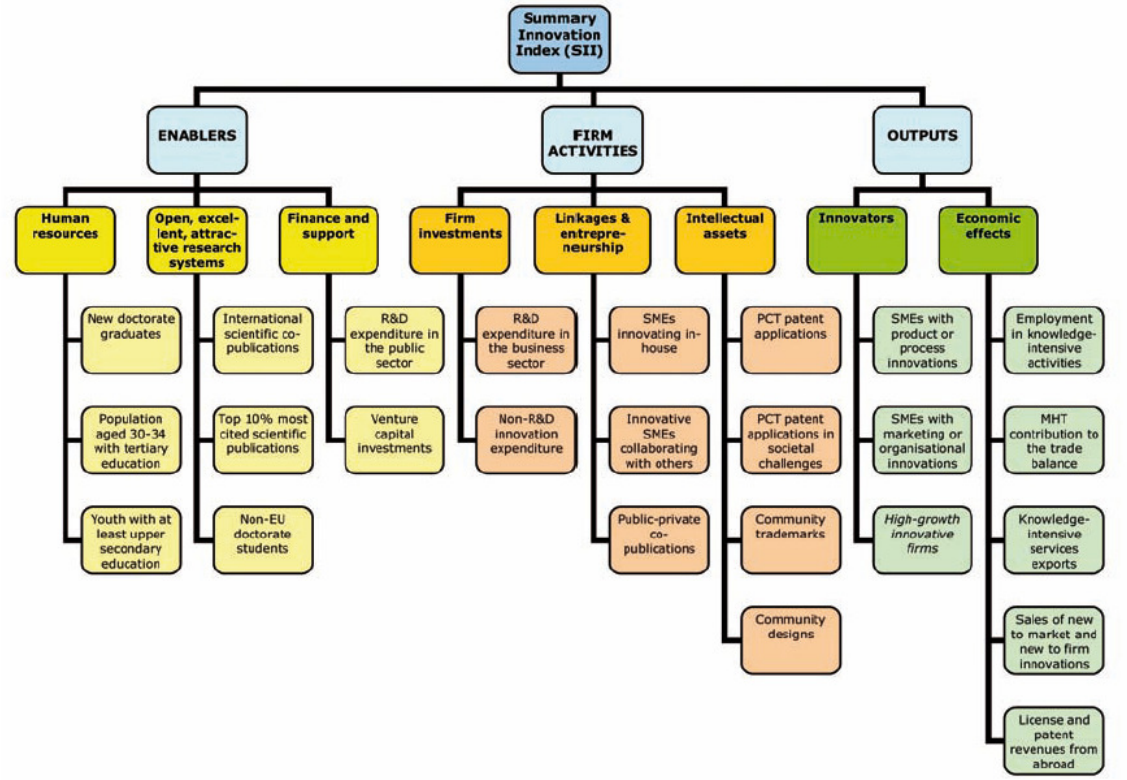
Italy as a country is a Moderate Innovator. Italy includes 21 NUTS 2 regions.

Regional performance differences are high in Italy with the best performing region, *Friuli-Venezia Giulia* (ITH4), performing 70% higher than the lowest performing region, *Sicilia* (ITG1). Innovation performance is higher in more northern regions as compared to more southern regions.

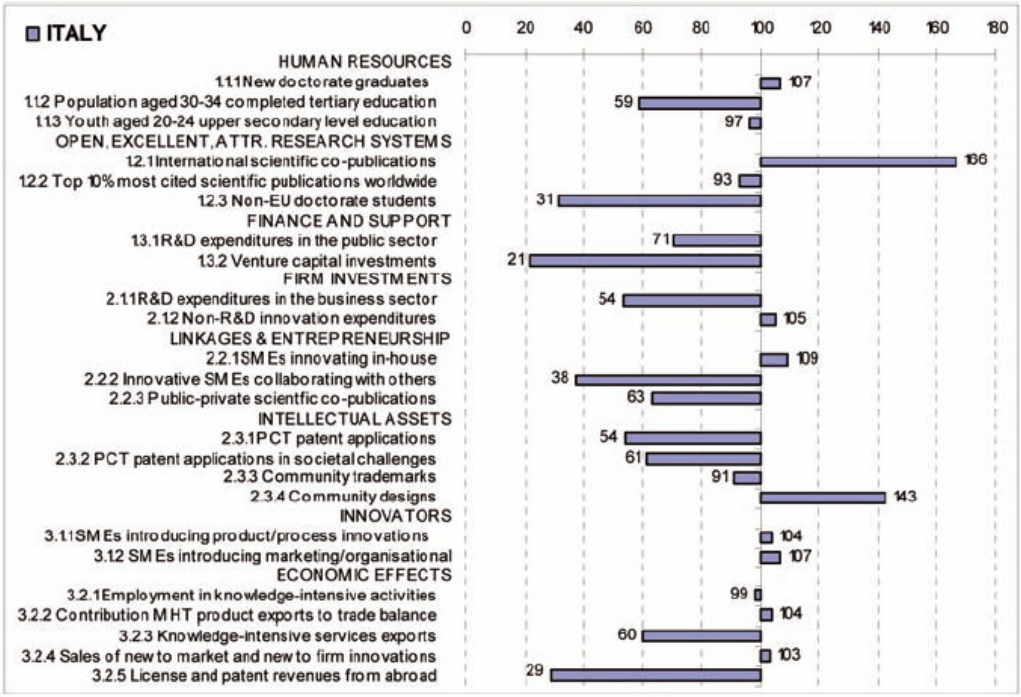
All Italian regions are Moderate Innovators, nine are Moderate +, six are Moderate and six are Moderate - Innovators.

For 12 regions, performance has improved, in particular for *Calabria* (ITF6) (+7.7%) and *Toscana* (ITE1) (+6.6%). For eight regions, performance has declined.

**Figure 1: Measurement framework of the Innovation Union Scoreboard**

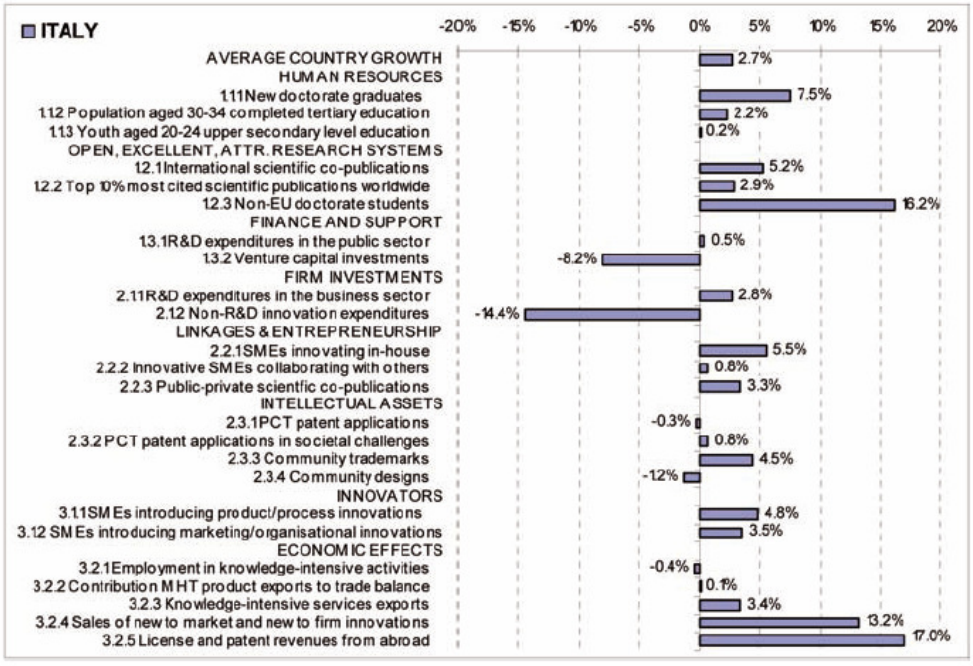


**Italy** is one of the moderate innovators with a below average performance. Relative strengths are in Innovators and Economic effects. Relative weak in Finance and support and Firm investmen




Indicator values relative to the EU27 (EU27=100)

High growth is observed for Sales of new-to-market and new-to-firm innovations and License and patent revenues from abroad. A strong decline is observed for Venture capital investments and Non-R&D innovation expenditure. Growth performance i Open, excellent and attractive research systems an Economic effects is well above average and in Firm investments well below average.




Annual average growth per indicator and average country growth

# Annex B: Current performance

| | EU27 | BE | BG | CZ | DK | DE | EE | IE | EL | ES | FR | IT | CY | LV | LT | LU | HU | MT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ENABLERS** | | | | | | | | | | | | | | | | | | |
| **Human resources** | | | | | | | | | | | | | | | | | | |
| 1.1.1 New doctorate graduates | 1.5 | 1.5 | 0.5 | 1.3 | 2.1 | 2.7 | 0.9 | 1.6 | 1.2 | 1.2 | 1.5 | 1.6 | 0.2 | 0.4 | 0.9 | 0.8 | 0.8 | 0.2 |
| 1.1.2 Population completed tertiary education | 34.6 | 42.6 | 27.3 | 23.8 | 41.2 | 30.7 | 40.3 | 49.4 | 28.9 | 40.6 | 43.4 | 20.3 | 45.8 | 35.7 | 45.4 | 48.2 | 28.1 | 21.1 |
| 1.1.3 Youth with upper secondary level education | 79.5 | 81.6 | 85.5 | 91.7 | 70.0 | 75.8 | 82.6 | 86.9 | 83.6 | 61.7 | 83.8 | 76.9 | 87.7 | 80.4 | 86.9 | 73.3 | 83.3 | 59.2 |
| **Open, excellent and attractive research systems** | | | | | | | | | | | | | | | | | | |
| 1.2.1 International scientific co-publications | 300 | 1280 | 205 | 529 | 1692 | 715 | 734 | 1131 | 544 | 599 | 683 | 500 | 1004 | 178 | 265 | 1428 | 387 | 328 |
| 1.2.2 Scientific publications among top 10% most cited | 10.90 | 13.59 | 2.61 | 5.51 | 14.60 | 11.64 | 7.45 | 11.38 | 9.52 | 10.19 | 10.33 | 10.11 | 8.85 | 3.95 | 5.95 | 10.11 | 4.91 | 7.06 |
| 1.2.3 Non-EU doctorate students | 20.02 | 19.69 | 4.13 | 4.00 | 15.43 | N/A | 1.55 | 22.25 | 1.00 | 17.33 | 31.56 | 6.24 | 1.64 | 0.60 | 0.24 | 20.39 | 2.61 | 4.05 |
| **Finance and support** | | | | | | | | | | | | | | | | | | |
| 1.3.1 R&D expenditure in the public sector | 0.75 | 0.65 | 0.26 | 0.72 | 0.99 | 0.94 | 0.87 | 0.55 | 0.43 | 0.64 | 0.80 | 0.53 | 0.33 | 0.50 | 0.68 | 0.45 | 0.43 | 0.24 |
| 1.3.2 Venture capital investments | 0.094 | 0.090 | 0.007 | 0.010 | 0.104 | 0.057 | N/A | 0.026 | 0.004 | 0.050 | 0.105 | 0.020 | N/A | N/A | N/A | 0.243 | 0.030 | N/A |
| **FIRM ACTIVITIES** | | | | | | | | | | | | | | | | | | |
| **Firm investments** | | | | | | | | | | | | | | | | | | |
| 2.1.1 R&D expenditure in the business sector | 1.27 | 1.37 | 0.30 | 1.11 | 2.09 | 1.90 | 1.49 | 1.17 | 0.17 | 0.67 | 1.43 | 0.68 | 0.08 | 0.19 | 0.24 | 0.98 | 0.75 | 0.49 |
| 2.1.2 Non-R&D innovation expenditure | 0.56 | 0.53 | 0.28 | 0.69 | 0.51 | 0.88 | 1.03 | 0.30 | 0.74 | 0.39 | 0.25 | 0.59 | 1.66 | 0.36 | 1.27 | 0.19 | 0.40 | 0.96 |
| **Linkages & entrepreneurship** | | | | | | | | | | | | | | | | | | |
| 2.2.1 SMEs innovating in-house | 31.83 | 39.80 | 12.98 | 27.21 | 40.81 | 45.25 | 33.57 | 38.76 | 32.70 | 22.06 | 29.95 | 34.79 | 41.55 | 14.44 | 15.67 | 40.54 | 11.40 | 22.49 |
| 2.2.2 Innovative SMEs collaborating with others | 11.69 | 20.15 | 3.33 | 10.26 | 15.46 | 14.01 | 18.52 | 11.93 | 13.31 | 5.81 | 11.09 | 4.41 | 21.49 | 4.19 | 8.76 | 14.69 | 6.68 | 4.56 |
| 2.2.3 Public-private co-publications | 52.8 | 97.1 | 4.1 | 33.7 | 179.9 | 75.5 | 25.0 | 34.4 | 15.8 | 28.7 | 49.0 | 33.4 | 26.6 | 2.2 | 9.6 | 35.5 | 31.2 | 8.4 |
| **Intellectual Assets** | | | | | | | | | | | | | | | | | | |
| 2.3.1 PCT patent applications | 3.90 | 3.73 | 0.34 | 0.89 | 7.04 | 7.42 | 2.35 | 2.76 | 0.42 | 1.43 | 4.20 | 2.10 | 0.60 | 1.21 | 0.31 | 1.62 | 1.48 | 0.29 |
| 2.3.2 PCT patent applications in societal challenges | 0.96 | 0.81 | 0.12 | 0.20 | 2.30 | 1.85 | 0.56 | 0.80 | 0.10 | 0.39 | 1.04 | 0.59 | 0.05 | 0.29 | 0.05 | 0.23 | 0.34 | 0.00 |
| 2.3.3 Community trademarks | 5.86 | 5.89 | 5.49 | 3.34 | 7.93 | 8.17 | 8.18 | 5.92 | 1.70 | 6.78 | 4.21 | 5.32 | 14.08 | 4.18 | 2.83 | 14.08 | 2.41 | 14.08 |
| 2.3.4 Community designs | 4.80 | 4.65 | 2.01 | 3.08 | 7.67 | 7.70 | 3.62 | 1.75 | 0.48 | 3.40 | 3.96 | 6.84 | 3.48 | 3.43 | 0.89 | 8.72 | 1.11 | 0.93 |
| **OUTPUTS** | | | | | | | | | | | | | | | | | | |
| **Innovators** | | | | | | | | | | | | | | | | | | |
| 3.1.1 SMEs introducing product or process innovations | 38.44 | 50.34 | 16.59 | 33.01 | 41.60 | 57.00 | 45.56 | 45.50 | 37.31 | 28.09 | 32.68 | 39.80 | 34.80 | 15.78 | 21.39 | 47.90 | 16.76 | 28.96 |
| 3.1.2 SMEs introducing marketing/organisational innovations | 40.30 | 41.73 | 16.31 | 41.12 | 42.64 | 60.55 | 35.99 | 45.04 | 51.29 | 27.74 | 42.80 | 43.04 | 36.99 | 22.68 | 26.39 | 58.67 | 22.36 | 30.96 |
| 3.1.3 Fast-growing innovative firms | | | | | | | | | | | | | | | | | | |
| **Economic effects** | | | | | | | | | | | | | | | | | | |
| 3.2.1 Employment in knowledge-intensive activities | 13.60 | 14.80 | 8.40 | 12.30 | 15.60 | 15.10 | 10.70 | 19.80 | 11.30 | 11.80 | 14.40 | 13.40 | 15.00 | 9.10 | 9.00 | 20.00 | 13.10 | 16.40 |
| 3.2.2 Contribution MHT product exports to trade balance | 1.28 | 2.37 | -4.78 | 3.82 | -2.77 | 8.54 | -2.70 | 2.57 | -5.69 | 3.05 | 4.65 | 4.96 | 1.72 | -5.42 | -1.27 | -3.35 | 5.84 | 0.92 |
| 3.2.3 Knowledge-intensive services exports | 45.14 | 41.32 | 26.84 | 27.26 | 63.33 | 56.70 | 37.40 | 67.43 | 5.38 | 21.61 | 32.58 | 27.19 | 48.48 | 35.32 | 13.69 | 67.43 | 26.55 | 13.63 |
| 3.2.4 Sales of new to market and new to firm innovations | 14.37 | 12.36 | 7.58 | 15.25 | 14.96 | 15.50 | 12.31 | 9.32 | 19.23 | 18.97 | 14.73 | 14.86 | 14.70 | 3.14 | 6.64 | 8.27 | 13.68 | 7.41 |
| 3.2.5 License and patent revenues from abroad | 0.58 | 0.50 | 0.03 | 0.05 | 0.79 | 0.40 | 0.10 | 1.80 | 0.02 | 0.07 | 0.57 | 0.17 | 0.01 | 0.04 | 0.00 | 0.78 | 0.74 | 0.30 |

# Annex B: Current performance

| | EU27 | NL | AT | PL | PT | RO | SI | SK | FI | SE | UK | HR | TR | IS | NO | CH | RS | MK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ENABLERS** | | | | | | | | | | | | | | | | | | |
| **Human resources** | | | | | | | | | | | | | | | | | | |
| 1.1.1 New doctorate graduates | 1.5 | 1.9 | 2.3 | 0.5 | 1.9 | 1.4 | 1.5 | 3.1 | 2.6 | 2.9 | 2.3 | 1.4 | 0.4 | 0.8 | 1.9 | 3.1 | 0.6 | 0.5 |
| 1.1.2 Population completed tertiary education | 34.6 | 41.1 | 23.8 | 36.9 | 26.1 | 20.4 | 37.9 | 23.4 | 46.0 | 47.5 | 45.8 | 24.5 | 16.3 | 44.6 | 48.8 | 44.0 | 20.6 | 20.4 |
| 1.1.3 Youth with upper secondary level education | 79.5 | 78.2 | 85.4 | 90.0 | 64.4 | 79.6 | 90.1 | 93.3 | 85.4 | 88.7 | 80.1 | 95.6 | 54.3 | 56.9 | 71.2 | 83.0 | 84.0 | 85.3 |
| **Open, excellent and attractive research systems** | | | | | | | | | | | | | | | | | | |
| 1.2.1 International scientific co-publications | 300 | 1330 | 1180 | 213 | 678 | 148 | 955 | 379 | 1323 | 1604 | 989 | 388 | 71 | 1692 | 1483 | 1692 | N/A | 134 |
| 1.2.2 Scientific publications among top 10% most cited | 10.90 | 15.13 | 10.92 | 3.52 | 10.04 | 3.77 | 7.39 | 3.27 | 11.48 | 12.28 | 13.28 | 3.20 | 6.73 | 11.19 | 12.17 | 15.84 | N/A | 3.08 |
| 1.2.3 Non-EU doctorate students | 20.02 | N/A | 8.78 | 1.91 | 10.59 | 1.98 | 6.54 | 1.39 | 5.91 | 19.99 | 31.42 | 2.21 | 2.52 | 20.77 | 30.93 | 31.56 | 7.05 | 7.04 |
| **Finance and support** | | | | | | | | | | | | | | | | | | |
| 1.3.1 R&D expenditure in the public sector | 0.75 | 0.97 | 0.87 | 0.53 | 0.69 | 0.31 | 0.64 | 0.43 | 1.09 | 1.03 | 0.64 | 0.42 | 0.49 | 1.10 | 0.84 | 0.79 | 0.68 | 0.14 |
| 1.3.2 Venture capital investments | 0.094 | 0.105 | 0.022 | 0.051 | 0.032 | 0.033 | N/A | N/A | 0.108 | 0.156 | 0.239 | N/A | N/A | N/A | 0.069 | 0.094 | N/A | N/A |
| **FIRM ACTIVITIES** | | | | | | | | | | | | | | | | | | |
| **Firm investments** | | | | | | | | | | | | | | | | | | |
| 2.1.1 R&D expenditure in the business sector | 1.27 | 0.89 | 1.87 | 0.23 | 0.73 | 0.17 | 1.42 | 0.25 | 2.34 | 2.34 | 1.09 | 0.34 | 0.36 | 1.64 | 0.86 | 2.11 | 0.10 | 0.04 |
| 2.1.2 Non-R&D innovation expenditure | 0.56 | 0.61 | 0.35 | 1.02 | 0.53 | 0.46 | 0.56 | 0.65 | 0.51 | 0.64 | N/A | 0.61 | 0.16 | N/A | 0.14 | 1.16 | 1.06 | 0.90 |
| **Linkages & entrepreneurship** | | | | | | | | | | | | | | | | | | |
| 2.2.1 SMEs innovating in-house | 31.83 | 39.10 | 36.35 | 11.34 | 34.10 | 10.75 | N/A | 21.84 | 33.18 | 37.68 | N/A | 25.08 | 28.18 | N/A | 23.22 | 28.20 | 30.59 | 11.30 |
| 2.2.2 Innovative SMEs collaborating with others | 11.69 | 14.87 | 20.52 | 4.15 | 8.09 | 2.93 | 13.63 | 8.29 | 16.50 | 17.47 | 22.68 | 9.26 | 5.28 | 17.44 | 9.56 | 9.40 | 7.49 | 9.60 |
| 2.2.3 Public-private co-publications | 52.8 | 128.2 | 86.4 | 5.3 | 17.0 | 8.3 | 85.4 | 15.7 | 97.9 | 147.0 | 79.5 | 27.4 | 1.7 | 179.9 | 115.9 | 179.9 | 6.7 | 0.0 |
| **Intellectual Assets** | | | | | | | | | | | | | | | | | | |
| 2.3.1 PCT patent applications | 3.90 | 6.24 | 5.11 | 0.45 | 0.65 | 0.18 | 3.01 | 0.37 | 8.93 | 8.93 | 3.23 | 0.62 | 0.87 | 3.86 | 3.61 | 8.12 | N/A | 0.18 |
| 2.3.2 PCT patent applications in societal challenges | 0.96 | 1.48 | 1.30 | 0.12 | 0.15 | 0.07 | 1.46 | 0.10 | 1.35 | 2.01 | 0.76 | 0.12 | 0.08 | 1.21 | 0.80 | 2.30 | N/A | N/A |
| 2.3.3 Community trademarks | 5.86 | 7.18 | 10.22 | 3.16 | 4.64 | 2.14 | 4.25 | 2.26 | 6.68 | 7.81 | 5.12 | 0.52 | 0.54 | 3.89 | 1.59 | 12.98 | 0.55 | 0.26 |
| 2.3.4 Community designs | 4.80 | 4.12 | 8.59 | 4.51 | 4.36 | 0.57 | 3.56 | 1.44 | 4.56 | 5.09 | 2.86 | 0.04 | 0.47 | 1.19 | 0.66 | 8.56 | 0.01 | 0.00 |
| **OUTPUTS** | | | | | | | | | | | | | | | | | | |
| **Innovators** | | | | | | | | | | | | | | | | | | |
| 3.1.1 SMEs introducing product or process innovations | 38.44 | 46.02 | 42.20 | 14.36 | 45.57 | 13.17 | 32.61 | 26.02 | 44.75 | 47.38 | 21.26 | 30.40 | 29.52 | 55.13 | 32.79 | 57.00 | 36.00 | 39.20 |
| 3.1.2 SMEs introducing marketing/organisational innovations | 40.30 | 36.91 | 42.33 | 19.95 | 47.38 | 25.54 | 37.65 | 27.25 | 38.89 | 42.15 | 30.64 | 31.91 | 50.31 | 45.90 | 29.13 | N/A | 39.06 | 30.80 |
| 3.1.3 Fast-growing innovative firms | | | | | | | | | | | | | | | | | | |
| **Economic effects** | | | | | | | | | | | | | | | | | | |
| 3.2.1 Employment in knowledge-intensive activities | 13.60 | 14.90 | 14.00 | 9.30 | 9.10 | 6.50 | 13.70 | 10.50 | 15.30 | 17.40 | 17.60 | 10.30 | 4.70 | 18.50 | 15.10 | 20.00 | 12.84 | 7.20 |
| 3.2.2 Contribution MHT product exports to trade balance | 1.28 | 1.68 | 3.18 | 0.88 | -1.20 | 0.38 | 6.05 | 4.35 | 1.69 | 2.02 | 3.13 | 2.98 | -2.22 | -8.87 | -8.87 | 8.44 | N/A | 5.42 |
| 3.2.3 Knowledge-intensive services exports | 45.14 | 26.31 | 22.21 | 26.14 | 28.99 | 43.03 | 20.91 | 19.63 | 35.93 | 38.70 | 57.59 | 14.99 | 18.76 | 50.32 | 49.40 | 26.51 | 45.20 | 27.85 |
| 3.2.4 Sales of new to market and new to firm innovations | 14.37 | 10.45 | 11.92 | 8.00 | 14.30 | 14.28 | 10.65 | 19.23 | 15.29 | 8.37 | 7.31 | 10.54 | 15.82 | 6.07 | 6.09 | 19.23 | 11.71 | 9.90 |
| 3.2.5 License and patent revenues from abroad | 0.58 | 1.80 | 0.19 | 0.05 | 0.03 | 0.13 | 0.17 | 0.00 | 1.22 | 1.16 | 0.58 | 0.04 | 0.00 | 1.60 | 0.17 | 1.80 | 0.12 | 0.10 |

# Annex A: Definitions of indicators

| | Indicator | Definition numerator | Definition denominator | Interpretation | Source |
|---|---|---|---|---|---|
| 1.1.1 | New doctorate graduates (ISCED 6) per 1000 population aged 25-34 | Number doctorate graduates (ISCED 6) | Population between 25 and 34 years | The indicator is a measure of the supply of new second-stage tertiary graduates in all fields of training. For most countries ISCED 6 captures PhD graduates only, with the exception of Finland, Portugal and Sweden where also non-PhD degrees leading to an award of an advanced research qualification are included. | Eurostat |
| 1.1.2 | Percentage population aged 30-34 having completed tertiary education | Number of persons in age class with some form of post-secondary education (ISCED 5 and 6) | Population between 30 and 34 years | This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields because the adoption of innovations in many areas, in particular in the service sectors, depends on a wide range of skills. International comparisons of educational levels however are difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree. The indicator focuses on a narrow share of the population aged 30 to 34 and it will more easily and quickly reflect changes in educational policies leading to more tertiary graduates. | Eurostat |
| 1.1.3 | Percentage youth aged 20-24 having attained at least upper secondary education | Number of young people aged 20-24 years having attained at least upper secondary education attainment level, i.e. with an education level ISCED 3a, 3b or 3c long minimum | Population between 20 and 24 years | The indicator measures the qualification level of the population aged 20-24 years in terms of formal educational degrees. It provides a measure for the "supply" of human capital of that age group and for the output of education systems in terms of graduates. Completed upper secondary education is generally considered to be the minimum level required for successful participation in a knowledge-based society and is positively linked with economic growth. | Eurostat |
| 1.2.1 | International scientific co-publications per million population | Number of scientific publications with at least one co-author based abroad (where abroad is non-EU for the EU27) | Total population | International scientific co-publications are a proxy for the quality of scientific research as collaboration increases scientific productivity. | Science-Metrix / Scopus (Elsevier) |
| 1.2.2 | Scientific publications among the top-10% most cited publications worldwide as % of total scientific publications of the country | Number of scientific publications among the top-10% most cited publications worldwide | Total number of scientific publications | The indicator is a proxy for the efficiency of the research system as highly cited publications are assumed to be of higher quality. There could be a bias towards small or English speaking countries given the coverage of Scopus' publication data. Countries like France and Germany, where researchers publish relatively more in their own language, are more likely to underperform on this indicator as compared to their real academic excellence. | Science-Metrix / Scopus (Elsevier) |
| 1.2.3 | Non-EU doctorate students as a % of all doctorate holders | For EU Member States: number of doctorate students from non-EU countries (for non-EU countries: number of non-national doctorate students) | Total number of doctorate students | The share of non-EU doctorate students reflects the mobility of students as an effective way of diffusing knowledge. Attracting high-skilled foreign doctorate students will add to creating a net brain gain and will secure a continuous supply of researchers. | Eurostat |
| 1.3.1 | R&D expenditure in the public sector (% of GDP) | All R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD) | Gross Domestic Product | R&D expenditure represents one of the major drivers of economic growth in a knowledge-based economy. As such, trends in the R&D expenditure indicator provide key indications of the future competitiveness and wealth of the EU. Research and development spending is essential for making the transition to a knowledge-based economy as well as for improving production technologies and stimulating growth. | Eurostat |
| 1.3.2 | Venture capital (% of GDP) | Venture capital investment is defined as private equity being raised for investment in companies. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. Venture capital includes early stage (seed + start-up) and expansion and replacement capital | Gross Domestic Product | The amount of venture capital is a proxy for the relative dynamism of new business creation. In particular for enterprises using or developing new (risky) technologies venture capital is often the only available means of financing their (expanding) business. | Eurostat |
| 2.1.1 | R&D expenditure in the business sector (% of GDP) | All R&D expenditures in the business sector (BERD) | Gross Domestic Product | The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sector (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories. | Eurostat |
| 2.1.2 | Non-R&D innovation expenditures (% of turnover) | Sum of total innovation expenditure for enterprises, in thousand Euros and current prices excluding intramural and extramural R&D expenditures | Total turnover for all enterprises | This indicator measures non-R&D innovation expenditure as percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas. | Eurostat (Community Innovation Survey) |

http://ec.europa.eu/enterprise/policies/innovation/files/ius-2013_en.pdf

| | Indicator | Definition numerator | Definition denominator | Interpretation | Source |
|---|---|---|---|---|---|
| 2.2.1 | SMEs innovating in-house (% of SMEs)[11] | Sum of SMEs with in-house innovation activities. Innovative firms are defined as those firms which have introduced new products or processes either 1) in-house or 2) in combination with other firms | Total number of SMEs | This indicator measures the degree to which SMEs, that have introduced any new or significantly improved products or production processes, have innovated in-house. The indicator is limited to SMEs because almost all large firms innovate and because countries with an industrial structure weighted towards larger firms tend to do better. | Eurostat (Community Innovation Survey) |
| 2.2.2 | Innovative SMEs collaborating with others (% of SMEs) | Sum of SMEs with innovation co-operation activities, i.e. those firms that had any co-operation agreements on innovation activities with other enterprises or institutions in the three years of the survey period | Total number of SMEs | This indicator measures the degree to which SMEs are involved in innovation co-operation. Complex innovations, in particular in ICT, often depend on the ability to draw on diverse sources of information and knowledge, or to collaborate on the development of an innovation. This indicator measures the flow of knowledge between public research institutions and firms and between firms and other firms. The indicator is limited to SMEs because almost all large firms are involved in innovation co-operation. | Eurostat (Community Innovation Survey) |
| 2.2.3 | Public-private co-publications per million population | Number of public-private co-authored research publications. The definition of the "private sector" excludes the private medical and health sector. Publications are assigned to the country/countries in which the business companies or other private sector organisations are located | Total population | This indicator captures public-private research linkages and active collaboration activities between business sector researchers and public sector researchers resulting in academic publications. | CWTS / Thomson Reuters |
| 2.3.1 | PCT patent applications per billion GDP (in PPP€) | Number of patent applications filed under the PCT, at international phase, designating the European Patent Office (EPO). Patent counts are based on the priority date, the inventor's country of residence and fractional counts. | Gross Domestic Product in Purchasing Power Parities | The capacity of firms to develop new products will determine their competitive advantage. One indicator of the rate of new product innovation is the number of patents. This indicator measures the number of PCT patent applications. | OECD / Eurostat |
| 2.3.2 | PCT patent applications in societal challenges per billion GDP (in PPP€) | Number of PCT patent applications in Environment-related technologies and Health. Patents in Environment-related technologies include those in General Environmental Management (air, water, waste), Energy generation from renewable and non-fossil sources, Combustion technologies with mitigation potential (e.g. using fossil fuels, biomass, waste, etc.), Technologies specific to climate change mitigation, Technologies with potential or indirect contribution to emissions mitigation, Emissions abatement and fuel efficiency in transportation and Energy efficiency in buildings and lighting. Patents in health-related technologies include those in Medical technology (IPC codes (8th edition) A61[B, C, D, F, G, H, J, L, M, N], H05G) and Pharmaceuticals (IPC codes A61K excluding A61K8) | Gross Domestic Product in Purchasing Power Parities | This indicator measures PCT applications in health technology and environment-related technologies and is relevant as increased numbers of patent applications in health technology and environment-related technologies will be necessary to meet the societal needs of an ageing European society and sustainable growth. | OECD / Eurostat |
| 2.3.3 | Community trademarks per billion GDP (in PPP€) | Number of new community trademarks applications | Gross Domestic Product in Purchasing Power Parities | Trademarks are an important innovation indicator, especially for the service sector. The Community trademark gives its proprietor a uniform right applicable in all Member States of the European Union through a single procedure which simplifies trademark policies at European level. It fulfils the three essential functions of a trademark: it identifies the origin of goods and services, guarantees consistent quality through evidence of the company's commitment vis-à-vis the consumer, and is a form of communication, a basis for publicity and advertising.<br>*Comment: two-year averages have been used* | OHIM[12] / Eurostat |

| | Indicator | Definition numerator | Definition denominator | Interpretation | Source |
|---|---|---|---|---|---|
| 2.3.4 | Community designs per billion GDP (in PPP€) | Number of new community designs applications | Gross Domestic Product in Purchasing Power Parities | A design is the outward appearance of a product or part of it resulting from the lines, contours, colours, shape, texture, materials and/or its ornamentation. A product can be any industrial or handicraft item including packaging, graphic symbols and typographic typefaces but excluding computer programs. It also includes products that are composed of multiple components, which may be disassembled and reassembled. Community design protection is directly enforceable in each Member State and it provides both the option of an unregistered and a registered Community design right for one area encompassing all Member States. *Comment: two-year averages have been used* | Eurostat (Community Innovation Survey) |
| 3.1.1 | SMEs introducing product or process innovations (% of SMEs) | Number of SMEs who introduced a new product or a new process to one of their markets | Total number of SMEs | Technological innovation, as measured by the introduction of new products (goods or services) and processes, is a key ingredient to innovation in manufacturing activities. Higher shares of technological innovators should reflect a higher level of innovation activities. | Eurostat (Community Innovation Survey) |
| 3.1.2 | SMEs introducing marketing or organisational innovations (% of SMEs) | Number of SMEs who introduced a new marketing innovation or organisational innovation to one of their markets | Total number of SMEs | The Community Innovation Survey mainly asks firms about their technological innovation. Many firms, in particular in the services sectors, innovate through other non-technological forms of innovation. Examples of these are marketing and organisational innovations. This indicator tries to capture the extent that SMEs innovate through non-technological innovation. | Eurostat (Community Innovation Survey) |
| 3.1.3 | High-growth innovative firms | -- | -- | -- | -- |
| 3.2.1 | Employment in knowledge-intensive activities as % of total employment | Number of employed persons in knowledge-intensive activities in business industries. Knowledge-intensive activities are defined, based on EU Labour Force Survey data, as all NACE Rev.2 industries at 2-digit level where at least 33% of employment has a higher education degree (ISCED5 or ISCED6) | Total employment | Knowledge-intensive activities provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy. | Eurostat |
| 3.2.2 | Contribution of medium and high-tech products exports to the trade balance | The contribution to the trade balance is calculated as follows: $(X_{MHT}-M_{MHT})- (X-M)*[(X_{MHT}+M_{MHT})/ (X+M)]$, where $(X_{MHT}-M_{MHT})$ is the observed trade balance for medium and high-tech products and $(X-M)*[(X_{MHT} +M_{MHT}) / (X+M)]$ is the theoretical trade balance (where X denotes exports and M denotes imports of resp. MHT products and all products). MHT exports include exports of the following SITC Rev.3 products: 266, 267, 512, 513, 525, 533, 54, 553, 554, 562, 57, 58, 591, 593, 597, 598, 629, 653, 671, 672, 679, 71, 72, 731, 733, 737, 74, 751, 752, 759, 76, 77, 78, 79, 812, 87, 88 and 891 | Value of total exports | The manufacturing trade balance reveals an economy's structural strengths and weaknesses in terms of technological intensity. It indicates whether an industry performs relatively better (or worse) than total manufacturing and can be interpreted as an indicator of revealed comparative advantage that is based on countries' trade specialisation.<br><br>A positive value indicates a structural surplus, while a negative value indicates a structural deficit. The indicator is expressed as a percentage of total trade in order to eliminate business cycle variations. | UN / Eurostat |
| 3.2.3 | Knowledge-intensive services exports as % of total services exports | Exports of knowledge-intensive services are measured by the sum of credits in EBOPS (Extended Balance of Payments Services Classification) 207, 208, 211, 212, 218, 228, 229, 245, 253, 260, 263, 272, 274, 278, 279, 280 and 284 | Total services exports as measured by credits in EBOPS 200 | The indicator measures the competitiveness of the knowledge-intensive services sector. Knowledge-intensive services are defined as NACE classes 61-62 and 64-72. These can be related to the above-mentioned EBOPS classes using the correspondence table between NACE, ISIC and EBOPS as provided in the UN Manual on Statistics of International Trade in Services (UN, 2002). | UN / Eurostat |
| 3.2.4 | Sales of new-to-market and new-to-firm innovations as % of turnover | Sum of total turnover of new or significantly improved products, either new to the firm or new to the market, for all enterprises | Total turnover for all enterprises | This indicator measures the turnover of new or significantly improved products and includes both products which are only new to the firm and products which are also new to the market. The indicator thus captures both the creation of state-of-the-art technologies (new to market products) and the diffusion of these technologies (new to firm products). | Eurostat (Community Innovation Survey) |
| 3.2.5 | License and patent revenues from abroad as % of GDP | Export part of the international transactions in royalties and license fees | Gross Domestic Product | Trade in technology comprises four main categories: Transfer of techniques (through patents and licences, disclosure of know-how); Transfer (sale, licensing, franchising) of designs, trademarks and patterns; Services with a technical content, including technical and engineering studies, as well as technical assistance; and Industrial R&D. TBP receipts capture disembodied technology exports. | Eurostat |

## Annex E: European Innovation Scoreboard 2008 – Country abbreviations

| | | | |
|---|---|---|---|
| AT | Austria | IT | Italy |
| BE | Belgium | JP | Japan |
| BG | Bulgaria | LT | Lithuania |
| CH | Switzerland | LU | Luxembourg |
| CY | Cyprus | LV | Latvia |
| CZ | Czech Republic | MT | Malta |
| DE | Germany | NL | Netherlands |
| DK | Denmark | NO | Norway |
| EE | Estonia | PL | Poland |
| ES | Spain | PT | Portugal |
| EU27 | EU27 | RO | Romania |
| FI | Finland | SE | Sweden |
| FR | France | SI | Slovenia |
| GR | Greece | SK | Slovakia |
| HR | Croatia | TR | Turkey |
| HU | Hungary | UK | United Kingdom |
| IE | Ireland | US | United States |
| IS | Iceland | | |

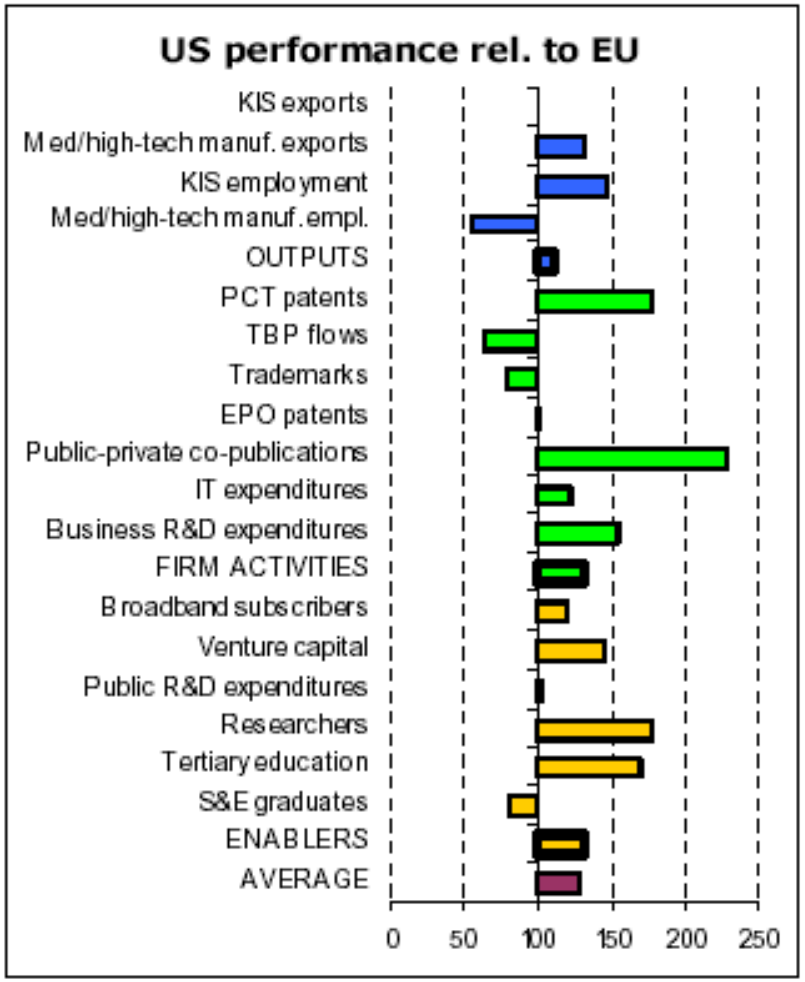
**SOURCES:**

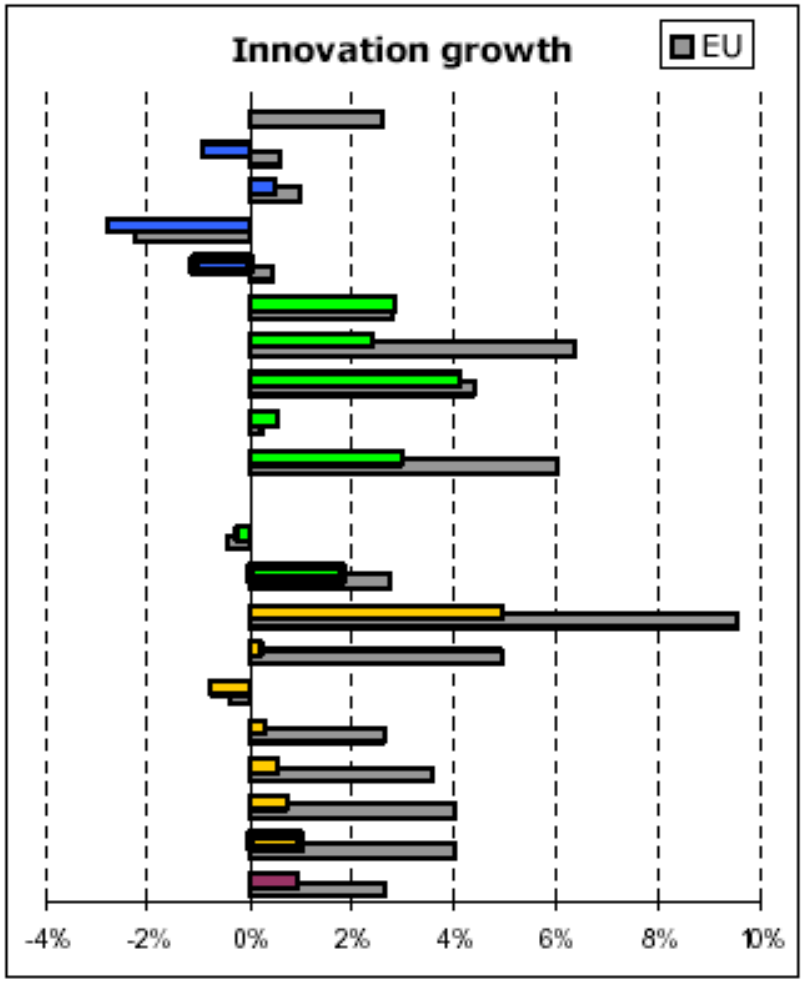
http://www.proinno-europe.eu/EIS2008/website/docs/EIS_2008_Final_report.pdf

http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009_en.pdf

http://ec.europa.eu/research/era/publication_en.cfm

**FIGURE 11: EU-US COMPARISON**



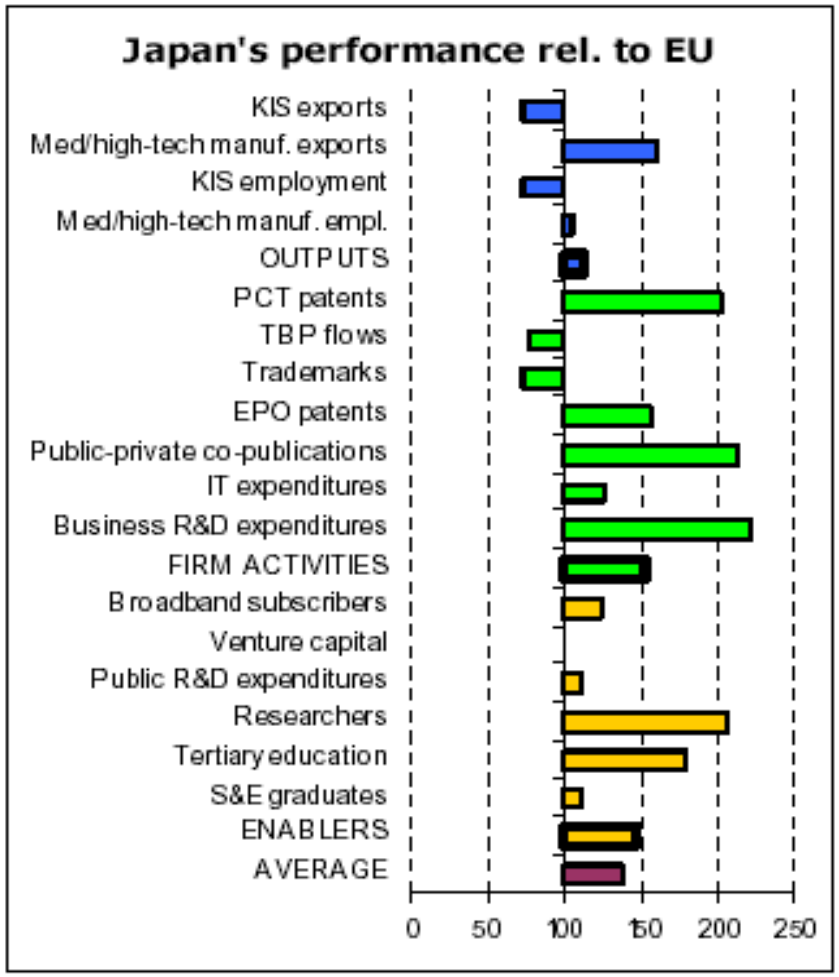



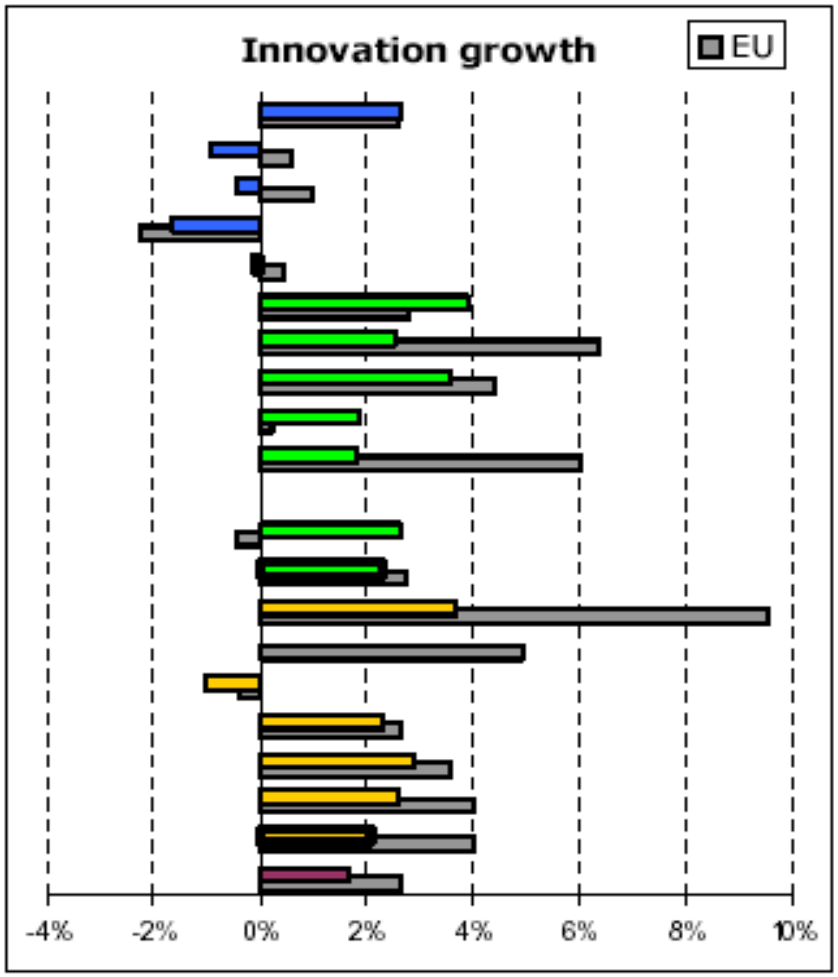

US data for KIS exports are not available.

Average annual growth rates as calculated over a five-year period.

The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in green.

**FIGURE 12: EU-JAPAN COMPARISON**




JP data for Venture capital are not available.

Average annual growth rates as calculated over a five-year period.

The indicators reflecting Enablers are highlighted in yellow, those reflecting Firm activities in green and those reflecting Outputs in green.

**TABLE 3: EU27-US-JAPAN INDICATORS**

| | Data source | Reference year |
|---|---|---|
| **ENABLERS** | | |
| * S&E graduates per 1000 population aged 20-29 | Eurostat | 2006 |
| Population with tertiary education per 100 population aged 25-64 | Eurostat | 2006 |
| * Researchers per 1000 population | OECD (MSTI database) | 2006<br>(2005 for US) |
| Public R&D expenditures (% of GDP) | Eurostat | 2006 |
| Venture capital (% of GDP) | EVCA / Eurostat | 2007<br>(no data for JP) |
| * Broadband subscribers per 1000 population | World Development Indicators (WorldBank) | 2005 |
| **FIRM ACTIVITIES** | | |
| Business R&D expenditures (% of GDP) | Eurostat | 2006 |
| IT expenditures (% of GDP) | EITO / Eurostat | 2006 |
| Public-private co-publications per million population | Thomson Reuters / CWTS | 2006 |
| EPO patents per million population | Eurostat | 2005 |
| * PCT patents per million population | OECD | 2005 |
| * Trademarks per million population, average of:<br>• Community trademarks per million population<br>• Trademark applications (residents) per million population | <br>OHIM / Eurostat<br>World Development Indicators (WorldBank) | <br>2007<br>2005 |
| Technology Balance of Payments flows (% of GDP) | World Development Indicators (WorldBank) | 2006 |
| **OUTPUTS** | | |
| Employment in medium-high & high-tech manufacturing (% of workforce) | Eurostat / OECD | 2006<br>(2003 for JP) |
| Employment in knowledge-intensive services (% of workforce) | Eurostat / OECD | 2006<br>(2003 for JP) |
| Medium and high-tech manufacturing exports (% of total exports) | Eurostat | 2006 |
| Knowledge-intensive services exports (% of total services exports) | Eurostat | 2006<br>(no data for US) |

The indicators highlighted with an * are not identical to but proxies for the EIS indicators.

**Table 1.1:** Main indicators for population, 1960 and 2012

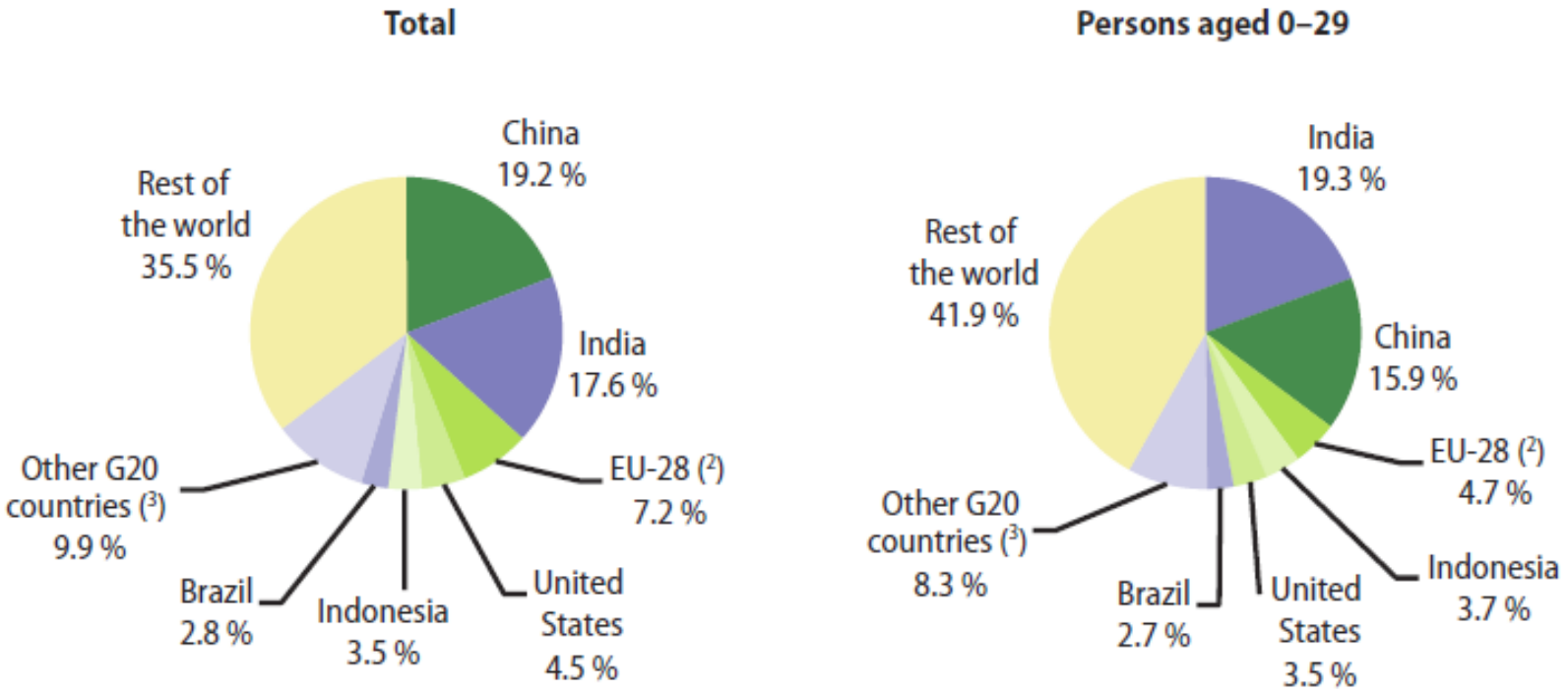
| | Population (million) | | Share in world population (% of total) | | Population density (inhabitants per km²) (²) | |
|---|---|---|---|---|---|---|
| | 1960 | 2012 | 1960 | 2012 | 1960 | 2011 |
| **EU-28 (¹)** | *408.4* | *505.2* | *13.4* | *7.3* | *92.9* | *116.9* |
| Argentina | 20.6 | 41.1 | 0.7 | 0.6 | 7.5 | 14.9 |
| Australia | 10.3 | *22.7* | 0.3 | *0.3* | 1.3 | *2.9* |
| Brazil | 72.8 | 198.7 | 2.4 | 2.8 | 8.6 | 23.3 |
| Canada | 17.9 | 34.9 | 0.6 | 0.5 | 2.0 | 3.8 |
| China | 667.1 | 1 350.7 | 22.0 | 19.2 | 71.5 | 144.1 |
| India | 449.6 | 1 236.7 | 14.8 | 17.6 | 151.2 | 410.7 |
| Indonesia | 88.7 | 246.9 | 2.9 | 3.5 | 49.0 | 134.6 |
| Japan | 92.5 | 127.6 | 3.0 | 1.8 | 252.3 | 350.7 |
| Mexico | 38.7 | 120.8 | 1.3 | 1.7 | 19.9 | 61.4 |
| Russia | 119.9 | *143.5* | 3.9 | *2.0* | 7.0 | 8.7 |
| Saudi Arabia | 4.1 | 28.3 | 0.1 | 0.4 | 1.9 | 12.9 |
| South Africa | 17.4 | *51.2* | 0.6 | *0.7* | 14.3 | 41.7 |
| South Korea | 25.1 | 50.0 | 0.8 | 0.7 | 254.0 | 512.7 |
| Turkey | 27.6 | 75.2 | 0.9 | 1.1 | 35.8 | 96.4 |
| United States | 180.7 | 313.9 | 5.9 | 4.5 | 19.7 | 34.1 |
| **World** | 3 036.8 | 7 046.4 | 100.0 | 100.0 | 23.3 | 53.6 |

(¹) 1960 population: excluding French overseas departments and territories. Annual average.
(²) G20 countries: 1961 data for land area used instead of 1960.

*Source:* Eurostat (online data codes: demo_gind and tps00003), the World Bank (Health Nutrition and Population Statistics), the Food and Agriculture Organisation of the United Nations (FAOSTAT: Resources) and the United Nations Department of Economic and Social Affairs (World Population Prospects: the 2012 revision)

**Figure 1.1:** Share of world population, 2012 (1)

(%)

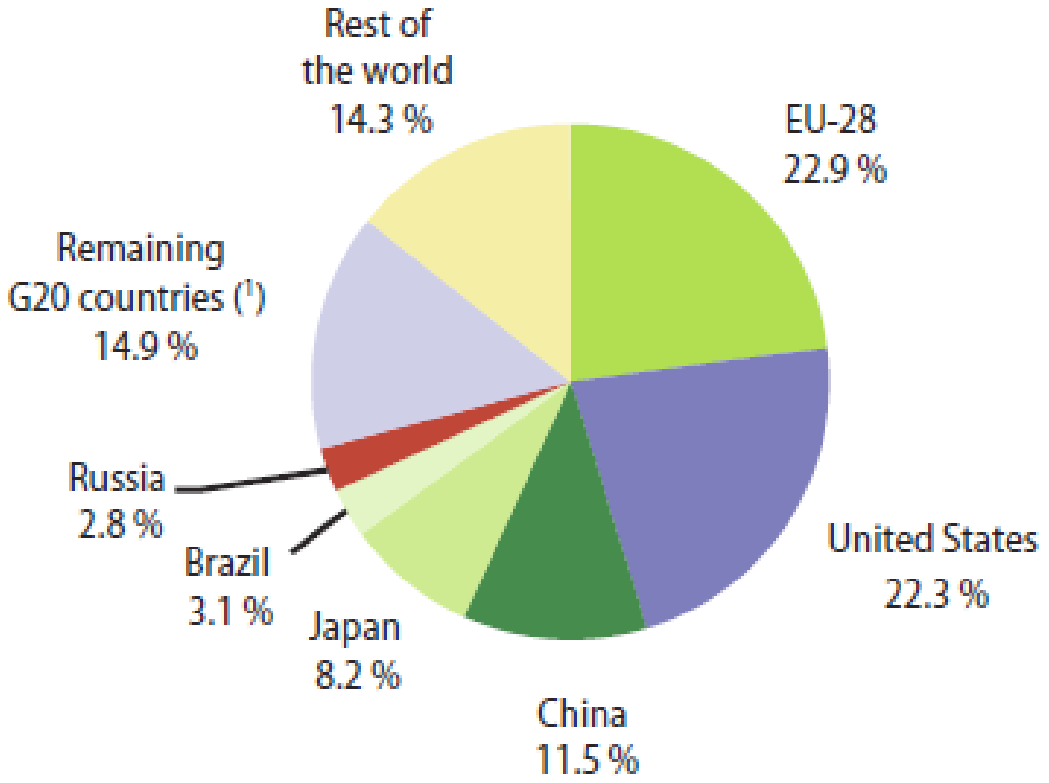



(1) Shares do not sum to 100 % due to rounding.
(2) Provisional.
(3) Russia, Japan, Mexico, Turkey, South Africa, South Korea, Argentina, Canada, Saudi Arabia and Australia. Data for Russia, South Africa and Australia: provisional.

*Source:* Eurostat (online data code: demo_pjangroup) and the World Bank (Health Nutrition and Population Statistics)

**Figure 6.1:** Share of world GDP, 2012

(%)




(1) India, Canada, Australia, Mexico, South Korea, Indonesia, Turkey, Saudi Arabia, Argentina and South Africa.

*Source:* Eurostat (online data code: nama_gdp_c) and the United Nations Statistics Division (National Accounts Main Aggregates Database)

**Figure 6.2:** Share of world GDP, 2002 and 2012

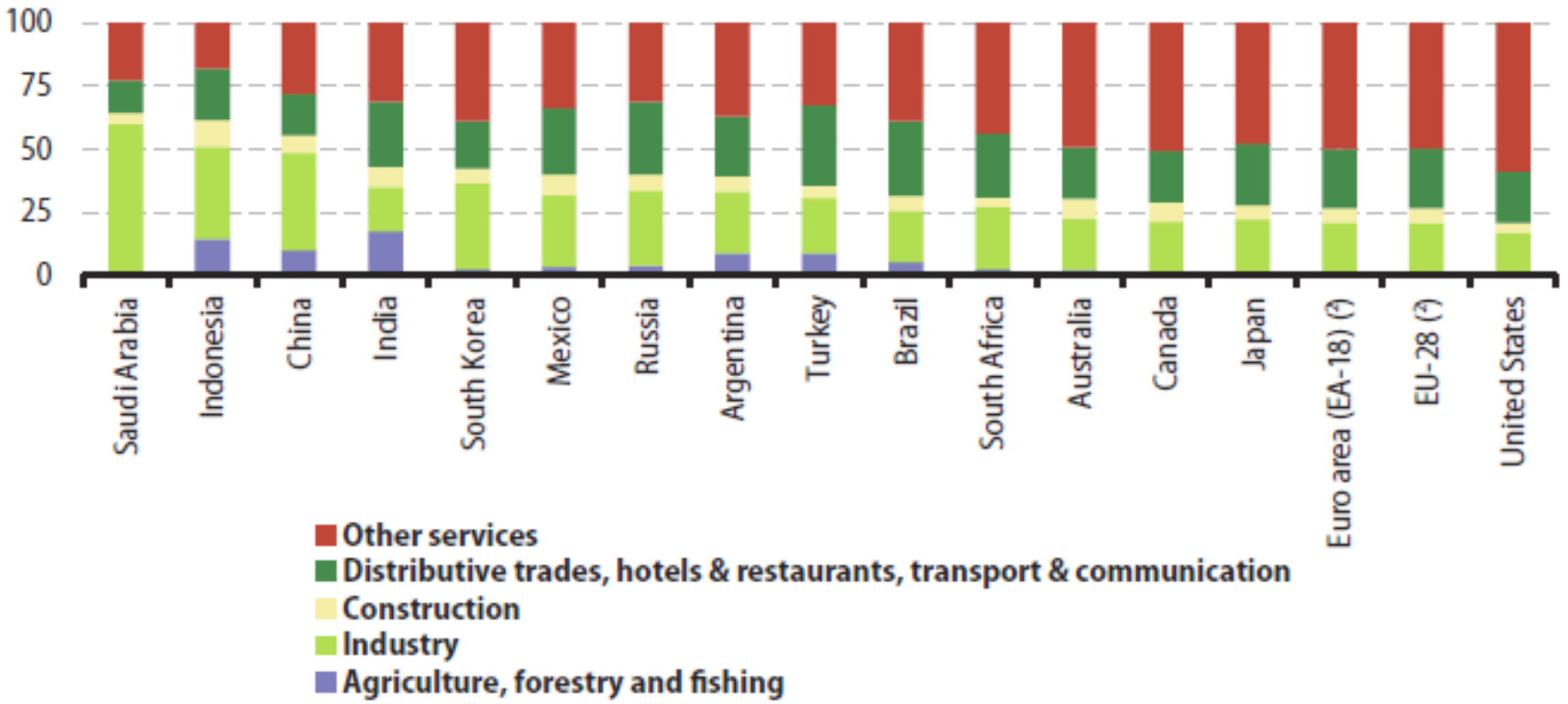
(%, based on current international PPP)


(1) 2012: value is zero.

*Source:* the World Bank (World Development Indicators)

**Figure 6.5:** Analysis of GDP, 2012 (1)

(% of total)




(1) Ranked on the combined share of distributive trades, hotels and restaurants, transport and communication and other services.
(2) Based on NACE Rev. 2.

*Source:* Eurostat (online data code: nama_nace10_c) and the United Nations Statistics Division (National Accounts Main Aggregates Database)

## Table 6.1: General government finances, 2002 and 2012

(% of GDP)

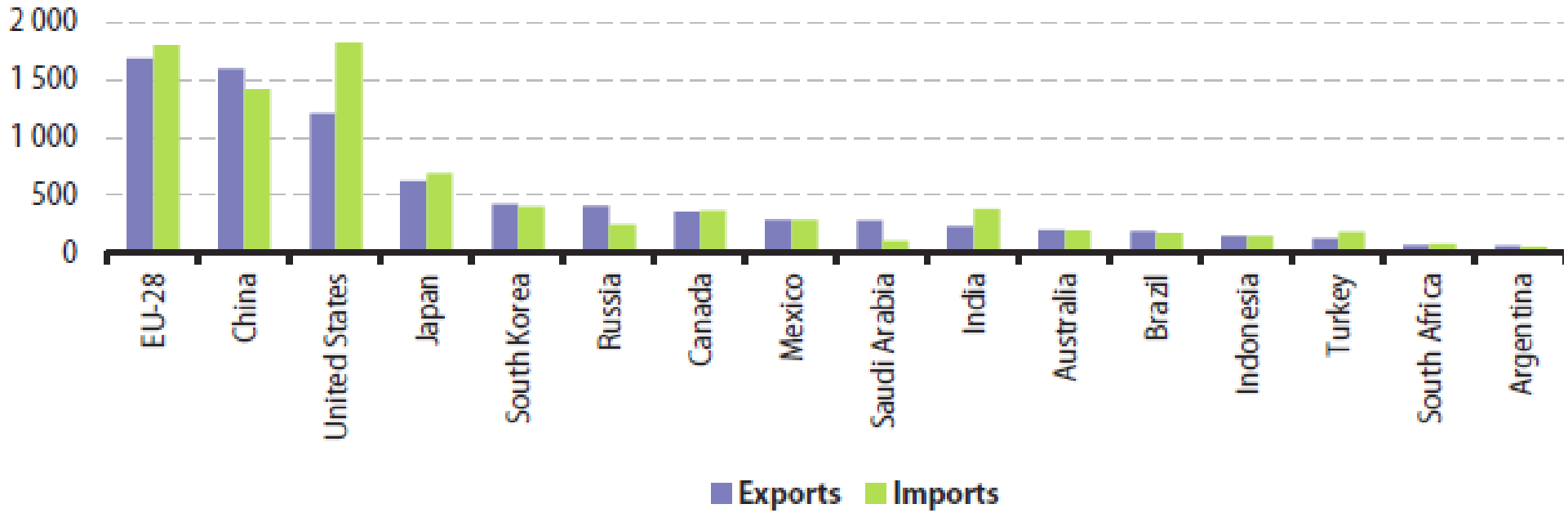
| | Expenditure | | Revenue | | Deficit/ surplus | | Gross debt | |
|---|---|---|---|---|---|---|---|---|
| | 2002 | 2012 | 2002 | 2012 | 2002 | 2012 | 2002 | 2012 |
| **EU-28 (1)** | 46.6 | 49.3 | 43.9 | 45.4 | -2.6 | -3.9 | 60.3 | 85.1 |
| **Euro area (EA-18) (2)** | 47.5 | 49.9 | 44.8 | 46.3 | -2.7 | -3.7 | 68.0 | 90.5 |
| Argentina | 38.9 | 44.5 | 23.0 | 40.2 | -15.9 | -4.3 | 165.0 | 47.7 |
| Australia | 35.1 | 37.1 | 35.3 | 33.3 | 0.2 | -3.7 | 15.1 | 27.9 |
| Brazil | 39.6 | 40.4 | 35.1 | 37.7 | -4.4 | -2.7 | 79.4 | 68.0 |
| Canada | 40.6 | 41.1 | 40.6 | 37.8 | 0.0 | -3.4 | 80.6 | 85.3 |
| China | 18.9 | 24.9 | 15.9 | 22.7 | -3.0 | -2.2 | 18.9 | 26.1 |
| India | 27.5 | *27.3* | 17.8 | *19.4* | -9.8 | *-8.0* | 83.0 | *66.7* |
| Indonesia | 18.7 | 19.7 | 17.9 | 18.0 | -0.9 | -1.7 | 67.8 | 24.5 |
| Japan | 36.6 | *41.3* | 28.9 | *31.1* | *-7.7* | *-10.1* | 164.0 | *238.0* |
| Mexico (3) | 21.9 | 27.3 | 18.5 | 23.6 | -3.3 | -3.7 | 43.0 | 43.5 |
| Russia | 36.3 | 37.0 | 37.0 | 37.4 | 0.7 | 0.4 | 40.3 | 12.5 |
| Saudi Arabia | 37.6 | 36.8 | 35.9 | 51.8 | -1.7 | 15.0 | 93.7 | 3.7 |
| South Africa | 25.8 | 32.7 | 24.7 | 27.9 | -1.1 | -4.8 | 36.9 | 42.3 |
| South Korea (4) | 17.9 | 21.4 | 21.6 | 23.3 | 3.6 | 1.9 | 18.6 | 35.0 |
| Turkey | 43.2 | 36.4 | 28.8 | 34.8 | -14.4 | -1.6 | 74.0 | 36.2 |
| United States | 34.6 | 38.8 | 30.9 | 30.4 | -3.8 | -8.3 | 55.4 | 102.7 |

(1) 2002: EU-27.
(2) Expenditure and revenue: EA-17.
(3) Central government instead of general government.
(4) Expenditure, revenue and deficit/surplus: central government instead of general government.

*Source:* Eurostat (online data codes: gov_a_main and gov_dd_edpt1) and the International Monetary Fund (World Economic Outlook, 2013)

**Figure 7.2:** Trade in goods, 2012 (1)

(EUR billion)




(1) EU-28: extra-EU flows. Other countries: flows with the rest of the world.

*Source:* Eurostat (Comext) and the United Nations (Comtrade)

## Table 7.1: Trade in goods and services, 2012 (1)

(% of GDP)

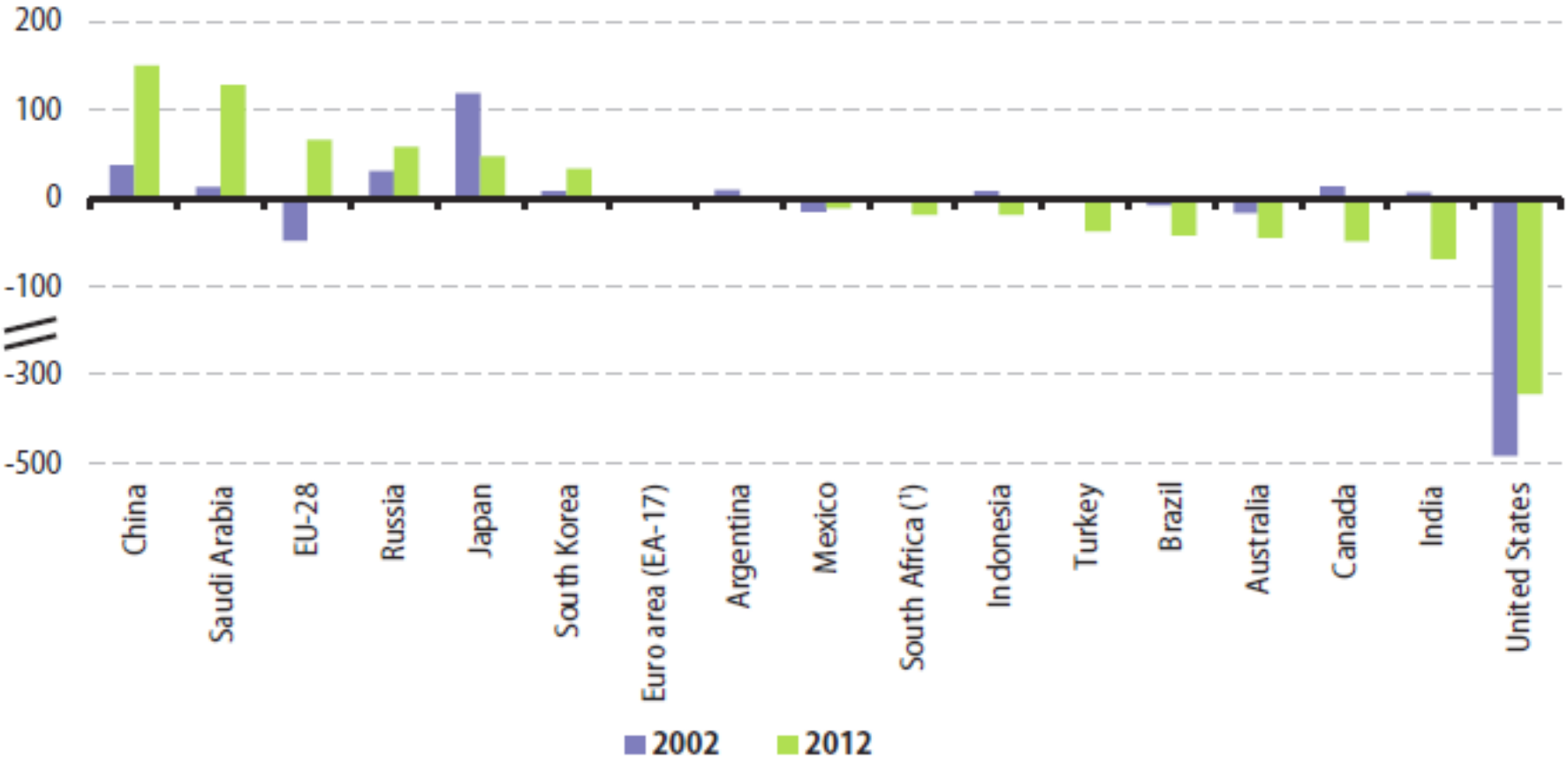
| | Goods | | | Services | | |
|---|---|---|---|---|---|---|
| | Credits | Debits | Balance | Credits | Debits | Balance |
| **EU-28** | 13.1 | 13.6 | -0.4 | 5.1 | 3.9 | 1.2 |
| Argentina | 17.0 | 14.4 | 2.6 | 3.2 | 3.9 | -0.7 |
| Australia | 16.4 | 16.7 | -0.3 | 3.4 | 4.1 | -0.7 |
| Brazil | 10.8 | 10.3 | 0.4 | 1.8 | 3.6 | -1.8 |
| Canada | 25.0 | 26.1 | -1.1 | 4.3 | 5.8 | -1.5 |
| China | 24.5 | 21.7 | 2.8 | 2.3 | 3.4 | -1.1 |
| India | 15.7 | 26.1 | -10.4 | 7.5 | 6.8 | 0.7 |
| Indonesia | 21.4 | 21.7 | -0.2 | 2.6 | 3.9 | -1.2 |
| Japan | 13.4 | 14.9 | -1.5 | 2.4 | 3.0 | -0.5 |
| Mexico | 31.3 | 32.1 | -0.8 | 1.4 | 2.5 | -1.1 |
| Russia | 26.3 | 16.7 | 9.6 | 2.9 | 5.3 | -2.3 |
| Saudi Arabia | 54.6 | 21.9 | 32.7 | 1.6 | 10.3 | -8.8 |
| South Africa | 22.7 | 32.3 | -9.6 | 3.9 | 4.6 | -0.7 |
| South Korea | 48.5 | 46.0 | 2.5 | 9.8 | 9.6 | 0.2 |
| Turkey | 19.4 | 30.1 | -10.7 | 5.4 | 2.6 | 2.8 |
| United States | 9.5 | 14.4 | -4.9 | 3.9 | 2.7 | 1.2 |

(1) EU-28: extra-EU flows. Other countries: flows with the rest of the world.

*Source:* Eurostat (online data codes: bop_q_eu and nama_gdp_c), the World Bank (World Development Indicators, based on International Monetary Fund (Balance of Payments Statistics Yearbook and data files), World Bank and OECD (GDP estimates))

**Figure 6.8:** Current account balance, 2002 and 2012

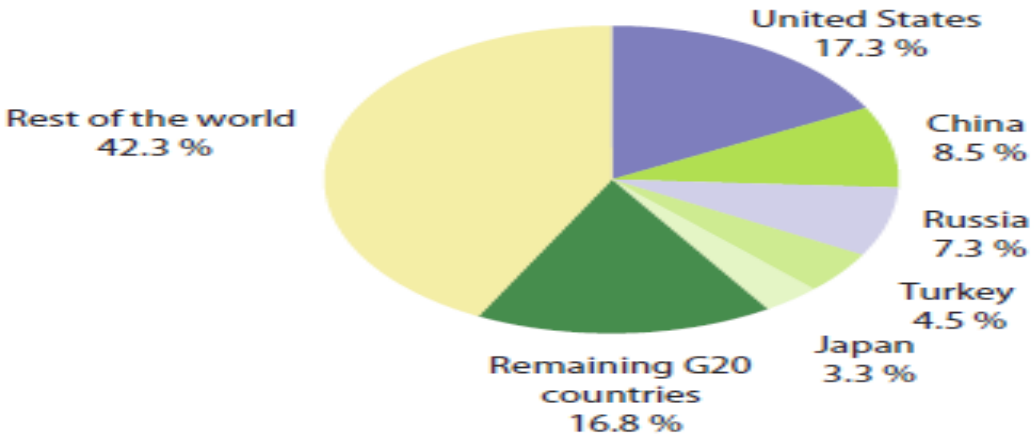
(EUR billion)




(1) 2012: estimates.

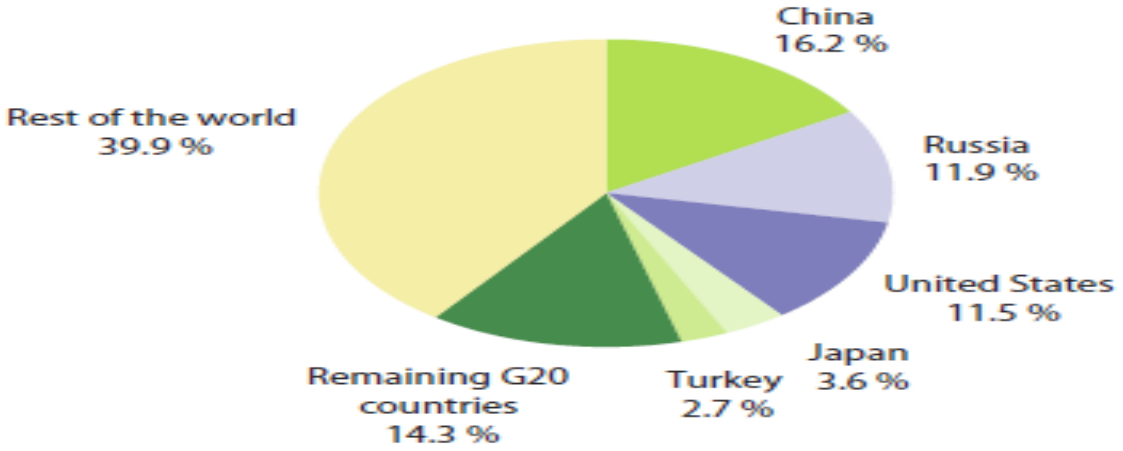
*Source:* Eurostat (online data codes: bop_q_eu, bop_q_euro and nama_gdp_c) and the International Monetary Fund (World Economic Outlook, 2013)

**Figure 7.3:** Main G20 trading partners for EU-27 exports of goods, 2012
(% share of extra-EU-27 exports)




*Source:* Eurostat (online data code: ext_lt_maineu)

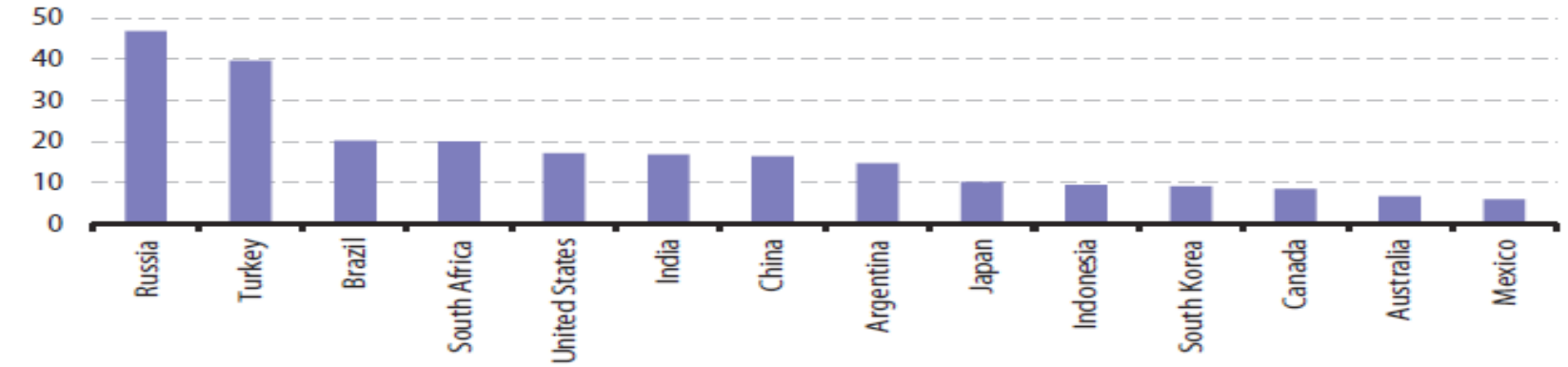
**Figure 7.4:** Main G20 trading partners for EU-27 imports of goods, 2012
(% share of extra-EU-27 imports)




*Source:* Eurostat (online data code: ext_lt_maineu)

**Figure 7.5:** Share of EU-28 as destination for all goods exported, 2012 (1)

(%)

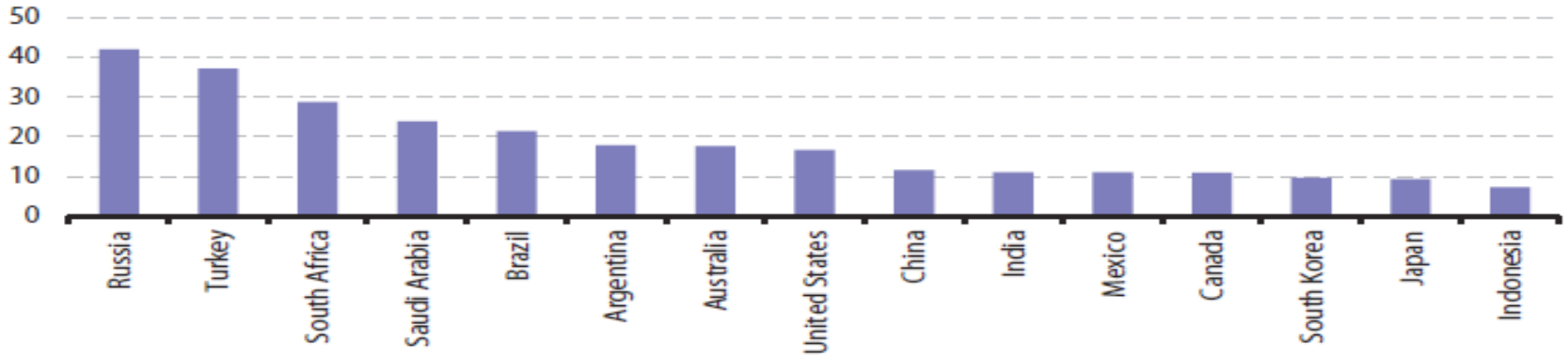



(1) Saudi Arabia: not available.

*Source:* the United Nations (Comtrade)

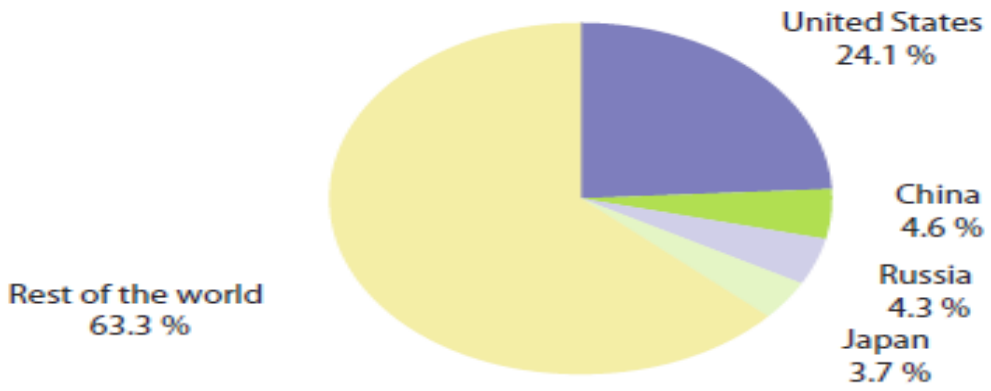
**Figure 7.6:** Share of EU-28 as origin of all goods imported, 2012

(%)



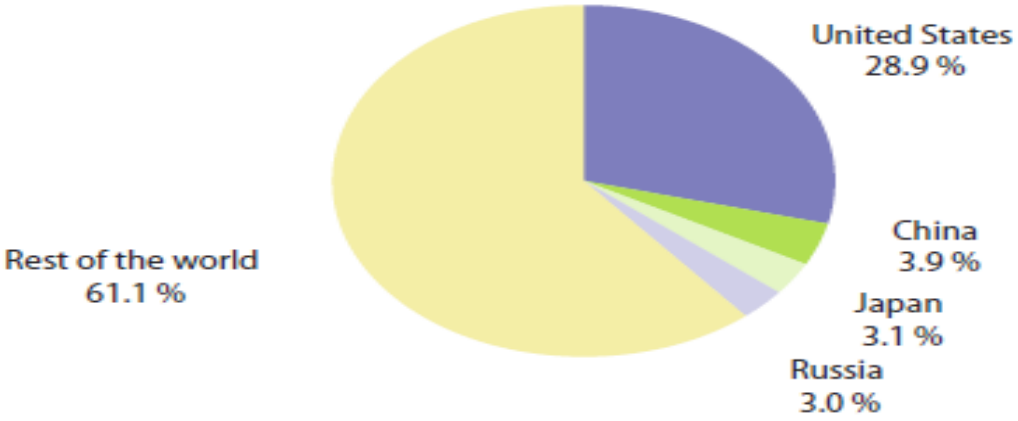

*Source:* the United Nations (Comtrade)

**Figure 7.7:** Selected G20 trading partners for EU-27 exports of services, 2012 (1)
(% share of extra-EU-27 exports)




(1) Provisional.
*Source:* Eurostat (online data code: bop_its_ybk)

**Figure 7.8:** Selected G20 trading partners for EU-27 imports of services, 2012 (1)
(% share of extra-EU-27 imports)




(1) Provisional.
*Source:* Eurostat (online data code: bop_its_ybk)

## I sistemi nazionali di innovazione (SIN)

Le attività tramite le quali un'impresa introduce nuovi processi produttivi e crea nuovi prodotti sono influenzate dalle infrastrutture economiche e sociali e dal contesto istituzionale in cui le imprese agiscono.

Lo studio dei sistemi nazionali di innovazione si è occupato dei fattori istituzionali, che hanno determinato la diversità tra i paesi in termini di performance innovativa delle imprese. Esso consiste nello **studio dei meccanismi di coevoluzione** tra: a) lo sviluppo dei **sentieri nazionali di specializzazione** e b) il **vantaggio competitivo e c)** lo sviluppo delle **competenze all'interno delle imprese** e d) l'evoluzione della **struttura istituzionale** (Gran Bretagna, Stati Uniti, Germania, Giappone) (cfr dati Eurostat).

Tra i fattori che hanno condizionato il diverso sviluppo economico e tecnologico dei singoli paesi in specifiche fasi storiche in alcuni paesi (Germania) sono: lo sviluppo di un **efficiente sistema educativo e della formazione professionale**, la diffusione di **industrie di beni strumentali**, la creazione di **grandi laboratori di ricerca**, la realizzazione di **reti di infrastrutture di trasporto e comunicazione**, l'adozione di **innovazioni di tipo organizzativo** (taylorismo), lo sviluppo di strette **relazioni industria-università** (formazione di tecnici e stimolo ad innovazioni radicali) (cfr dati Eurostat).

**L'insieme delle organizzazioni, istituzioni e infrastrutture di supporto** all'attività innovativa delle imprese costituisce **un sistema nazionale o locale dell'innovazione (Freeman 1987).**

I sistemi di innovazione nazionali e locali sono diversi non solo in termini di **performance innovativa**, ma anche in termini di **connettività**, cioè di efficacia nella **creazione e trasmissione della conoscenza e delle competenze** tra le imprese e le diverse istituzioni e organizzazioni.

## Gli elementi di un sistema nazionale di innovazione

**Un sistema di innovazione nazionale** è dato da un **insieme di componenti economiche e sociali tra loro interrelate**, che contribuisce a **spiegare il comportamento innovativo delle imprese**. Si tratta di **un approccio eclettico e aperto**, in gran parte influenzato dalle **teorie evolutive**.

**Il sistema innovativo nazionale rappresenta una rete di istituzioni del settore pubblico e privato** le cui attività e interazioni introducono, importano, modificano e diffondono **le nuove tecnologie** (Freeman 1987, Nelson e Rosenberg 1993).

Secondo **un'accezione più ampia**, **il sistema innovativo nazionale** può includere **tutti gli aspetti della struttura istituzionale che influenzano l'apprendimento** e la ricerca del **cambiamento**. **L'apprendimento interattivo** è favorito dalla **struttura delle relazioni clienti-fornitori**, dalle **relazioni tra le imprese e tra imprese e organizzazioni** (Lundvall 1992).

In questo contesto **l'innovazione è definita in termini ampi**, come capacità di **sviluppare prodotti e processi** che sono **nuovi per l'impresa**, anche se si tratta di innovazioni che **non spostano la frontiera della tecnologia** a scala globale.

**Le istituzioni sono tutti gli usi, i costumi, le regole, i sistemi giuridici, le norme consolidate e le leggi** che regolano le interazioni tra le persone e le imprese.

Le istituzioni assicurano un certo grado di **stabilità istituzionale, culturale e organizzativa** e perciò riducono l'**incertezza** e l'ammontare di **informazioni necessarie** per le scelte e le azioni e permettono di immagazzinare e trasferire conoscenza.

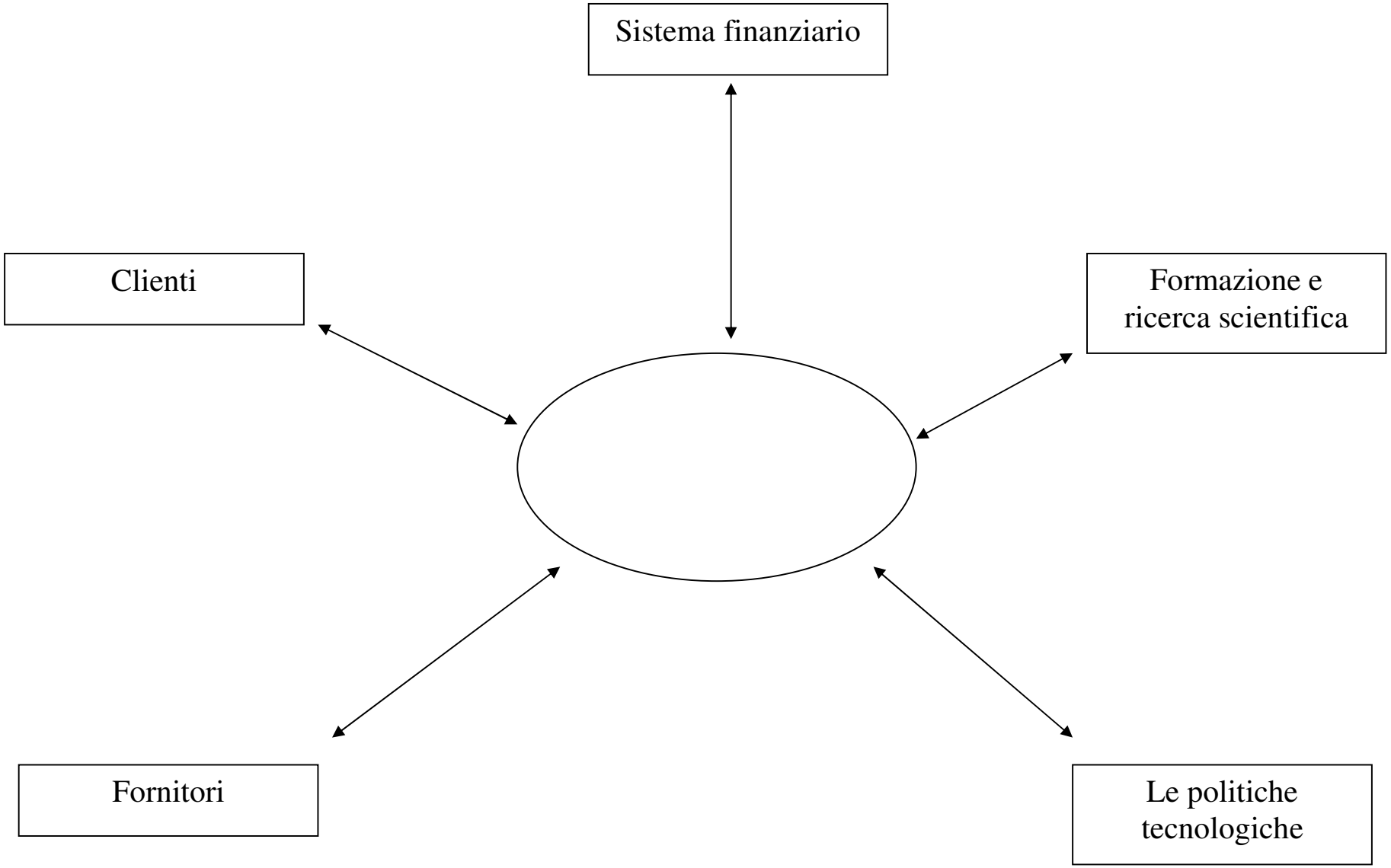
Tra le **organizzazioni o i fattori** più rilevanti sono quindi: **i clienti e i fornitori, le istituzioni pubbliche** dei diversi livelli e le loro politiche tecnologiche, **le istituzioni di formazione e ricerca,** come le università e i laboratori di ricerca pubblici e privati, **le banche e gli altri intermediari finanziari** ed anche **il sistema dei servizi alle imprese specialistici, il sistema delle relazioni industriali e dei rapporti tra imprese e lavoratori e sindacati, il sistema a rete di collaborazioni produttive e tecnologiche e di compartecipazioni finanziarie tra le imprese**.

La crescita italiana è stata minore di quella di quasi tutti i paesi europei da quasi 20 anni. Infatti, l'OCSE stima (cfr. Looking to 2060: Long-term growth prospects for the world, http://stats.oecd.org/Index.aspx?DataSetCode=EO91_LTB ) che l'Italia è cresciuta nel periodo 1995-2011 solo dell'1%, meno di Francia (1,7%) e Germania (1,4%), e prevede che crescerà solo dell'1,3% nel periodo 2011-2030, meno di tutti i paesi europei, Grecia inclusa.

Nella prospettiva della teoria dei sistemi nazionali dell'innovazione, il basso tasso di crescita del "sistema di innovazione" o dell'economia italiana negli ultimi decenni è stato determinato dalle inadeguate politiche in Italia seguite negli ambiti:

- il mercato del lavoro e il sistema delle relazioni industriali imprese-sindacato
- la pubblica amministrazione
- la ricerca scientifica e università e politiche della innovazione
- il sistema bancario e finanziario
- gli investimenti in innovazione delle piccole e medie imprese
- i M&A tra grandi imprese

e non solo nelle politiche macroeconomiche, fiscali e monetarie.


Sistema finanziario
Clienti
Formazione e ricerca scientifica
Fornitori
Le politiche tecnologiche

## Una visione stilizzata del sistema nazionale/locale dell'innovazione
## Le interazioni tra le imprese: le interazioni cliente-fornitore (ICF)

**Il progresso tecnologico rappresenta un processo generalmente cumulativo** che tende a svilupparsi secondo una traiettoria in larga parte determinata dal **quadro cognitivo degli agenti coinvolti**. In questo processo **l'apprendimento interattivo** rappresenta uno dei modi tramite i quali le imprese gestiscono una conoscenza che è in parte tacita e specifica alle singole imprese.

**Le imprese possono trarre vantaggio da rapporti stabili con i clienti e con in fornitori**, al fine di mettere in moto meccanismi di confronto e di **apprendimento interattivo** riguardo alle necessità degli utilizzatori e alle opportunità tecnologiche emergenti e fattibilità economica e tecnica dei nuovi processi.

**Quanto maggiore è la velocità del cambiamento e l'incertezza, tanto maggiore è l'importanza della stabilità delle relazioni**, che permette lo sviluppo di linguaggi e codice di comunicazione comune e di relazioni personali e informali, permette **risparmi in termini di costi di transazione** e riduce i costi legati ad **asimmetrie informative**, quali i rischi di **comportamenti opportunistici** e fenomeni di **selezione avversa**.

**Il fenomeno per cui la parte meno informata si trova a trattare con le persone che dovrebbe evitare** (vendita di auto usate, contratti di assicurazione) si chiama "**selezione avversa**". Gli agenti più informati si autoselezionano in modo da determinare un danno per la parte meno informata (**situazione *ex ante*).**

Inoltre, in un contesto di incertezza e di **difficoltà di controllo** (**moral hazard**) alcuni soggetti potrebbero **essere incentivati a tenere un comportamento sleale** (opportunismo e scarso impegno di un manager scorretto), salvo attribuire il risultato non positivo ad eventi casuali (**situazione *ex post*).**

## Le interazioni tra imprese: le interazioni verticali e orizzontali

Considerando le **relazioni verticali (nella filiera produttiva),** lo sviluppo di attività innovative è favorito dalla **presenza in un dato paese o regione di clienti e produttori di componenti competenti**, che abbiano la capacità di formulare problemi e richieste in maniera appropriata.

Invece, le **interazioni orizzontali (sul territorio ma anche a scala nazionale) tra le imprese** nel processo innovativo possono essere date dalle **attività di cooperazione tecnologica** tra imprese oppure da **meccanismi competitivi**.

I processi di tipo interattivo sono favoriti da una **ridotta distanza geografica e culturale.** Pertanto, le relazioni cliente-fornitore possono essere influenzate da **fattori nazionali specifici**, quali la presenza di **network locali di imprese**, composti principalmente da piccole e medie imprese appartenenti allo stesso settore. Le relazioni tra le imprese sono facilitate dall'**omogeneità sociale e culturale**, che favorisce la **diffusione di modelli organizzativi e di tecnologie appropriate**.

Gli accordi di cooperazione consentono di **mettere insieme le limitate risorse dedicate alla ricerca** delle singole imprese e di avere accesso a competenze chiave per lo sviluppo della conoscenza scientifica. I processi di tipo interattivo sono facilitati dagli **accordi di cooperazione** che creano una situazione in cui le **relazioni sono personalizzate, stabili e di reciproca fiducia**. Tali situazioni possono avere un **carattere locale o nazionale**, dato che la gran parte delle attività di cooperazione tra le imprese avviene a scala locale o nazionale.
Nei singoli paesi emergono **diverse forme delle relazioni tra le imprese** che hanno favorito la cooperazione tra le stesse. Ad esempio il "network" fatto da interazioni ripetute e da **forti legami di integrazione** delle imprese **nella Silicon Valley (California)** contrasta con la **mera concentrazione**, senza effetti significativi di sinergia, tipico della **Route 128 (Boston), che non ha portato alla creazione di un network**.

I **grandi gruppi industriali giapponesi** sono caratterizzati da soluzioni istituzionali come il **possesso incrociato di azioni** e l'esistenza di momenti specifici di **incontro dei dirigenti aziendali**, dalla condivisione di personale, servizi e attrezzature.

Lo sviluppo della cooperazione può essere giustificato dalla intenzione di **proteggere talune tecnologie chiave**. Inoltre, la cooperazione può tradursi in **strutture oligopolistiche altamente concentrate**, che distorcono il mercato.

**L'assetto istituzionale in Giappone** sembra aver favorito (Freeman 1987) un tipo di **concorrenza fondata sul progresso tecnico, la qualità e la differenziazione del prodotto** e aver incoraggiato la formazione, la ricerca e le scelte di investimento.

**In Asia mercati regolamentati al fine di proteggere e promuovere industrie allo stato nascente ("infant industries")** possono aver **stimolato l'apprendimento cumulativo e lo sviluppo di competenze** tecniche a scala nazionale.

Un **mercato dei capitali orientato al profitto di breve periodo ("shareholder value")**, una **competitività basata principalmente sui costi** non forniscono incentivi adeguati per **scelte di investimento orientate verso obiettivi di lungo periodo.**

**I modelli competitivi** sono forme istituzionali socialmente costruite e storicamente determinate la cui architettura dipende, in parte, da **scelte di politica industriale**.

## Le istituzioni di ricerca scientifica e il sistema educativo

Alcuni **settori (science based)** sono nati sotto la **spinta esogena (technology push) di nuove scoperte scientifiche**, come ad esempio l'elettricità, la radio e la televisione. In molti altri casi, come nel settore chimico e nel settore aeronautico, sono state **le nuove tecnologie produttive e lo sviluppo di nuovi processi produttivi** a stimolare la ricerca scientifica e a stimolare **l'apertura di nuovi campi di ricerca** (**demand pull)**.
Un ruolo fondamentale nell'**interfaccia tra le scoperte scientifiche ed il cambiamento tecnologico** interno alle imprese è svolto dallo sviluppo delle cosiddette **scienze di trasferimento (transfer sciences**). Le scienze di trasferimento hanno lo scopo di risolvere problemi strettamente connessi con l'attività economica (**ingegneria meccanica, civile, elettrica e chimica, ottica, laser, microelettronica, robotica, scienze informatiche, biotecnologia, microbiologia, chimica e farmaceutica**). In questi campi la ricerca viene finanziata in gran parte dall'industria e **la comunità degli scienziati in tali campi è strettamente legata alla comunità economica**, che ha un interesse immediato nella applicazione dei risultati ottenuti.

Le **competenze tecnico-scientifiche** vengono sviluppate dalle imprese grazie al **rapporto con il sistema educativo, come le università**, e attraverso lo scambio di conoscenza e di personale con **laboratori e centri di ricerca pubblici e privati**. Pertanto, le istituzioni che si occupano dell'avanzamento della frontiera della conoscenza **devono essere studiate in stretta relazione con il tessuto produttivo in cui sono integrate**.

**L'università fornisce** **a**) **cultura generale** in campo tecnologico, b) **specifiche competenze** tecniche-scientifiche, c) **ricerca scientifica** di base e applicata. L'intensità e la **rilevanza dell'interazione tra università e industria** cambia considerevolmente nel tempo, nei diversi paesi, lungo i diversi stadi di vita del prodotto e a seconda dei settori. In tempi recenti, le università hanno sviluppato il **cosiddetto "terzo settore" ("third stream")** che accanto alla formazione e alla ricerca assegna un ruolo istituzionale al **trasferimento tecnologico e alla collaborazione università-imprese**.

## Il ruolo del sistema finanziario

Il finanziamento dei costi di ricerca e sviluppo pone il problema della **percepibilità e visibilità dei costi** che l'impresa deve sostenere e di valutare i flussi futuri di reddito attesi dai progetti di RS.

Nel rapporto tra il finanziatore e l'impresa si pongono problemi di "**selezione avversa"** (non disponibilità di informazioni corrette sugli obiettivi dei manager) e di "**moral hazard"** (non disponibilità di informazioni corrette sulle azioni dei manager). L'esistenza di "**fallimenti del mercato**" dei capitali possono determinare **la situazione in cui non vengano finanziati progetti di investimento,** che pur hanno un valore attuale netto atteso positivo.

Il **finanziamento sub-ottimale dei programmi di ricerca e sviluppo** può essere determinato da **un tasso di sconto troppo elevato** (accorciamento dell'orizzonte temporale), dovuto al prevalere di una **logica speculativa di breve periodo**, come è tipico del **mercato borsistico** che dà priorità ai profitti di breve periodo.

I **sistemi bank-based** sembrano incorrere meno nel **rischio dello "short-terminism"** (miopia). La **proprietà: famiglie e banche (** o il **"private equity")**, mantiene un controllo più diretto sulle imprese e con esso la capacità e la volontà di valutare le prospettive di lungo periodo. Le **relazioni stabili tra finanziatori e imprese favoriscono la comunicazione, la fiducia e la conoscenza e riducono il grado di asimmetria informativa** e quindi il rischio di selezione avversa e di comportamenti opportunistici. Prestiti a lungo termine sono concessi in cambio di una **rinuncia ad una totale autonomia da parte del management delle imprese**.

Peraltro, **se la tecnologia cambia velocemente e la tecnologia è incorporata in nuove imprese**, **l'investimento diventa molto rischioso**. In questo caso **un sistema basato su relazioni stabili può non essere adeguato**.

E' preferibile che gli investitori abbiano **un portafoglio più diversificato** e mirino esplicitamente al **sostegno di imprese nuove piuttosto che delle imprese consolidate**, come nel caso del "**venture capital"**.

## Il ruolo del governo e la politica tecnologica

Le politiche tecnologiche possono influenzare le performance innovative delle imprese e dei paesi. Le politiche tecnologiche possono mirare a:

a) creazione e sviluppo di una **tecnologia specifica**, come nel caso del **sostegno a specifiche imprese** ("**campioni nazionali**"),
b) creazione di **infrastrutture specifiche**, che promuovano il cambiamento tecnico ("**centri di competenza**").

Lo strumento più utilizzato è il **finanziamento della attività di RS**. Più di un terzo della spesa in RS nei paesi OCSE è finanziata dal governo.

In alcuni paesi la **spesa pubblica** in RS è orientata ad **obiettivi militari** (Stati Uniti, Gran Bretagna, Francia, non in Giappone).

La RS militare ha beneficiato l'industria civile quando ha aperto **lo sviluppo di nuove tecnologie generiche** (elettronica), non quando è stata orientata allo sviluppo di prodotti di specifico interesse della difesa militare.

Altri governi hanno sviluppato politiche orientate direttamente alla **protezione di industrie nascenti** e allo **sviluppo della industria nazionale** (Giappone).

Inoltre, i governi possono **influire in modo indiretto** sulla propensione delle imprese ad innovare, tramite lo **sviluppo delle competenze tecniche** assicurato dal **sistema educativo** e tramite la **regolazione del grado di esposizione alla concorrenza internazionale**.

Spesso i governi regionali e quelli nazionali hanno adottato politiche volte alla **creazione di infrastrutture specialistiche, come poli tecnologici,** incubatori, università specializzate, programmi di ricerca comune fra università e industria, seminari, fiere, enti, fondazioni, associazioni, infrastrutture fisiche, uffici, parchi scientifici, attrezzature, laboratori, centri di competenza.

Le politiche pubbliche possono **promuovere la connettività tra le diverse istituzioni**, gli accordi di cooperazione tra le imprese e gli istituti di ricerca scientifica e tecnologica, fra imprese e università, anche tramite **contratti di collaborazione** e la **mobilità del personale** fra imprese e centri di ricerca.

**In Giappone il MITI** (ministero del commercio internazionale e dell'industria) ha orientato le politiche a **investimenti di lungo periodo** in tecnologie avanzate e in formazione di competenze.

Le politiche del MITI si sono basate sul **riconoscimento dell'importanza delle esternalità** e degli investimenti in infrastrutture nei processi innovativi. **Infatti, l'intervento del MITI è stato altamente decentralizzato e focalizzato sulle esigenze locali**, con la creazione di circa 200 laboratori di supporto e consulenza tecnica alle imprese.

**L'intervento pubblico è diverso nei "Liberal Market Systems" e nei "Coordinated Market Systems"** (Hall and Soskice, 2001),

The countries of **Continental and North Europe and Japan**, which may be defined as "coordinated market economies" (Hall and Soskice, 2001), are different from the "liberal market economies", such as the **United States, Great Britain and other Anglo-Saxon countries**. In the former countries many economic and social conflicts between the various firms and actors are solved through the design and adoption of solutions, based on the balance of the conflicting interest of various stakeholders or on the so called "governance" model (Cappellin and Wink 2009). This model of regulation of the social relationships is distinct from the "free market" or competition model and the "government" or hierarchical model.

## Le politiche anti-trust e della proprietà intellettuale

Le politiche pubbliche influiscono sulla attività innovativa anche tramite le politiche di **tutela della concorrenza** e la **tutela dei diritti di proprietà intellettuale**.

La **politica anti-trust negli USA** ha facilitato **l'ingresso di nuove imprese in settori ad alta opportunità tecnologica** come la microelettronica, ha scoraggiato la crescita tramite l'acquisizione di altre grandi imprese, stimolando così l'attività interna di ricerca e sviluppo. Peraltro la politica della concorrenza **potrebbe ostacolare le possibilità di cooperazione tecnologica** e ostacolare l'innovazione e il miglioramento della performance di un paese.

Un'**efficiente legislazione brevettuale** favorisce l'appropriazione dei benefici del cambiamento tecnologico e quindi **stimola l'attività innovativa delle imprese**. Peraltro, una tutela dei brevetti troppo stringente **potrebbe ostacolare la diffusione della conoscenza** e la diffusione delle nuove tecnologie.

**Le piccole e medie imprese nella microelettronica e nelle biotecnologie** si sono potute sviluppare nel secondo dopoguerra grazie anche ad un **sistema di protezione della proprietà intellettuale più permissivo**, che le ha tenute al riparo da costose cause giuridiche.

**La diffusione della conoscenza e l'adozione di innovazioni incrementali** sono favorite da un'alta propensione a brevettare da parte delle imprese, da un **sistema dei brevetti caratterizzato da costi limitati**, da **un basso grado di novità richiesta e da una durata limitata nel tempo.**

## Le politiche europee per l'innovazione

In Europa si è assistito ad un'evoluzione dal **sostegno ai "campioni nazionali**" alla creazione di **reti di relazioni di ricerca**.

Programmi europei, come Esprit, **promuovono la collaborazione tra le grandi imprese**, ma possono rafforzare la struttura oligopolistica del mercato.

Sono state promosse **reti di innovatori** in diversi settori:
- "big science" e attività di **ricerca pre-competitiva**,
- settori di **priorità tecnologica**,
- **network locali**.

Si è assistito ad un effettivo **allargamento della partecipazione ai network**, ma i risultati in termini di performance innovativa complessiva sono tuttora insufficienti

## Il paradosso europeo

**L'Europa dimostra una performance scientifica migliore della propria performance tecnologica** rispetto agli USA. Peraltro, l'Europa è caratterizzata da una **debolezza relativa nelle discipline scientifiche nuove** e direttamente rilevanti per l'innovazione industriale, come alcuni segmenti dell'**information technologies e biologia molecolare**.

Inoltre, **l'Europa è caratterizzata da minori investimenti in R&S** e da un minore numero di ricercatori, ingegneri e tecnici.

**Aree di svantaggio relativo** dell'Europa sono quelle dell'**elettronica (tranne le telecomunicazioni**), **biotecnologie** e tecnologie legate allo **sfruttamento delle risorse naturali**.
L'Europa presenta invece un **vantaggio relativo** in settori quali i **macchinari industriali, auto, chimica (e aeronautica)**.

Peraltro, esistono **forti differenze tra i diversi paesi europei.**

Gli ostacoli maggiori all'innovazione nel contesto europeo sono:
- **insufficiente ricerca industriale** e dispersione degli sforzi,
- **inadeguata valorizzazione delle risorse umane**: sistemi di istruzione e formazione, mobilità di studenti e ricercatori,
- **strutture di finanziamento all'innovazione arretrate**: grandi imprese, banche, venture capital,
- scarsa **tutela dei diritti di proprietà intellettuale**,
- **inadeguata propensione all'innovazione di molte PMI** ma anche di molte grandi imprese,
- **scarsa efficacia della domanda pubblica** (assenza della spesa militare).

## THE FOUR PHASES OF TRANSFORMATION OF THE EUROPEAN PRODUCTION SYSTEM

In summary, the following four phases can be observed in the long term change of the European productive structure:

1. the large **Fordist company** (60s and 70s),

2. the **flexible specialization of SMEs** (70s-80s),

3. the outsourcing of industrial productions and the increasing integration **between manufacturing and service productions within the companies** (80s-90s),

4. the economy driven by the **creation of new HT products** and **the tight interaction between the producers with the consumers,** to respond to the new emerging demands of the consumers. That requires **interactive learning processes** and the **tight interaction** also through new communication technologies and **exchange of knowledge**, between the various companies and between these latter and the end and intermediate consumers (2000s).

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## THE CHANGES IN THE MODELS OF INDUSTRIAL POLICY

**The industrial policy models have undergone continuous evolution** over the last 60 years. That is largely connected with the evolution of technologies and of specializations and therefore with the change in the **problems of the industrial system**.

a)**public aid** policy and fiscal and financial incentives to companies,
b) **competition policy**,
c)**vertical policies** in the sectors and production chains,
d) **horizontal policies** on external factors of competitiveness,
e)policies for individual companies as **national champions** or **SMEs**,
f) financial policies through **credit or equity (M&A)**
g) policies for **industrial districts**
h) policies of the **centres of competence and growth poles**
i) policies of **"smart specializations"** and **intangible investments in education**,
j) **public procurement** policies
k) fiscal and financial incentives for the **creation of new markets driven by lead users**
l) policies of **national / regional innovation systems and of quadruple helix model**

# APPENDICE

INDUSTRIAL POLICY FOR THE TWENTY-FIRST CENTURY*
Dani Rodrik Harvard University
John F. Kennedy School of Government79 Kennedy Street
Cambridge, MA 02138
(617) 495-9454
Fax: (617) 496-5747
E-mail: dani_rodrik@harvard.edu http://www.ksg.harvard.edu/rodrik/
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COMMISSION STAFF WORKING DOCUMENT
Annual Single Market Report 2021
*Accompanying the*
Communication from the Commission to the European Parliament, the Council, theEuropean Economic and Social Committee and the Committee of the Regions
Updating the 2020 New Industrial Strategy: Building a stronger Single Market forEurope's recovery
{COM(2021) 350 final} - {SWD(2021) 352 final} - {SWD(2021) 353 final}

# INDUSTRIAL POLICY FOR THE TWENTY-FIRST CENTURY*

Dani Rodrik Harvard University

John F. Kennedy School of Government79 Kennedy Street
Cambridge, MA 02138
(617) 495-9454
Fax: (617) 496-5747
E-mail: dani_rodrik@harvard.edu http://www.ksg.harvard.edu/rodrik/

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## I. Introduction

Once upon a time, economists believed the developing world was full of market failures, and the only way in which poor countries could escape from their poverty traps was through forceful government interventions. Then there came a time when economists started to believe government failure was by far the bigger evil, and that the best thing that government could do was to give up any pretense of steering the economy. Reality has not been kind to either set of expectations. Import substitution, planning, and state ownership did produce some successes, but where they got entrenched and ossified over time, they led to colossal failures and crises. Economic liberalization and opening up benefited export activities, financial interests, and skilled workers, but more often than not, they resulted in economy-wide growth rates (in labor and total factor productivity) that fell far short of those experienced under the bad old policies of the past.

Few people seriously believe any more that state planning and public investment can act as the driving force of economic development. Even economists of the left share a healthy respect for the power of market forces and private initiative. At the same time, it is increasingly recognized that developing societies need to embed private initiative in a framework of public action that encourages restructuring, diversification, and technological dynamism beyond what market forces on their own would generate. Perhaps not surprisingly, this recognition is now particularly evident in those parts of the world where market-oriented reforms were taken the farthest and the disappointment about the outcomes is correspondingly the greatest—notably in Latin America.[1]

[1] See for example de Ferranti et al. (2002). This is a report put out by the Latin America and Caribbean department of the World Bank. It is cognizant of the need to adopt some kind of industrial policies in order to generate technological dynamism in the region.

Therefore we now confront a rare historic opportunity. The softening of convictions on both sides presents an opening to fashion an agenda for economic policies that takes an intelligent intermediate stand between the two extremes cited above. Market forces and private entrepreneurship would be in the driving seat of this agenda, but governments would also perform a strategic and coordinating role in the productive sphere beyond simply ensuring property rights, contract enforcement, and macroeconomic stability.

This paper is a contribution to one component of such an agenda, focusing on policies for economic restructuring. Such policies have been called in the past "industrial policies," and for lack of a better term, I will continue to call them as such. I will use the term to apply to restructuring policies in favor of more dynamic activities generally, regardless of whether those are located within industry or manufacturing per se. Indeed, many of the specific illustrations in this paper concern non-traditional activities in agriculture or services. There is no evidence that the types of market failures that call for industrial policy are located predominantly in industry, and there is no such presumption in this paper.

The nature of industrial policies is that they complement—opponents would say "distort"—market forces: they reinforce or counteract the allocative effects that the existing markets would otherwise produce. The objective of this paper is to develop a framework for conducting industrial policy that maximizes its potential to contribute to economic growth while minimizing the risks that it will generate waste and rent-seeking.

I shall argue that in order to achieve this objective we need to think of industrial policy in a somewhat different light than is standard in the literature. The conventional approach to industrial policy consists of enumerating technological and other externalities and then targeting policy interventions on these market failures. The discussion then revolves around the

administrative and fiscal feasibility of these policy interventions, their informational requirements, their political-economy consequences, and so on. I start also from generic market failures, but then I take it as a given that the location and magnitude of these market failures is highly uncertain. A central argument of this paper is that the task of industrial policy is as much about eliciting information from the private sector on significant externalities and their remedies as it is about implementing appropriate policies. The right model for industrial policy is not that of an autonomous government applying Pigovian taxes or subsidies, but of strategic collaboration between the private sector and the government with the aim of uncovering where the most significant obstacles to restructuring lie and what type of interventions are most likely to remove them. Correspondingly, the analysis of industrial policy needs to focus not on the policy *outcomes*—which are inherently unknowable ex ante—but on getting the policy *process* right. We need to worry about how we design a setting in which private and public actors come together to solve problems in the productive sphere, each side learning about the opportunities and constraints faced by the other, and not about whether the right tool for industrial policy is, say, directed credit or R&D subsidies or whether it is the steel industry that ought to be promoted or the software industry.

Hence the right way of thinking of industrial policy is as a discovery process—one where firms and the government learn about underlying costs and opportunities and engage in strategic coordination. The traditional arguments against industrial policy lose much of their force when we view industrial policy in these terms. For example, the typical riposte about governments' inability to pick winners becomes irrelevant. Yes, the government has imperfect information, but as I shall argue, so does the private sector. It is the information externalities generated by ignorance in the private sector that creates a useful public role—even when the public sector has

worse information than the private sector. Similarly, the idea that governments need to keep private firms at arms' length to minimize corruption and rent-seeking gets turned on its head. Yes, the government needs to maintain its autonomy from private interests. But it can elicit useful information from the private sector only when it is engaged in an ongoing relationship with it—a situation that has been termed "embedded autonomy" by the sociologist Peter Evans (1995).

It is innovation that enables restructuring and productivity growth. A second key theme of this paper is that innovation in the developing world is constrained not on the supply side but on the demand side. That is, it is not the lack of trained scientists and engineers, absence of R&D labs, or inadequate protection of intellectual property that restricts the innovations that are needed to restructure low-income economies. Innovation is undercut instead by lack of demand from its potential users in the real economy—the entrepreneurs. And the demand for innovation is low in turn because entrepreneurs perceive new activities to be of low profitability.

I will discuss the reasons for this conjecture in greater detail in section II, but a useful analogy to keep in mind is with education and human capital. For quite a while, policy makers thought that the solution to poor human capital lay in improving the infrastructure of schooling—more schools, more teachers, more textbooks, and more access to all three. These interventions did increase the supply of schooling, but when the results were in, it became evident that the increase in schooling did not produce the productivity gains that were anticipated (Pritchett 2004). The reason is simple. The real constraint was the low *demand* for schooling—that is, the low propensity to acquire learning—in environments where the absence of economic opportunities depress the return to education. Similarly, an expansion of an economy's scientific and technological capacity will not endow it with the needed productive dynamism unless there

is adequate demand for innovation by the business sector.

The plan of the paper is as follows. In section II, I review the main arguments in favor of industrial policy, emphasizing the pervasive role of market failures that result in the under-provision of entrepreneurship in pursuit of structural change. The standard rationale for industrial policy is technological externalities, either static or dynamic in the form of learning-by-doing that is external to firms. I will emphasize two other market failures which I believe are far more rampant: information externalities entailed in discovering the cost structure of an economy, and coordination externalities in the presence of scale economies. In section III, I turn to the institutional requirements for an effective industrial policy. I will argue here that getting the institutional setting right, with an adequate balance between autonomy and embeddedness on the part of government officials, is far more important than worrying about the precise policy instruments to be deployed. I will also provide some architectural and design guidelines for institutionalizing industrial policies and describe an illustrative range of programs.

In section IV, I discuss existing industrial policy programs and evaluate them in light of the foregoing discussion. Unlike what is commonly believed, the last two decades have not seen the twilight of industrial policy. Instead, incentives and subsidies have been refocused on exports and direct foreign investment, in the belief (largely unfounded, as it turns out) that these activities are the source of significant positive spillovers. Therefore, the challenge in most developing countries is not to rediscover industrial policy, but to redeploy it in a more effective manner. Finally, section V asks whether the practice of industrial policy remains feasible under today's international rules of the game. I discuss the range of constraints that are embodied in multilateral, regional, and bilateral agreements. I emphasize that most of these constraints—with the significant exception of the WTO Agreements on Subsidies and TRIPS—are either voluntary

or do not bind in a significant way. What stands in the way of coherent industrial policy is the willingness of governments to deploy it, not their ability to do so.

## II. Why Industrial Policy?

In an important article published in the *American Economic Review*, Jean Imbs and Romain Wacziarg (2003) examined the patterns of sectoral concentration and diversification in a large cross-section of countries. They uncovered an important regularity in their data. As poor countries get richer, sectoral production and employment become less concentrated and more diversified. And this process goes on until relatively late in the process of development. It is only after countries reach roughly the level of Ireland's income that production patterns start to become more concentrated. If sectoral concentration is graphed against income per capita, one therefore obtains a U-shaped curve. Imbs and Wacziarg stress the robustness of their finding:

> "In fact, our result is an extremely robust feature of the data. The nonmonotonicity holds above and beyond the well-known shift of factors of production from agriculture to manufacturing and on to services—in particular, the U-shaped pattern is present when focusing only on manufactured goods. It is valid whether a sector's size is measured by its share in total employment or whether it is measured by shares in value added. It holds within countries through time as well as in a pure cross section, for a variety of levels of disaggregation and data sources. The estimated turnaround point occurs quite late in the development process and at a surprisingly robust level of income per capita. Thus, increased sectoral specialization, although a signifcant development, applies only to high-income economies. Countries diversify over most of their development path." (Imbs and Wacziarg 2003, 64)

What is significant about this finding from our standpoint is that it goes against the standard intuition flowing from the principle of comparative advantage. The logic of comparative advantage is one of specialization. It is specialization that raises overall productivity in an economy that is open to trade. Those who associate under-development with inadequate exposure to international markets generally imply—although this is often left

unstated—that specialization according to comparative advantage is an essential ingredient of development.

Imbs and Wacziargs' findings suggest otherwise. Whatever it is that serves as the driving force of economic development, it cannot be the forces of comparative advantage as conventionally understood. The trick seems to be to acquire mastery over a broader range of activities, instead of concentrating on what one does best. This point is further underscored by the detailed analysis of export data by Klinger and Lederman (2004), who show that the number of new export products also follows an inverted U-curve in income.

The next question is what determines why some countries are better able to develop this mastery than others. Why do some economies find it easier to diversify from traditional to non-traditional products and keep the progression rolling along? We get a better handle on this question by turning it on its head and asking why diversification is not a natural process and how it can be easily derailed.

Imagine an economy with a well-behaved government that has done its Washington Consensus homework. Macroeconomic instability is not a problem, market interventions are minimal, trade restrictions are few and far in between, property rights are protected, and contracts are enforced. Will the type of entreprenurship that is required to build up non-traditional activities be amply supplied? There are good reasons to believe that the answer is no. Most fundamentally, market prices cannot reveal the profitability of resource allocations that do not yet exist. (In general equilibrium theory, this is finessed by assuming that markets are "complete" and there is a price for everything.) The returns from investing in non-traditional activities are therefore hazy at best. It is possible to state this difficulty in the language of conventional economics, and in what follows I will discuss two key "externalities" that blunt the

incentives for productive diversification: information externalities and coordination externalities. Both are reasons to believe that diversification is unlikely to take place without directed government action.

Consider a recent example taken from the pages of the *New York Times*. Taiwan has traditionally grown and exported sugar, an industry that has recently fallen into hard times due to low international prices and other reasons. What should now be grown in the fields to replace the sugarcane that is the source of income for many farmers? In many countries, the result would have been a depressed rural sector, increasingly indebted farm households, and a drag on the economy. In Taiwan, the response has been a $65 million government investment program to develop a world-class orchid industry. The government pays for a genetics laboratory, quarantine site, shipping and packing areas, new roads, water and electrical hookups for privately-owned greenhouses, and an exposition hall—in fact everything except for the cost of the greenhouses. It also provides low-interest credit to farmers to help them build the greenhouses.[2]

This is admittedly an extreme example, and the Taiwanese experiment with orchids may yet turn out to be an expensive flop. But I will suggest below that this vignette illustrates a general principle rather than an exception. Most significant instances of productive diversification are indeed the result of concerted government action and of public-private collaboration. This is as much true of Latin America as it is of East Asia.

Information externalities

Diversification of the productive structure requires "discovery" of an economy's cost structure—i.e., discovery of which new activities can be produced at low enough cost to be

[2] This information is taken from *New York Times*, August 24, 2004, p. A1.

profitable. Entrepreneurs must experiment with new product lines. They must tinker with technologies from established producers abroad and adapt them to local conditions. This is the process that Ricardo Hausmann and I called "self discovery" (Hausmann and Rodrik 2004), and which seems integral to the stylized facts about development uncovered by Imbs and Wacziarg (2003).

When we put ourselves in the shoes of an entrepreneur engaged in cost discovery, we immediately see the key problem: this is an activity that has great social value and yet is very poorly remunerated. If the entrepreneur fails in his venture, he bears the full cost of his failure. If he is successful, he has to share the value of his discovery with other producers who can follow his example and flock into the new activity. In the limit, with free entry, entrepreneurship of this kind produces private costs and social gains. It is no great surprise that low-income countries are not teeming with entrepreneurs engaged in self-discovery.

Note that the kind of discovery that matters in this context differs from innovation and R&D as these terms are commonly understood. What is involved is not coming up with new products or processes, but "discovering" that a certain good, already well established in world markets, can be produced at home at low cost. This may involve some technological tinkering to adapt foreign technology to domestic conditions, but this tinkering rarely amounts to something that is actually patentable and therefore monopolizable. The entrepreneurs who figured out that Colombia was good terrain for cut flowers, Bangladesh for t-shirts, Pakistan for soccer balls, and India for software generated large social gains for their economies, but could keep very few of these gains to themselves. The policy regimes in developing countries have no analogues to the patent system that protects innovation in the advanced countries.

In Hausmann and Rodrik (2004) we provised some informal evidence to suggest that these features are endemic to the process of economic development. We showed that countries with nearly identical resource and factor endowments specialize in very different types of products, once one looks beyond very broad aggregates such as labor-intensive commodities. Bangladesh exports millions of dollars worth of hats, while Pakistan exports virtually none. Conversely, Pakistan exports tons of soccer balls, while Bangladesh lacks a significant soccer ball industry. At a different level of income, Korea is a world power in microwave ovens and barely exports any bicycles, while the pattern is reversed in Taiwan. It is impossible to ascribe these patterns of specialization to comparative advantage. They are more likely the result of random self-discovery attempts, followed by imitative entry. Indeed, we showed how whole industries often arise out of the experimental efforts of lone entrepreneurs. Garments in Bangladesh, cut flowers in Colombia, IT in India, and salmon in Chile (with a state entity acting as the entrepreneur in the last case) are some of the better documented cases. In each one of these cases, imitative entry through managerial and labor turnover, was the key mechanism that enabled industry growth (while undercutting the rents of incumbent entrepreneurs). The orchid case in Taiwan provides an example in the earlier stages of development. It is unlikely that a private farmer would have had the incentive to invest in orchids in the absence of good information that the effort would have been profitable. Once the industry is established by the state, the number of private greenhouses will surely take off if the early investments pay off.

Klinger and Lederman (2004) have recently provided more systematic evidence on the market failures that restrict self-discovery. These authors show that their measure of self-discovery in a country (the number of new products being exported) is positively associated with the height of entry barriers: the more costly are government regulations that impede business

formation, the higher the rate of self-discovery in exports. This somewhat counterintuitive result can only be understood in terms of the ideas considered here: easy of entry facilitates imitation, undercuts the rents to entrepreneurship in self-discovery, and therefore reduces the level of self-discovery.

The first-best policy response to the informational externalities that restrict self-discovery is to subsidize investments in new, non-traditional industries. As a practical matter, it is difficult to implement such a subsidy. The difficulty in monitoring the use to which the subsidy would be put—an investor might as well use it for purposes that provide direct consumption benefits—renders the first-best policy intervention largely of theoretical interest.[3] In Hausmann and Rodrik (2003), we recommend generically a carrot-and-stick strategy. Since self-discovery requires rents to be provided to entrepreneurs, one side of the policy has to take the form of a carrot. This can be a subsidy of some kind, trade protection, or the provision of venture capital. Note that the logic of the problem requires that the rents be provided only to the initial investor, not to copycats. To ensure that mistakes are not perpetuated and bad projects are phased out, these rents must in turn be subject either to performance requirements (for example, a requirement to export), or to close monitoring of the uses to which they are put. In other words, there has to be a stick to discipline opportunistic action by the recipient of the subsidy. East Asian industrial policies have typically had both elements (see the classic discussion in Amsden 1989 and Wade 1990). Latin American industrial policies typically have used too much of the carrot, and too little of the stick, which explains why Latin America has ended up with much inefficiency alongside some world-class industries.

[3] The situation is somewhat analogous with respect to technological externalities that flow from R&D. In this case, the first-best is an R&D subsidy. But advanced countries provide patent protection, which is second-best, to stimulate R&D.

A subtle but important point here is that that even under the optimal incentive program, some of the investments that are promoted will turn out to be failures. This is because optimal cost discovery requires equating the social marginal cost of investment funds to the *expected* return of projects in new areas. The realized return on some of the projects will necessarily be low or negative, to be compensated by the high return on the successes. The stunning success that Fundacion Chile—a public agency—achieved with salmon can pay for many subsequent mistakes.[4] In fact, if there are no or few failures, this could even be interpreted as a sign that the program is not aggressive or generous enough. However, a good industrial policy will prevent such failures from gobbling up the economy's resources indefinitely, and it will ensure that they are phased out. The trick for the government is not to pick winners, but to know when it has a loser.

Coordination externalities

Many projects require simultaneous, large-scale investments to be made in order to become profitable. Return, for example, to the orchid case in Taiwan. An individual producer contemplating whether to invest in a greenhouse needs to know that there is an electrical grid he can access nearby, irrigation is available, the logistics and transport networks are in place, qurantine and other public health measures have been taken to protect his plants from his neighbors' pests, and his country has been marketed abroad as a dependable supplier of high-quality orchids. All of these services have high fixed costs, and are unlikely to be provided by private entities unless they have an assurance that there will be enough greenhouses to demand

[4] Fundacion Chile is a public agency that was created by funds donated by ITT. It began experimenting with salmon in the second half of the 1970s and set up a firm in the early 1980s using a technology adapted from that in Norway and Scotland. The company was eventually sold to a Japanese fishing company. Before Fundacion Chile's efforts, Chile exported barely any salmon. The country is now one of the world's biggest salmon exporters. See Agosin (1999).

their services in the first place. This is a classic coordination problem. Profitable new industries can fail to develop unless upstream and downstream investments are coaxed simultaneously. The Taiwanese government's investments upstream aim precisely to overcome this obstacle.

More generally, coordination failures can arise whenever new industries exhibit scale economies and some of the inputs are non-tradable (or require geographic proximity) (Rodrik 1996). Big push models of development are based on the idea that such features are predominant in low-income environments. The cluster approach to development represents a narrower version of the same idea, focussing on the development of specific sectors such as tourism, pharmaceuticals, or bio-tech. In all these versions, the coordination failure model places a premium on the ability to coordinate the investment and production decisions of different entrepreneurs. Sometimes, when the industry in question is highly organized and the benefits of the needed investments can be localized, this coordination can be achieved within the private sector, without the government playing a specific role. But more commonly, with a nascent industry and a private sector that has yet to be organized, a government role will be required.

An interesting but often neglected aspect of coordination failures is that they do not necessitate subsidization, and overcoming them need not be costly to the government budget. In this respect, coordination externalities differ from the information externalities discussed above that do necessitate subsidies of some sort. It is the logic of coordination failures that once the simultaneous investments are made all of them end up profitable. Therefore none of the investors needs to be subsidized *ex post*, unless there is an additional reason (i.e., a non-pecuniary externality) that such subsidization is required. The trick is to get these investments made in the first place. That can be achieved either by true coordination—"firm A will make this investment if firm B makes this other investment"—or by designing ex ante subsidies that do

not need to be paid ex post. A implicit bail-out, or an investment guarantee is an example of such an ex-ante subsidy. Suppose the government guarantees that the investor will be made whole if the project fails. This induces the investor to proceed with the investment. If the project succeeds, the investor does not need any cash transfer from the government, and no subsidies are paid out. This is one way in which some industries got started out in South Korea, as the regime of President Park gave implicit investment guarantees to leading Chaebols that invested in new areas. On the other hand, this type of policy is obviously open to moral hazard and abuse; for a while it was common to blame the Asian financial crisis on the "cronyism" engendered by these implicit bail-out guarantees.

As Andres Rodriguez-Clare (2004) has recently stressed, all industries in principle have the characteristics that could produce clusters. Moreover, many industries can in principle operate at some level *in the absence* of clusters. This suggests that what needs support is not specific sectors per se, but the type of technologies that have scale or agglomeration economies and would fail to catch on in the absence of support. Simply providing trade protection to a particular sector may not overcome the coordination failure that prevents the adoption of a modern technology, since it increases the profitability of operating without that technology as well. The appropriate policy intervention is focused not on industries or sectors, but on the activity or technology that produces the characterictics of a coordination failure.

Hence, the policies that overcome coordination failure share an important characteristic with those focused on information externalities. Both sets of interventions need to be targeted on activities (a new technology, a particular kind of training, a new good or service), rather than on sectors per se. It is activities that are new to the economy that need support, not those that are already established.

Back to reality

When viewed from the perspective of the discussion above, it is not surprising to observe that industrial restructuring rarely takes place without significant government assistance. Scratch the surface of nontraditional export success stories from anywhere around the world, and you will more often than not find industrial policies, public R&D, sectoral support, export subsidies, preferential tariff arrangements, and other similar interventions lurking beneath the surface. The role played by such policies in East Asia is well known. What is less well appreciated is how the same holds for Latin America as well.

By way of illustration, Table 1 lists the top five export items (to the United States) of three leading Latin American economies: Brazil, Chile, and Mexico. When one leaves aside traditional commodity exports such as copper and crude oil, it is striking how each of the products on the list has been the beneficiary of preferential support policies. In the case of Brazil, the steel, aircraft, and (to an important extent) shoe industries are all the creation of import substitution policies of the past. High levels of protection (steel and shoes) and public ownership, public R&D, and subsidized credit (aircraft) were deliberately used to generate rents for entrepreneurs investing in new areas and to build up industrial clusters. In the case of Chile, industrial policies played a huge role in grapes, forestry, and salmon. The role of Fundacion Chile in getting the salmon industry off the ground has been already mentioned. In grapes, there was significant public R&D in the 1960s that transformed an industry that was primarily oriented to the local market into a global powerhouse (Jarvis 1994). And in forestry, there is a history of at least 60 years of subsidizing plantations (see Clapp 1995) as well as a big push since 1974 to turn the wood, pulp and paper, and furniture cluster into a major export industry (Agosin 1999).

Productive diversification in Chile is hardly the result of letting markets run free. In Mexico, the motor vehicles and computer industries are the creation of import-substitution policies (initially), followed by preferential tariff policies under NAFTA. None of these are the result of hands-off policies, or of level playing fields and unadulterated market forces.

Hence the difference between East Asia and Latin America is not that industrial transformation has been state-driven in one and market-driven in the other. It is that industrial policy has not been as concerted and coherent in Latin America as it has been in East Asia, with the consequence that the transformation has been less deeply rooted in the former than it is in the latter.

## III. Institutional arrangements for industrial policy

In the previous discussion I have linked the need for industrial policy to two key market failures that weaken the entrepreneurial drive to restructure and diversify low-income economies. One has to do with the informational spillovers involved in discovering the cost structure of an economy, and the other has to do with the coordination of investment activities with scale economies. It is tempting to then go on to discuss the list of policy instruments, first-best and second-best, that can overcome these difficulties. But this would overlook two key issues that bedevil the conduct of industrial policy.

First, the public sector is not omniscient, and indeed typically has even less information than the private sector about the location and nature of the market failures that block diversification. Governments may not even know what it is they do not know. Consequently, the policy setting has to be one in which public officials are able to elicit information from the business sector on an ongoing basis about the constraints that exist and the opportunities that are

available. It cannot be one in which the private sector is kept at arms' length and autonomous bureaucrats issue directives. To use Peter Evans' terminology, industrial policy-making has to be embedded within a network of linkages with private groups.

Second, industrial policy is open to corruption and rent-seeking. Any system of incentives designed to help private investors venture into new activities can end up serving as a mechanism of rent transfer to unscrupulous businessmen and self-interested bureaucrats. The natural response is to insulate policymaking and implementation from private interests, and to shield public officials from close interaction with businessmen. Note how this impulse—"keep bureaucrats and businessmen distant from each other"—is diametrically opposed to the previous one arising from the need for information flows.

The critical institutional challenge therefore is to find an intermediate position between full autonomy and full embeddedness. Too much autonomy for the bureaucrats, and you have a system that minimizes corruption, but fails to provide the incentives that the private sector really needs.[5] Too much embeddedness for the bureaucats, and they end up in bed with (and in the pockets of) business interests. Moreover, we would like the process to be democratically accountable and to carry public legitimacy.

Getting this balance right is so important that it overshadows, in my view, all other elements of policy design. In particular, once the institutional setting is "right," we need to worry considerably less about appropriate policy choice. A first-best policy in the wrong institutional setting will do considerably less good than a second-best policy in an appropriate

[5] Some years ago, I compared the effectiveness of six different export subsidy programs around the world, and found, somewhat to my surprise, that the programs with the clearest rules and least opportunity for manipulation by the private sector were not the most effective on the ground. The best functioning programs were those in places like Brazil and South Korea where the bureaucrats were in close interaction with the exporters they were subsidizing. See Rodrik (1995).

institutional setting. Put differently, when it comes to industrial policy specifying the process is more important than specifying the outcome.

Thinking of industrial policy as a "process" has the added benefit that it leaves open the possibility that the actual obstacles to diversification may differ significantly from those hypothesized above. Listening to businessmen without getting captured may reveal that the real problems are not the government's errors of omission (e.g., externalities that have not been internalized), but its errors of commission (e.g., misguided interventions that have increased the cost of doing business). Occasionally, the problems may lie in unexpected areas—for example a quirk in the tax code or a piece of otherwise innocuous legislation. Policy recommendations based on ex-ante reasoning would get it badly wrong in such cases.

These ideas have much in common with the recent literature on institutional innovation, which emphasizes the shortcomings of the hierarchical, principal-agent model of governance in environments of volatility and deep uncertainty (see in particular Sabel 2003, 2004). Solving the problems outlined in the previous section involves social learning—discovering where the information and coordination externalities lie and therefore what the objectives of industrial policy ought to be and how it is to be targeted. In this setting, the principal-agent model, with the government as the principal, the firms as its agent, and an optimal policy which aligns the agents' behavior with the principal's objectives at least cost, does not work very well. What is needed instead is a more flexible form of strategic collaboration between public and private sectors, designed to elicit information about objectives, distribute responsibilities for solutions, and evaluate outcomes as they appear. An ideal industrial policy process operates in an institutional setting of this form.

As Charles Sabel emphasizes, institutions of learning have to be experimentalist by their nature. Just as discovering underlying costs require entrepreneurial experimentation, discovering the appropriate ways in which restructuring bottlenecks can be overcome needs a trial-and-error approach to policymaking.

These ideas need to be operationalized in order to become useful in practice. The challenge in a paper like this is to give a flavor of how this can be done without falling into the trap of misplaced concreteness and appearing to recommend a one-size-fits all institutional strategy. I proceed in two steps. First, I will discuss some generically desirable architectural features of institutions of industrial policy. Next, I will enumerate some design principles that should inform the formulation of industrial policy. These suggestions occupy an intermediate position between the more abstract ideas discussed above and concrete recommendations on institutional design.[6]

Elements of an institutional architecture

Political leadership at the top. The success of industrial policy often depends on the presence of high-level political support. Fiscal prudence has a champion in the person of a finance minister and sound money has a champion in the person of a central bank governor. Economic restructuring also needs a political advocate who has the ear of the president or prime minister and can stand as equals with other members of the economic cabinet. This serves several purposes. First, it raises the profile of industrial policies and enables problems of economic transformation to receive a hearing at the highest levels of the government. Second, it provides coordination, oversight and monitoring for the bureaucrats and the agencies entrusted

[6] These ideas draw on work done in El Salvador and reported in Hausmann and Rodrik (2003b). See also Sabel and Reddy (n.d.) for some suggestions on the architecture of industrial policymaking.

with carrying out industrial policies. If the bureaucrats are to have autonomy, it is critical that their performance be systematically monitored by such a high-level official. Third, it identifies a clear political principal as accountable for the consequences of industrial policies. This political advocate could be a cabinet-level minister, the vice-president (in presidential systems), or even the president himself (as was the case in South Korea under President Park).

Coordination and deliberation council(s). While institutional choices will naturally differ from setting to setting, depending on initial conditions, there is a generic need for coordination or deliberation councils within which the information exchange and social learning, as discussed above, can take place. These are private-public bodies that ought to include relevant groups or their representatives. To avoid the biases of incumbents and insiders, these should go beyond the typical "peak" organizations that include only well organized groups and business associations. They would be the setting in which private-sector interests would communicate their requests for assistance to the government, and the latter would goad the former into new investment efforts. These councils would seek out and gather information (from private sector and elsewhere) on investment ideas, achieve coordination among different state agencies when needed, push for changes in legislation and regulation to eliminate unnecessary transaction costs or other impediments, generate subsidies and financial backing for new activities when needed, and credibly bundle these different elements of support along with appropriate conditionalities. They can be created both at the national and sub-national or sectoral levels. Preferably, the larger of these councils would have their staff of technocrats.

Mechanisms of transparency and accountability. Industrial policies need to be viewed by society at large as part of a growth strategy that is geared to expand opportunities for all, rather than as giveaways to already privileged sections of the economy. This is particularly important

since pro-active policies of the type discussed in this paper can sometimes be partial to bigger firms and entrepreneurs (unlike microcredit programs, say, or support of small and medium-sized enterprises). Hence promotion activities need to be undertaken in a transparent and accountable manner. The operation of the deliberation/coordination councils should be published and the decisions reached announced. There should be full accounting of public resources spent in support of new activities.

Ten design principles for industrial policy

For reasons explained earlier, it is impossible (and undesirable) to specify ex ante the policy outputs that the type of architecture discussed above will yield. All depends on the opportunities and constraints that will be identified through the deliberative process. One country may choose to develop a services cluster around the expansion of the national port. Another may decide to set up public venture capital funds targeted at biotech and computer software. A third may go for tax breaks to encourage downstream processing of forestry products. A fourth may find it is excessive red tape and bureaucratic regulations that inhibit entreprenurship in new activities. Nonetheless, it is possible to list some general "design principles" that can inform the formulation of the resulting industrial policies.

1. Incentives should be provided only to "new" activities. The main purpose of industrial policy is to diversify the economy and generate new areas of comparative advantage.It follows that incentives ought to focus on economic activities that are new to the domestic economy. "New" refers to both products that are new to the local economy and to new technologies for producing an existing product. Many countries provide tax incentives for newinvestments without sufficiently discriminating between investments that expand the range of

capabilities of the home economy and those that do not. Note also that this focus differs substantially from the tendency that many incentive programs have to subsidize small and medium sized enterprises (SMEs). SME support policies are based on the criterion of size—not on whether the activity in question has the potential to spawn new areas of specialization. It is the latter that produces economic growth.

2. There should be clear benchmarks/criteria for success and failure. As I have already emphasized, industrial policy is a necessarily experimental process. It is the nature of entrepreneurship that not all investments in new activities will pay off. And not all promotion efforts will be successful. In Korea, Taiwan, and Chile, successes have more than paid for the mistakes. But in the absence of a clear idea of what constitutes success and observable criteria for monitoring it, failures can get entrenched. Recipients of subsidies can game public agencies and continue to receive support despite poor outcomes. Bureaucrats administering incentives can claim success and keep their programs running. Ideally, the criteria for success should depend on productivity—both its rate of increase and its absolute level—and not on employmentor output. While productivity can be notoriously difficult to measure, project audits by business and technical consultants can provide useful indications. So can benchmarking, using the experience of similar industries in neighboring countries. Performance in international markets (i.e., export levels) is also a good indicator, as it provides a quick-and-dirty way of gauging how the industry is doing relative to world-class competitors.

3. There must be a built-in sunset clause. One way to ensure that resources (both financial and human) do not remain tied up for a long time in activities that are not paying off isto phase out support by default. Hence, every publicly supported project needs to have not only

a clear statement ex ante of what constitutes success and failure, but also an automatic sunset clause for withdrawing support after an appropriate amount of time has elapsed. .

4. Public support must target activities, not sectors. It is common for investment promotion agencies to specify their priorities in terms of sectors or industries—e.g., tourism, callcenters, or biotech. This leads to the misdirection of industrial promotion efforts. The targets ofpublic support should be viewed not as sectors but as activities. This facilitates structuring the support as a corrective to specific market failures instead of generic support for this or that sector. Rather than providing investment incentives, say, for tourism or call centers, governmentprograms should subsidize bilingual training, feasibility reports for nontraditional agriculture, infrastructure investment, adaptation of foreign technology to local conditions, risk and venture capital, and so on. Cross-cutting programs such as these have the advantage that they span several sectors at once and are targeted at market failures directly.

5. Activities that are subsidized must have the clear potential of providing spillovers and demonstration effects. There is no reason to provide public support to an activity unless that activity has the potential to crowd in other, complementary investments or generate informational or technological spillovers. Public support must be contingent on an analysis of this sort. Moreover, activities that are supported should be structured in such a way to maximize the spillovers to subsequent entrants and rivals.

6. The authority for carrying out industrial policies must be vested in agencies with demonstrated competence. It is common to complain about incompetence and corruption in government bureaucracies. But bureaucratic competence varies greatly among different agencies within the same country, and most countries have some pockets of bureaucratic competence. It is preferable to lodge promotion activities in such agencies instead of creating new agencies from

scratch or using existing ones with poor track records. This will have an implication about the tools of industrial policy that can be used. If the development bank is in good shape but tax administration is a mess, promotion may need to be done through directed credit rather than tax incentives. Note how this may conflict with the requirement that policy tools be targeted as closely as possible to the source of a market failure. The location of competence may predetermine the tools used. But this is a necessary compromise: when administrative and human resources are scare, it is better to employ second-best instrument effectively than to use first-best instruments badly.

7. The implementing agencies must be monitored closely by a principal with a clear stake in the outcomes and who has political authority at the highest level. As we have seen, effective industrial policy requires a certain degree of autonomy for the bureaucratic agencies implementing it. But autonomy does not and should not mean lack of accountability. Close monitoring (and coordination) of the promotion activities by a cabinet-level politician, a "principal" who has internalized the agenda of economic restructuring and shoulders the main responsibility for it, is essential. Such monitoring guards not only against self-interested behavior on the part of the agencies, but also helps protect the agencies from capture by private interests. As suggested above, this principal could be a cabinet-level minister, a vice-president, or even the president (or prime minister) himself.

8. The agencies carrying out promotion must maintain channels of communication with the private sector. Autonomy and insulation do not mean that bureaucrats must maintain arms' length relationships with entrepreneurs and investors. In fact, ongoing contacts and communication are important so as to allow public officials to have a good information base on business realities, without which sound decisionmaking would be impossible.

9. Optimally, mistakes that result in "picking the losers" will occur. Public strategies of the sort advocated here are often derided because they may lead to picking the losers rather than the winners. It is important of course to build safeguards against this, as outlined above. But an optimal strategy of discovering the productive potential of a country will necessarily entail somemistakes of this type. Some promoted activities will fail. The objective should be not to minimize the chances that mistakes will occur, which would result in no self-discovery at all, butto minimize the costs of the mistakes when they do occur. If governments make no mistakes, it only means that they are not trying hard enough.

10. Promotion activities need to have the capacity to renew themselves, so that the cycle of discovery becomes an ongoing one. Just as there is no single blueprint for undertaking promotion, the needs and circumstances of productive discovery are likely to change over time. This requires that the agencies carrying out these policies have the capacity to reinvent and refashion themselves. Over time, some of the key tasks of industrial policy will have to be phased out while new ones are taken on.

An illustrative range of incentive programs

As I have argued, industrial policy should not be thought of as a generic range of incentive programs. It is instead a process designed to elicit areas where policy actions are most likely to make a difference. The output of such a process—the type of policies and approaches used—will depend critically on a county's own circumstances. Nonetheless, it may be useful to discuss briefly a number of illustrative programs in order to provide a more concrete sense of what industrial policies will entail.

1. Subsidizing costs of "self-discovery". As I discussed above, uncertainty about what new products can be profitably produced constitutes a key obstacle to economic restructuring. The resolution of this uncertainty typically requires some upfront investments, as well as productive tinkering to get imported technologies to work well under local conditions. Since both of these areas are rife with externalities (successes can be easily emulated), the economic case for subsidizing them is strong. Therefore, governments will generally need a facility to defray the costs of the early stages of the cost discovery process. The manner in which this would be done can be envisaged as a "contest" whereby private-sector entrepreneurs would bid for public resources by bringing forth pre-investment proposals. The criteria for financing suchstudies would be that (i) they relate to substantially new activities; (ii) they have the potential toprovide learning spillovers to others in the economy; and (iii) the private sector entities are willing to submit themselves to oversight and performance audits.

2. Developing mechanisms for higher risk finance. Going from the pre-investment phaseof a project to the investment stage requires a more sizable expenditure of resources, which must be financed somehow. Commercial banks are typically not good at this: they intermediate deposits and must remain liquid for prudential reasons. Business development and self- discovery require longer term and riskier forms of financial intermediation. Other forms of risk finance, such as corporate debt markets, equity markets, or private venture capital funds, are alsotypically conspicuous by their absence. Hence governments will need alternative sources of finance. This may come in several different forms, depending on the available fiscal and bureaucratic resources. Some examples are: development banks, publicly funded (but professionally managed) venture funds, public guarantees for longer term commercial bank

lending, or special vehicles that direct a share of public pension fund assets to a portfolio of higher risk investments.

3. Internalizing coordination externalities. Coordination externalities are highly specific to each activity and are essentially impossible to make concrete ex ante. The needs of tourism are very different than the needs of call centers. What this means is that governments need to have the capacity to identify these coordination failures and attempt to resolve them. The coordination and deliberation councils discussed above are one mechanism for instituting and developing such a capacity. But it is clear that these efforts need to be undertaken at multiple levels—both at the national level as well as the regional and sectoral levels. In all this, chambersof commerce and industry and farmer and labor associations can play a useful constructive role. As dicussed above, the government's relationships with these private-sector entities need to be socially legitimized through mechanisms of accountability and transparency. Proposals need to be made public, formally analyzed and evaluated by technocrats, and their fiscal impact costed out. The goal is to identify coordination opportunities while constraining inconvenient rent- seeking behavior.

4. Public R&D. Technology cannot be acquired from advanced countries in an off-the-shelf manner. Whether it is table grapes in Chile or information technology in Taiwan, many new industries have required publicly funded R&D efforts to identify, adapt, and transfer technology from abroad. The trick is to ensure that these efforts are well integrated with privatesector activities and are targeted to their needs. Programs that work best are likely to be those that are responsive to private sector demands.

5. Subsidizing general technical training. New activities will eventually encounter a shortage of adequately trained personnel, even if this is not a binding constraint at the outset.

Innovating firms will fear that labor turnover will reduce the returns to on-the-job training and will thus under-provide training. This will inevitably delay the process of self-discovery. So there is a strong case to be made for subsidizing training for vocational, technical and language skills. In general, public training facilities have a lousy reputation in developing countries, as they seem rarely targeted on the real needs of the private sector. Therefore, it may be preferable to offer subsidies or matching grants to private firms or institutes to co-finance their training efforts.

6. Taking advantage of nationals abroad. Many if not most developing countries have sizable numbers of migrant workers in the advanced countries. These workers tend to be amongthe most entrepreneurial in society, and often have higher skills than the workers at home (see Kapur and McHale forthcoming). Most governments look at these expatriate workers almost exclusively as a source of remittance income. But given their entpreneurialism, skills, and exposure to business in the developed world, as well as the desire of many of them to return home (under the right set of circumstances), they may well be far more valuable as a source of self-discovery at home. Governments can actively court them, encourage their return, and use them to spawn new domestic economic activities. If even a fraction of the tax incentives used toattract foreign investment is targeted at nationals abroad, the benefits could well be sizable.

## IV. The exaggerated rumors of industrial policy's death

An agenda of the sort laid out above may seem overly ambitious and too big a departure from today's accepted policy practice. After all, industrial policies are supposed to have been confined to the trashbin of history in modern and modernizing economies, along with other outmoded policies like central planning and trade protection. The reality is that industrial policies have run rampant during the last two decades—and nowhere more so than in those

economies that have steadfastly adopted the agenda of orthodox reform. If this fact has escaped attention, it is only because the preferential policies in question have privileged *exports* and *foreign investment*—the two fetishes of the Washington Consensus era—and because their advocates have called them strategies of "outward orientation" and other similar sounding names instead of industrial policies. Anytime a government consciously favors some economic activities over others, it is conducting industrial policy. And by this standard, the recent past has seen more than its share of industrial policies.

While exports have been supported in a number of different ways, export processing zones (EPZs) are the most visible form of discrimination in their favor. There are close to 1000 EPZs around the world, and it is rare to find a country without one. Firms that locate in EPZs get favored treatment in a number of ways: they are allowed unlimited duty-free access on all their imports (provided they export their output); they receive tax holidays on corporate, property, and income taxes; they are generally sheltered from bureacratic regulations that other firms have to contend with; they are provided with superior infrastructure and communication services; they are often exempt from labor legislation that applies to other firms (Madani 1998).

Incentives offered to foreign direct investment are, if anything, more common. Practically all countries in the world have some government agency charged with attracting foreign investment and a program of tax holidays and other subsidies directed at foreign firms. In addition to these tax subsidies, foreign investors are offered one-stop shopping services, receive help in navigating through domestic regulatory requirements, sometimes receive trade protection in return for their investment, and often receive privileged legal status. For example, unlike domestic firms, foreign investors frequently have the option of submitting domestic legal disputes to international arbitration. Developing countries actively compete with each other to

provide generous incentives to attract foreign firms, even though such incentives tend to play at best a marginal role in the location decisions of multinational firms.

The driving force behind the incentives in favor of exports and foreign investment has been the belief that these economic activities are particularly prone to positive externalities and spillovers. Exports and foreign direct investment are supposed to generate technological and learning spillovers for other activities. Hence, despite the decisive turn to markets during the last two decades, the dominant view among policy makers—revealed at least through their actions—has been that particular externalities remain rampant and need to be corrected through the deployment of generous subsidies. What stands out with this brand of industrial policy is the strong presumption that the important externalities reside in exports and direct foreign investment.

Economic research provides little support for this presumption. It has been known for a while that exporting firms tend to be more productive and technologically more dynamic than firms that sell mainly to the home market. We now know that the reason has to do, as a general rule, not with any benefits that accrue from the activity of exporting per se, but simply with selection effects: It is better firms (in all respects) that are able to or choose to export (see Tybout 2000 for a survey). Consequently, subsidizing exporting can do very little to enhance overall productive or technological capacity. Similarly, careful studies have been able to find very little systematic evidence of technological and other externalities from foreign direct investment, some even finding negative spillovers (see Hanson 2001 for a discussion of the issues). In these circumstances, subsidizing foreign investors is a particularly silly policy, as it serves to transfer income from poor-country taxpayers to the pockets of shareholders in rich countries, with no compensating benefit.

Export processing zones and incentives for direct foreign investment are the most noticeable elements of industrial policy in developing countries, but they are not the only ones. Most countries have continued to maintain industrial policies of different types, some of which are the vestiges of import-substitution policies of the past and others are ad hoc responses to perceived shortcomings of existing policy setups. This is not adequately appreciated so I present in Table 2 an illustrative list of credit and tax incentives for domestic investment and production in a range of developing countries. The table is based on Melo (2001), which was confined to countries in South America, and expands Melo's compilation to countries in other parts of the world using national and international sources. As the table shows, credit facilities and tax incentives for favored sectors have been extremely widespread, in Latin America no less than in Asia and Africa. In Latin America, the incentives tend to be focused on tourism, mining, forestry, and agribusiness. Elsewhere, selected manufacturing and service industries also tend to get promoted.

The lesson from this survey of current practice is that industrial policy has far from disappeared. In most countries, the challenge is not to reinstitute industrial policy, but to redeploy the machinery that is already in place in a more productive manner. As we have just seen, much of today's industrial policy takes a presumptive stand on where the externalities are—exports and direct foreign investment—and is formulated in sectoral terms. The institutional architecture is rarely adequate to engage in the kind of discovery that I have advocated here. The overarching vision that informs their design is hardly ever articulated. Consequently, what is needed is not more industrial policy, but better industrial policy. Indeed, it would not be surprising if in many countries industrial policies could be rendered more

effective by actually *reducing* their scope (and targeting them better).[7]

## V. Is Industrial Policy Still Feasible?

Developing countries operate today in a global policy environment that is much different than the one two or three decades ago. In particular, there has been a tendency to discipline national economic policies through multilateral, regional, or bilateral agreements. These disciplines impose restrictions on the ability of developing countries to conduct certain types of industrial poicies. I shall review these restrictions here. While it is true developing countries have a somewhat narrower room for policy autonomy today, it is easy to exaggerate the significance of the restrictions. There remains much scope for coherent industrial policy of the type I have outlined above, especially if countries do not give up policy autonomy *voluntarily* by signing up for bilateral agreements with the U.S. or for restrictive international codes. Few of the illustrative programs described in section III would come under international disciplines. What constrains sensible industrial policy today is largely the willingness to adopt it, not the ability to do so.

Restrictions on industrial policy come in different guises.[8] I present a more detailed view of these in Table 3, and point to some general features here. Foremost in the hiearchy are the rules of the WTO, which are more far-reaching and intrusive than those under old GATT system. Previously, membership in the world trading system had few or no entry requirements for poor countries. The balance-of-payments and infant-industry exceptions were liberal enough to allow

[7] For example, Uruguay has a generous tax holiday program for new investments that does not discriminate between investments that are likely to generate the informational and coordination spillovers that I focused on above and those that are not. As a consequence, the program ends up financing projects such as the renovation of a hippodrome (which apparently was the largest project which has benefited from tax incentives so far).

[8] See also Lall (2004) for a discussion of existing constraints.

countries to adopt any and all industrial policies. Under the WTO, there are several restrictions. Export subsidies are now WTO-illegal (for all but least-developed countries), as are domestic content requirements and other performance requirements on enterprises that are linked to trade, quantitative restrictions on imports, and patent laws that fall short of international standards. All of these had been part of the arsenal of industrial policies utilized by South Korea and Taiwan during the 1960s and 1970s. Moreover, countries that are not yet members of the WTO are often hit with more restrictive demands as part of their accession negotiations.

Regional or bilateral agreements typically expand the range of disciplines beyond those that are found in the WTO. In particular, the U.S. has pushed for tighter restrictions in the areas of investment regulations, intellectual property protection, and capital account whenever it negotiates a free-trade agreement with a developing country (see illustrations in Table 3). On the financial side, a number of international codes and standards have clauses that can be interepreted as restricting the use of industrial policy (see Table 3). And IMF conditionality often goes beyond narrow monetary and fiscal matters to prescribe policies on trade and industrial policy (so-called structural conditionality). The pinnacle of IMF structural conditionality was reached during the Asian financial crisis. While the IMF's official line has veered away from structural conditionality since then, IMF programs typically still contain many detailed requirements on trade and industrial policies (see Table 3 for illustrations from Turkey and Ethiopia).

It is important to emphasize that not all international disciplines are necessarily harmful. For example, the principle of *transparency* that is enshrined in international trade agreements and in international financial codes and standards is fully consistent with the industrial-policy architecture recommended above, and hence is hard to find fault with. Moreover, when designed

appropriately, regional trade agreements can be a useful vehicle for industrial policy programs. For example, both Morocco and Tunisia put in place ambitious industrial upgrading (*mise a niveau*) programs in conjunction with their free-trade agreements with the EU, and obtained EU and World Bank funds to pay for them. Mercosur had a special regime for the automotive sector that gave a big boost to auto and components industries in Argentina and Uruguay.
Governments with a strategic sense of their economic priorities can generally put such international agreements to good use, and transform potential constraint into opportunity.

Among existing international disciplines, probably the most significant is the one that constrains the use of export subsidies. The WTO's Agreement on Subsidies essentially renders illegal all Free Trade Zones of the type discussed previously (as well as other fiscal and credit incentives geared towards exports) for countries above the $1,000 per-capita income level. How much of a real loss this is is not all that clear. As I discussed in the previous section, at present existing policies in many countries are probably too biased towards exporting as it is. There is nothing in the empirical literature to suggest that exports generate the kind of positive externalities that would justify their subsidization as a general rule. On the other hand, conditioning subsidies on exports has the valuable feature that it ensures the incentives are reaped by winners (i.e., those that are able to compete in international markets) rather than the losers. As such, export subsidies are a nice example of performance-based incentive policies (which makes them consistent with the design principles enunciated above). The success in East Asia with export subsidies has much to do with this carrot-and-stick feature: you get the subsidy, but only so long as you perform in world markets. On balance, therefore, the Agreement on Subsidies must be judged to have made a significant dent in the ability of developing countries to

employ intelligently-designed industrial policies.[9]

A second area where international rules may have some bite is in intellectual property. As Richard Nelson (2003) has stressed, the ability to copy technologies developed in advanced countries has been historically one of the most important elements determining the ability of lagging nations to catch up. The WTO's TRIPS Agreeement and its more restrictive versions in bilateral/regional trade agreements make it virtually impossible to employ a strategy of reverse engineering and copying. The developmental costs of TRIPS has so far received attention mainly in regard to public health and access to essential medecines. Its adverse effects on technological capacity has yet to receive commensurate attention.

In light of this, it is encouraging that discussions of the multilateral trade regime are increasingly paying attention (or at least lip service) to the question of "policy space" for developing countries (see Hoekman 2004). There is growing recognition that the pendulum between policy autonomy and international rules may have swung too far in the direction of the latter in recent trade rounds. The attempt in the Doha Round to extend multilateral disciplines to national competition and investment policies has gone nowhere. And many consider the "single undertaking" model of trade negotiations adopted since the Uruguay Round and under which all nations, regardless of their levels of development and needs, sign on to the same text, to be all but dead. This is all good news from the perspective developed in this paper. Developing nations should push hard for "policy space" in future trade negotiations. In the past they compromised on that in return for greater market access in rich country markets. This has turned out to be a bad bargain. The purpose of international rules should be not to impose common

[9] Note that a prohibition on export subsidies cannot be justified using the traditional beggar-thy-neighbor arguments. Unlike, say, the use of import tariffs by a large country, the use of export subsidies produces a net benefit to the rest of the world since it lowers the world market price of the subsidized commodity and improves the external terms of trade of the rest of the world.

rules on countries with different regulatory systems, but to accept these differences and regulate the interface between them so as to reduce adverse spillovers (Rodrik 2001).

## VI. Concluding Remarks

Markets can malfunction both when governments interfere too much and when they interfere too little. Development policies of the last two decades have been obsessed with the first category of policy mistakes—governments' errors of commission. Hence the efforts to reduce or eliminate regulations, trade restrictions, financial repression, and public ownership. Governments' errors of omission—needed interventions that were not supplied—were deemphasized, in part as a reaction to the strong emphasis placed on them by earlier policies of import substitution. Recently governments around the world have begun to seek a more balanced strategy, as liberalization and privatization have failed to deliver the expected performance. I have argued in this paper that properly formulated industrial policies have an important role to play in such strategies.

There is no shortage of arguments against industrial policy. A less than comprehensive list of such arguments would include the following.

- Governments cannot pick winners.
- Developing countries lack the competent buraucracies to render it effective.
- Industrial interventions are prone to political capture and corruption.
- There is little evidence that industrial policies work.
- What is needed is not industrial policy, but across-the-board support for R&D andintellectual protection.

- And in any case international rules no longer leave scope for industrial policyinterventions.

There is more than a grain of truth in each of these claims. Yet, as we have seen, there are also good counter-arguments in each case.

- Yes, the government cannot pick winners, but effective industrial policy is predicatedless on the ability to pick winners than on the ability to cut losses short once mistakeshave been made. In fact, making mistakes ("picking wrong industries") is part and parcel of good industrial policy when cost discovery is at issue.
- Competent bureaucracies are a scarce resource in most developing countries, but mostcountries do have (or can build) pockets of bureaucratic competence. In any case, it isnot clear what the counterfactual is. The standard market-oriented package hardly economizes on bureaucratic competence. As we have discovered during the last decade, and the expansion of the Washington Consensus agenda into governance and institutional areas indicate, running a market economy puts a significant premium on regulatory capacity. Industrial policy is no different.
- Industrial policies can be captured by the interests whose behavior they aim to alter. But once again, this is little different from any other area of policy. In many countries, privatization has turned out to be a boon for insiders or government cronies.
- It is not true that there is a shortage of evidence on the benefits of industrial policy. To the contrary, as I have illustrated above with reference to Latin America, it is difficult to come up with real winners in the developing world that are not a product of industrial policies of some sort.

- Supply-side innovation policies may have a role, but what constrains productive restructuring is a more fundamental feature of low-income environments: entrepreneurship in new activities has high social returns but low private returns.
- There is plenty of scope for industrial policies in the present international economicenvironment. In fact, contrary to general belief, the last two decades have seen a tremendous amount of industrial policy.

I have taken the view in this paper that industrial policy is a process of economic self-discovery in the broader sense. The right image to carry in one's head is not of omniscient planners who can intervene with the first-best Pigovian subsidies to internalize any and all externalities, but of an interactive process of strategic cooperation between the private and public sectors which, on the one hand, serves to elicit information on business opportunities and constraints and, on the other hand, generates policy initiatives in response.

It is impossible to specify the results of such a process ex ante: the point is to discover where action is needed and what type of action can bring forth the greatest response. It is pointless to obsess, as is common in many discussions of industrial policy, about policy instruments and modalities of interventions. What is much more important is to have a process in place which helps reveal areas of desirable interventions. Governments that understand this will be constantly on the lookout for ways in which they can facilitate structural change and collaboration with the private sector. As such, industrial policy is a state of mind more than anything else.

I close by making two points that relate the discussion here to the broader policy agenda that faces developing countries. The first point is that much of industrial policy, as discussed here, is concerned with the provision of public goods for the productive sector. Public labs and

public R&D, health and infrastructural facilities, sanitary and phytosanitary standards, infrastructure, vocational and technical training can all be viewed as public goods required for enhancing technological capabilities. From this perspective, industrial policy is just good economic policy of the type that traditional, orthodox approaches prescribe. Secondly, the capacity to provide these public goods effectively is an important part of the social capabilities needed to generate development. That in turn requires good institutions, with the key features that I have discussed above. Such institutional development is at the core of today's orthodox development agenda.[10] In both senses, then, the agenda of industrial policy laid out in this paper not only does not greatly differ from today's broader, conventional agenda of development, it is part and parcel of it.

[10] Paradoxically, as Ocampo (2004, 28) has rightly emphasized, the "suboptimal development of institutions in the area of productive development has … become a direct institutional deficiency affecting economic growth, which is generally ignored in the call to strengthen institutional development."

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Table 1: Top 5 export items (HS4) to the U.S. (in 2000)

| Country | Item | Value ($ mil) |
|---|---|---|
| Brazil | aircraft | 1,435 |
| | shoes | 1,069 |
| | non-crude petroleum | 689 |
| | steel | 485 |
| | chemical woodpulp | 465 |
| Chile | copper | 457 |
| | grapes | 396 |
| | fish | 377 |
| | lumber | 144 |
| | wood | 142 |
| Mexico | motor vehicles | 15,771 |
| | crude oil | 11,977 |
| | computers & peripherals | 6,411 |
| | ignition wiring sets | 5,576 |
| | trucks | 4,853 |

**Table 2. Illustrative list of industrial policies in support of production and investment**

| Country | Loans for working capital | Loans for fixed assets and/or investment projects | Equity investment | Loans to specific sectors | Credit programs for particular regions | Horizontal tax incentives | Tax incentives to specific sectors | Tax incentives to particular regions |
|---|---|---|---|---|---|---|---|---|
| South American Countries | | | | | | | | |
| Argentina | X | X | | X | X | | Mining, forestry | |
| Bahamas | | | | | | X | Hotels,financial services, spirits and beer | |
| Barbados | | | | | | X | Financial services, insurance, information technology | |
| Belize | | | | | | X | Mining | |
| Bolivia | | | | | | | Mining | |
| Brazil | X | X | X | Oil, natural gas, shipping, power sector,telecom, software, motion picture industry | X | | | X |
| Chile | X | X | | | X | X | Forestry, oil, nuclear materials | X |
| Colombia | X | X | X | Motion picture industry | X | | | X |
| Costa Rica | X | | | | | | Forestry, tourism | |
| Dominican Republic | | | | | | | Tourism, agribusiness | |
| Ecuador | X | X | X | | | | Mining, tourism | |
| El Salvador | X | X | | Mining; services sector | | | | |
| Guatemala | | | | | | | | |
| Guyana | | | | | | | Agribusiness | |
| Haiti | | | | | | X | | |
| Honduras | X | X | | Transport sector, shrimp | | | | |
| Jamaica | | | | | | | Motion picture industry, tourism, bauxite, aluminum,factory construction | |

**Table 2. Illustrative list of industrial policies in support of production and investment (cont.)**

| Country | Loans for working capital | Loans for fixed assets and/or investment projects | Equity investment | Loans to specific sectors | Credit programs for particular regions | Horizontal tax incentives | Tax incentives to specific sectors | Tax incentives to particular regions |
|---|---|---|---|---|---|---|---|---|
| Mexico | X | X | X | Motion picture industry | | X | Forestry, motion picture industry, air and maritime transportation, publishing industry | |
| Nicaragua | X | X | | | | | Tourism | |
| Panama | X | X | | | | | Tourism, forestry | |
| Paraguay | X | X | | | | X | | X |
| Peru | X | X | | | | | Tourism, mining, oil | X |
| Surinam | | | | | | X | | |
| Trinidad & Tobago | | | | | | X | Hotels, construction | |
| Uruguay | X | X | | | | X | Hydrocarbons, printing , shipping, forestry, military industry, airlines, newspapers, broadcasters ,theaters, motion picture industry | |
| Venezuela | X | X | | | | X | Hydrocarbons and other primary sectors | |
| Other countries | | | | | | | | |
| India | X | X | ? | Motion Picture Industry,jute textiles, tea plantations | X | X | infrastructure facilities, Power projects, new industries in electronic hardware/software parks,airports, ports, inland ports and waterways, and industrial parks,for hotels, cold-storage firms and manufacturers of priority items. | X |

**Table 2. Illustrative list of industrial policies in support of production and investment (cont.)**

| Country | Loans for working capital | Loans for fixed assets and/or investment projects | Equity investment | Loans to specific sectors | Credit programs for particular regions | Horizontal tax incentives | Tax incentives to specific sectors | Tax incentives to particular regions |
|---|---|---|---|---|---|---|---|---|
| China | X | X | ? | Software, | X | ? | Hight Tech. IC manufacturers and softwaredevelopment enterprises that source production equipment made domestically in China. | X |
| Malaysia | X | X | ? | Shipping industry, Shipyard Industry and maritime Related Activities | X | ? | Manufacturing Sector,Technology Industries, Agricultural Sector, Tourism Industry, Research and Development, Software, Computers and ICT | X |
| Thailand | X | X | X | ? | ? | ? | agriculture and agricultural products, direct involvement in technological and human resource development, public utilities and infrastructure, environmental protection and conservation, and targeted industries. | X |
| Nigeria | X | X | ? | Agriculture | X | ? | Agriculture, Oil and Gas sectors, Minerals such as Barytes, Gypsum, Kaolin and Marble, Energy Sector | X |

**Table 2. Illustrative list of industrial policies in support of production and investment (cont.)**

| Country | Loans for working capital | Loans for fixed assets and/or investment projects | Equity investment | Loans to specific sectors | Credit programs for particular regions | Horizontal tax incentives | Tax incentives to specific sectors | Tax incentives to particular regions |
|---|---|---|---|---|---|---|---|---|
| Ghana | X | X | ? | manufacturing and processing industries, including agro-industrial, fishing and agricultural sectors — food production, livestock breeding, poultry farming and processing of agricultural produce | ? | ? | Non-Traditional Export , Hotels, Real Estate, Rural Banks, Agriculture and agro-industry, Waste Processing, Free Zones Enterprise/Development | X |
| Uganda | X | X | ? | Agriculture, Forestry, Animal Husbandry including pisciculture, Agro-industries including manufacturing and distribution of agricultural inputs | ? | ? | Plants, machinery and construction materials | X |

**Table 2. Illustrative list of industrial policies in support of production and investment (cont.)**

Sources: Melo (2001) for South American countries. See below for others.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| India | http://www.idbi.com/ | http://www.idbi.com/ | - | http://www.idbi.com/, http://www.finance.indiamart.com/exports_imports/incentives/index.html | http://www.finance.indiamart.com/exports_imports/incentives/index.html | EIU | http://www.finance.indiamart.com/exports_imports/incentives/general_tax_incentives.html and EIU | http://www.techno-preneur.net/timeis/haryana/incentive.html |
| China | EIU (general Incentives) | EIU (general Incentives) | - | - | http://english1.peopledaily.com.cn/english/20000518_41146.html | - | http://www.ey.com/GLOBAL/content.nsf/China_E/Tax_-_Tax_Insight_-_2003_July_31 | http://www.hsbc.com.hk/hk/corp/aoc/businf.htm |
| Malaysia | http://www.smidec.gov.my/detailpage.jsp?section=financialassistance&subsection=loan&detail=bankindustri3&level=4 | http://www.smidec.gov.my/detailpage.jsp?section=financialassistance&subsection=loan&detail=bankindustri3&level=4 | - | http://www.smidec.gov.my/detailpage.jsp?section=financialassistance&subsection=loan&detail=bankindustri3&level=4 | EIU | - | http://e-directory.com.my/web/sw-investorinfo-incentive.htm | http://www.mida.gov.my |
| Thailand | http://www.ifct.co.th/database/index.asp?l=eng and | Industrail Finance Corporation of Thailand | http://www.ifct.co.th/database/index.asp?mid=7&sid=15&cid=54 | | | - | http://www.deltha.cec.eu.int/bic/doing_business_thailand/incentive_investment_promotion_act.htm | http://www.deltha.cec.eu.int/bic/doing_business_thailand/incentive_investment_promotion_act.htm |

**Table 2. Illustrative list of industrial policies in support of production and investment (cont.)**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Nigeria | http://www.nigeria businessinfo.com /ifcfinance-nigeria2002.htm | http://www.nigeriabu sinessinfo.com/ifcfinance-nigeria2002.htm | | http://www.nipc-nigeria.org/dfi.htm The Nigerian Industrial Development Bank (NIDB) | EIU | - | http://www.nigeria.gov.ng/business/incentives.htm | http://www.nigeria.gov.ng/business/incentives.htm |
| Ghana | The National Investment Bank is an industrial development bank providing financial assistance to manufacturing and processing industries, including agro-industrial projects.(no web site) | | - | but don know which specific sectors http://www.ghana-embassy.org/financial_intitutions.htm | - | - | http://www.gipc.org.gh/IPA_Information.asp?hdnGroupID=3&hdnLevelID=3 | http://www.gipc.org.gh/IPA_Information.asp?hdnGroupID=3&hdnLevelID=3 |
| Uganda | http://www.bou.or.ug/DevFIN.htm | http://www.bou.or.ug/DevFIN.htm | - | http://www.bou.or.ug/DevFIN.htm | - | - | http://www.unctad.org/en/docs//iteipcmisc3_en.pdf | http://www.ugandainvest.com/incentives.htm |

**Table 3: Restrictions imposed by international agreements on the ability of countries to undertake industrial policies.**

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| **WTO** | | |
| Most Favored Nation | A product made in one member country be treated no less favorably than "like" good that originates in another country | It applies unconditionally. Although exceptions are made for the formation of free trade areas or custom unions and for preferential treatment of developing countries |
| National Treatment | Foreign gods, once they have satisfied whatever border measures are applied, be treated no less favorably, in thermos of internal taxation than like or directly competitive domestically produced good | The obligation applies whether or not a specific tariff commitment was made, and it cover taxes and other policies, which must be applied in a non discriminatory fashion to like domestic and foreign products |
| Reciprocity | Mutual or correspondent concessions of advantages or privileges in the commercial relations between two countries | The developed contracting parties do not expect reciprocity for commitments made by them in trade negotiations to reduce or remove tariffs an the barriers to the trade of less developed contracting parties (yet, this condition is not legally binding) |
| Safeguard Actions | A WTO member may take a "safeguard" action (i.e., restrict imports of a product temporarily) to protect a specific domestic industry from an increase in imports of any product which is causing, or which is threatening to cause, serious injury to the industry | a) to attain no economic objectives (public health or national security) b) to ensure fair competition ( antidumping measures, etc) c) economic reasons (serious balance of payment deficits o desire of the government to support infant industries) |
| Antidumping agreem | Impose discipline son the use of antidumping by countries. Is one of the main safeguard instruments used among developing countries | Contains a number of provisions aimed at reducing the extent to which antidumping can be used against developing countries that are trying to develop their exports |
| Agreement on Subsidies and Countervailing Measures (SCM) | Prohibits exports subsidies by countries with incomes per capita above U$1.000 and lays out rules for the use of countervailing measures to offse injury to domestic industries caused by foreign production subsidies | Provision related to developing countries: If the subsidy is less than 2% of the per unit value of the product exported, developing countries are exempt form countervailing measures (whereas th figure is 1% when a product from and industrial country is under investigation |
| Agreement on trade related Investment Measures | Prohibits the use of a number of investment performance-related measures that have an effect on trade: local content and trade-balancing requirements | The agreement requires mandatory notification of all non- conforming TRIMs and their elimination within two years for developed countries, within five years for developing countries and within seven years for least-developed countries. |
| TRIPS Agreement | The IP areas covered are patents and the protection of plant varieties; copyrights and related rights, undisclosed information, trademarks, geographical indications, industrial designs, and the layout of designs of integrated circuits. Generally, IP gives creators exclusive rights over the use of their creations for a fixed duration of time. In some cases however, the IPR are valid indefinitely. | The required strengthening of protection of intellectual property rights (IPR) has implications for industrial policy. In the case of domestic firms, it implies both a need to and greater incentives t innovate and compete dynamically, reverse engineering and imitations has become less feasible. For foreign firms it means that market access through a commercial presence may becom more attractive as IPR protection improves TRIPS Article 66.2 requires industrial countries to support technology transfer to least developed |

| | | |
|---|---|---|
| | | countries. |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| **International Financial Codes and Standards** | | |
| **Basel Core Principles for Effective Banking Supervision** | | |
| Directed lending and connected lending | Bank supervisors must set prudential limits to restrict bank exposures to single borrowers or groups of related borrowers; they must have in place requirements that banks lend to related companies and individuals on an arm's-length basis, that such extensions of credit are effectively monitored and that other appropriate steps are taken to control or mitigate the risks. | These principles are voluntary, but compliance with them is frequently checked in the context of World Bank or IMF programs. |
| **Code of Good Practices on Transparency in Monetary and Financial Policies** | | |
| Transparency of financial practices in support of government policies | Requires transparency in the conduct of Central Banking and financial operations, inter alia, when those operations are undertaken in suppotr of government economic policies. | These principles are voluntary, but compliance with them is frequently checked in the context of World Bank or IMF programs. |
| **Code of Good Practices on Fiscal Transparency** | | |
| Nondiscrimination in government regulation | Government involvement in the private sector (e.g., through regulation an equity ownership) should be conducted in an open and public manner, an on the basis of clear rules and procedures that are applied in a nondiscriminatory way. | These principles are voluntary, but compliance with them is dfrequently checked in the context of World Bank or IMF programs. |
| **Regional trade agreements** | | |
| **NAFTA** | | |
| Tariff Elimination | Except as otherwise provided in this Agreement, no Party may increase any existing customs duty, or adopt any customs duty, on an originating good | Each Party may adopt or maintain import measures to allocate in quota imports, provided that such measures do not have trade restrictive effects on imports additional to those caused by the imposition of the tariff rate quota. |
| Restriction on Drawback and Duty Deferral Programs | 1) No Party may refund the amount of customs duties paid, or waive or reduce the amount of customs duties owed, on a good imported into its territory.2) No Party may, on condition of export, refund, waive or reduce:<br>a) an antidumping or countervailing duty that is applied pursuant to a Party's domestic law | This Article does not apply to: a) a good entered under bond for transportation and exportation to the territory of another Party; b) a good exported to the territory of another Party in the same condition as when imported into the territory of the Party from which the good was exported (processes such as testing, cleaning, repacking or inspecting the good, or preserving it in its same condition, shall not be considered to change a good's condition).c) a refund of customs duties by a Party on a particular good imported into its territory and subsequently exported to the territory of another Party |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| Investment: Performance requirements | No Party may impose or enforce any of the following requirements, to an investment or an investor of a Party or of a non-Party in its territory: (a) to export a given level or percentage of goods or services; (b) to achieve a given level or percentage of domestic content; (c) to purchase, use or accord a preference to goods produced or services provided in its territor or to purchase goods or services from persons in its territory; (d) to relate in any way the volume or value of imports to the volume or value of expor or to the amount of foreign exchange inflows associated with such investment; (e) to restrict sales of goods or services in its territory that such investment produces or provides by relating such sales in any way t the volume or value of its exports or foreign exchange earnings; (f) to transfer technology; or (g) to act as the exclusive supplier of the goods it produces or services it provides to a specific region or world market. | Provided that such measures are not applied in an arbitrary or unjustifiable manner, or do not constitute a disguised restriction on international trade or investment, the restriction does not prevent any Party from adopting or maintaining measures, including environmental measures:<br>(a) necessary to secure compliance with laws and regulations that are not inconsistent with the provisions of this Agreement;<br>(b) necessary to protect human, animal or plant life or health; or<br>(c) necessary for the conservation of living or non-living oexhaustible natural resources. |
| Import and Export Restrictions | Except as otherwise provided in this Agreement, no Party may adopt or maintain any prohibition or restriction on the importation of any good of another Party or on the exportation or sale for export of any good destine for the territory of another Party, . | Applies under all conditions except in accordance with Article XI of the GATT, including its interpretative notes, and to this end d Article XI of the GATT and its nterpretative notes, or any equivalent provision of a successor agreement to which all Parties are party, are ncorporated into and made a part of this Agreement |
| EU | | |
| Freedom of movement for goods | It follows from the abolition, in intra-Community trade, of customs duties and charges having equivalent effect in addition to quantitative restrictions in trade and measures having equivalent effect. In both cases, the dismantling of barriers is based on the standstill concept, according to which Member States are not authorized to restore such instruments between themselves. | It applies unconditionally |
| Freedom of movement for services | The concept of the freedom to perform services is closely linked to the right of establishment. In both cases, the non-national or Community business in question must be given national treatment i.e. the conditions applied to them must not be different from those applied to nationals or national businesses. | Certain limits have been set by the Treaty, which excludes services linked to the civil service and which stipulates that restrictions on the freedom to perform services can be justified on grounds of public policy, public security and public health. In addition, certain sectors such as transport, banking and insurance also have their own systems. These sectors have usually been subject to substantial regulation in the Member States and the application of the freedom of movement for services could not easily be achieved simply through mutual recognition of standards. |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| Freedom of movement for capital | In connection with the free movement of capital , the Treaty prohibits allrestrictions on capital movements (investments) and all restrictions on payments (payment for goods or services). | Member States are, however, authorized to take any measure justified by the wish to prevent infringements of their own legislation, specifically relating to fiscal provisions or prudentialsupervision of financial institutions. Moreover, Member States may lay down procedures for declaring capital movements for administrative or statistical information purposes in addition to measures associated with public policy or public security.<br>However, these measures and procedures must not be a means<br>of arbitrary discrimination or a disguised restriction on the freemovement of capital and payments. |
| EU-Morocco | | |
| Free Movement ofGoods | No new customs duties on imports nor charges having equivalent effect shall be introduced in trade between the<br>Community and Morocco. Customs duties and charges having equivalenteffect<br>applicable on import into Morocco of products originating in the Community shall be abolished upon the entry into force of thisAgreement. | There are some products that are exempt of this restriction (those listed in Annexes 3, 4, 5 and 6). Also, exceptional measures of limited duration may be taken by Morocco in the form of an increase or reintroduction of customs duties. These measures may only concern infant industries, or certain sectors undergoing restructuring or facing serious difficulties, particularly where these difficulties produce major social problems. |
| | Products originating in Morocco shall be imported into theCommunity free of customs duties and charges having<br>equivalent effect. | |
| | No new quantitative restriction on imports or measure having equivalent effect shall be introduced in trade between<br>the Community and Morocco. | |
| | The two Parties shall refrain from any measures or practice of an internal fiscal nature establishing, whether directly or indirectly, discrimination between the products ofone Party and like products originating in the territory of the<br>other Party. | |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| EU-Tunisia | | |
| Free Movement ofGoods | No new customs duties on imports nor charges having equivalent effect shall be introduced in trade between the Community and Tunisia. Productoriginating in Tunisia shall be imported into the Community free of customduties and charges having equivalent effect and without quantitative restrictions or measures having equivalent effect | This shall not preclude the retention by the Community of an agricultural component on imports of the goods originating in Tunisia listed in Annex 1.The agricultural component shall reflectdifferences between the price on the Community market of the agricultural products considered as being used in the production of such goods and the price of imports from third countries where the total cost of the said basic products is higher in the Community. The agricultural component may take the form of a fixed amount or an ad valorem duty. Such differences shall be replaced, where appropriate, by specific duties based on tariffication of the agricultural component or by ad valorem dutie Exceptional measure of limited duration which derogate from th provisions of Article 11 may be taken by Tunisia in the form of an increase or reintroduction of customs duties.<br>These measures may only concern infant industries, or certain<br>sectors undergoing restructuring or facing serious difficulties, particularly where these difficulties produce major social problem |
| | The Community and Tunisia shall gradually implement greater liberalizatiof their reciprocal trade in agricultural and fishery products. | |
| | Without prejudice to the provisions of the GATT:<br>(a) no new quantitative restriction on imports or measure having equivaleeffect shall be introduced in trade between the Community and Tunisia;<br>(b) quantitative restrictions on imports and measures having equivalenteffect in trade between Tunisia and the Community shall be abolished upon the entry into force of this Agreement;<br>(c) the Community and Tunisia shall apply to the other's exports customsneither duties or charges having equivalent effect nor quantitative restrictions or measures of equivalent effect. | Where any product is being imported in increased quantities annunder such conditions as to cause or threaten to cause:<br>- serious injury to domestic producers of like or directly competitive products in the territory of one of the Contracting Parties, or<br>- serious disturbances in any sector of the economy or difficultie which could bring about serious deterioration in the economic situation of a region, the Community or Tunisia may take appropriate measures under the conditions and in accordance with the procedures laid down in Article 27."The safeguard measures shall be immediately notified to the Association Committee by the Party concerned and shall be the subject of periodic consultations, particularly with a view to their abolition as<br>soon as circumstances permit." |

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| | 1. The two Parties shall refrain from any measures or practice of an internal fiscal nature establishing, whether directly or indirectly, discrimination between the products of one Party and like products originating in the territory of the other Party.<br>2. Products exported to the territory of one of the Parties may not benefit from repayment of indirect internal taxation in excess of the amount of indirect taxation imposed on them directly or indirectly. | |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| US-Jordan | | |
| Tariffs | The FTA eliminates all tariff barriers on virtually all goods traded between the United States and Jordan within ten years. | Not every export of the United States or Jordan will qualify for this duty-free treatment. The United States and Jordan has agreed to eliminate existing tariffs only on "originating goods of the other Party". Goods must qualify under the Rules of Origin in order to take advantage of the FTA. Also, Products under specia staging categories including certain alcohol and textile products, generalized system of preference (GSP) exports, agriculture quota-class goods, poultry, apples, and cars will experience either an accelerated reduction of tariffs or a delay in reduction. |
| Intellectual property | Jordan has agreed to accede to: Articles 1-14 of the World Intellectual Property Organization's (WIPO) Copyright Treaty; Articles 1-23 of the WIPO Performances and Phonographs Treaty; Articles 1-22 of the International Convention for the Protection of New Varieties of Plants; Articles 1-6 of the Joint Recommendation Concerning Provisions on the Protection of Well-Known Marks; Patent Cooperation Treaty (1984); Protocol Relating to the Madrid Agreement Concerning the International Registrations of Marks (1989) | The United States and Jordan have agreed to take measures related to certain regulated products, particularly in the area of "approving the marketing of pharmaceuticals or agricultural chemical products that utilize new chemical entities" and protecting the information against disclosure and unfair commercial use. |
| Services | Liberalization of bilateral trade in services between the United States and Jordan. With the liberalization of trade in services, United States companies will have greater access to Jordanian service industries, especially tourism, transportation, health, financial, education, environmental, business, communications, distribution and recreational/cultural services. | |
| Rules of Origin | The FTA defines originating goods as having three components: a qualitative definition of origin ("the "wholly obtained"/"substantial transformation" tests), a quantitative definition of origin (the 35% domestic content requirement) and a direct transport requirement. | The direct transport requirement and permitted exceptions are discussed in Chapter 9 of the Rules of Origin. not significant) |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| US-Chile | | |
| Tariffs eliminations | Neither Party may increase any existing customs duty, or adopt any customs duty, on an originating good. Each Party shall progressively eliminate its customs duties on originating goods. 3. The United States shall eliminate customs duties on any non-agricultural originating goods that, after the date of entry into force of this Agreement, are designated as articles eligible for duty-free treatment under the U.S. Generalized System of Preferences, effective from the date of such designation. | a Party may:(a) raise a customs duty back to the level established in its Schedule to Annex 3.3 following a unilateral reduction; or (b) maintain or increase a customs duty as authorized by the Dispute Settlement Body of the WTO. |
| Drawback and Duty Deferral Programs | Neither Party may refund the amount of customs duties paid, or waive or reduce the amount of customs duties owed, on a good imported into its territory. Neither Party may, on condition of export, refund, waive, or reduce:(a) an antidumping or countervailing duty; (b) a premium offered o collected on an imported good arising out of any tendering system in respect of the administration of quantitative import restrictions, tariff rate quotas, or tariff preference levels; or (c) customs duties paid or owed on a good imported into its territory and substituted by an identical or similar good that is subsequently exported to the territory of the other Party | This applies on condition that the good is:(a) subsequently exported to the territory of the other Party (b) used as a material in the production of another good that is subsequently exported rto the territory of the other Party; or (c) substituted by an identica or similar good used as a material in the production of another good that is subsequently exported to the territory of the other Party. |
| Import and Export Restrictions | Neither Party may adopt or maintain any prohibition or restriction on the importation of any good of the other Party or on the exportation or sale for export of any good destined for the territory of the other Party | This prohibit any country form adopting (a) export and import price requirements, except as permitted in enforcement of countervailing and antidumping orders and undertakings; (b) import licensing conditioned on the fulfillment of a performance requirement; or (c) voluntary export restraints not consistent with Article VI of GATT 1994, as implemented under Article 18 of the SCM Agreement and Article 8.1 of the AD Agreement. |
| Export taxes | Neither Party may adopt or maintain any duty, tax, or other charge on the export of any good to the territory of the other Party | Applies always , unless such duty, tax, or charge is adopted or maintained on any such good when destined for domestic consumption. |
| Textile and Apparel | If, as a result of the elimination of a duty provided for in this Agreement, a textile or apparel good benefiting from preferentia tariff treatment under this Agreement is being imported into the territory of a Party in such increased quantities, in absolute terms or relative to the domestic market for that good, and under such conditions as to cause serious damage, or actual threat thereof, to a domestic industry producing a like or directl competitive good, the importing Party may, to the extent and fo such time as may be necessary to prevent or remedy such damage and to facilitate adjustment, take emergency action, consisting of an increase in the rate o duty on the good to a leve not to exceed the lesser of:(a) the most-favored nation (MFN) applied rate of duty in effect at the time the action is taken; and (b) the MFN applied rate of duty in effect on the date of entry | The importing Party may take an emergency action under this Article only following an investigation by its competent authoritie Also, (a) no emergency action may be maintained for a period exceeding three years; (b) no emergency action may be taken or maintained beyond the period ending eight years after duties on good have been eliminated pursuant to this Agreement; (c) no emergency action may be taken by an importing Party against any particular good of the other Party more than once; and (d) o termination of the action, the good will return to duty-free status. - |

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| | into forc of this Agreement. | |
| Intellectual Property | Both parties need to accede or ratify to a series of patent and Intellectualproperty treaties | Each Party may, but shall not be obliged to, implement in its domestic law more extensive protection than is required by thisAgreement provided that such protection does not contravene the provisions of this Agreement. |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| **IMF (structural conditionality)** | | |
| Trade Policy (general) | Complete equalization of excises on all domestic, imported goods and<br>Eliminate reference prices for all imports and remove exchange controls | |
| Indonesia. | | |
| Stand-By Agreement 1998 | Eliminate all restrictions on foreign investment in palm oil plantations, retai and wholesale trade and establish a level playing field in the import and distribution of essential food items between BULOG and private sector participants. | l |
| | Eliminate subsidies on sugar, wheat flour, corn, soybean meal and<br>fishmeal. | |
| | Phase out local content program for motor vehicles and abolish local<br>content regulations on dairy products. | |
| | Discontinue budgetary and extra budgetary support and privileges to IPTN<br>(Nusantara Aircraft Industry) projects. | |
| | Reduce by 5 percentage points tariffs on items currently subject to tariffsof 15 to 25 percent. Tariff reduction on non-food agricultural, chemical,<br>steel-metal, and fishery products | |
| | Phase out remaining quantitative import restrictions and other non-tariff<br>barriers. | |
| | Abolish export taxes on leather, cork, ores and waste aluminum productsand Reduce export taxes on logs, sawn timber, rattan and minerals | |
| | Eliminate all other export restrictions. | |
| | Take effective action to allow free competition in:<br>(i) importation of wheat, wheat flour, soybeans and garlic;<br>(ii) sale or distribution of flour; and<br>(iii) importation and marketing of sugar. | |
| Korea | | |
| Stand-By Arrangement December 5, 1997 Economic Program | 1) Eliminate trade-related subsidies;<br>2) Eliminate restrictive import licensing;<br>3) Eliminate the import diversification program; and<br>4) Streamline and improve the transparency of the import certificatio | |
| Turkey | | |
| stand-by arrangement with theInternational Monetary Fund. 2001 | Agriculture reform program : removal of credit subsidies from state banks,reform the sugar market and liberalization of the tobacco sector | |
| Ethiopia | | |

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| Letter of Intent, Memorandum of Economic and Financial Policies, and Technical Memorandum of Understanding 2001 | Cease price verification on all nonagricultural commodity exports and non cofee agricultural exports for which verifiable international prices are not readily available. For other agricultural exports, except coffee, replace exante price verification with ex post audit, and, for coffee, replace the verification of a single point price with the verification of a range of prices for each variety; Reduce import tariffs and liberalize the payments and exchange regulations for foreign trade in goods and services | |

| Restriction | How the restriction is defined | Under what condition it applies |
|---|---|---|
| | (i) removing restrictions on foreign suppliers'/partners' credit and on importing inputs without payment from foreign collaborators, as well as onother implicit forms of credit not involving formal loan agreements; (ii) allowing all exporters of manufactures (including of agro-processed products) to obtain foreign commercial borrowing; (iii) easing the constraints on debt-equity ratios for exporters by allowing the NBE to authorize exporters to exceed the limit of 60/40 that currently obtains; and<br>(iv) allowing banks to open import letters of credit for exporters with<br>confirmed letters. | |
| | Eliminate price and quality preferences for domestic input suppliers and<br>further improve the duty drawback and exemption schemes | |
| Mozambique | | |
| Enhanced Structural Adjustment Facility 1998–2000 | Rationalize import tariffs. Lower the top import tariff rate from 35 percent tat least 30 percent. Reduce export tax exemptions | |

**Sources:**

WTO: World Bank (2002) "Development, Trade and WTO: A Handbook" Edited by Bernard Hoekman, Aaditya Mattoo and Philip EnglishNAFTA: http://www.nafta-sec-alena.org/DefaultSite/home/index_e.aspx
EU http://europa.eu.int/pol/comm/index_en.htm
EU-Morocco http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/l_070/l_07020000318en00020190.pdf EU-Tunisia http://europa.eu.int/eur-lex/pri/en/oj/dat/1998/l_097/l_09719980330en00020174.pdf US-Jordan. http://www.jordanusfta.com/
US-Chile.http://www.ustr.gov/new/fta/Chile/final/03.market%20access.PDF
IMF http://www.imf.org/external/np/pdr/cond/2001/eng/trade/index.htm, http://www.imf.org/external/np/pdr/cond/2001/eng/trade/index.htm Indonesia. http://www.imf.org/external/np/loi/041098.pdf
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EThiopia. http://www.imf.org/external/np/pfp/eth/etp.htm, http://www.imf.org/external/pubs/ft/scr/1999/cr9998.pdf Mozambique. http://www.imf.org/external/np/pfp/mozam/moztap.htm

ULTIMA PARTE

European Commission

BRUSSELS, 5.5.2021
SWD(2021) 351 final

# COMMISSION STAFF WORKING DOCUMENT

## Annual Single Market Report 2021

Accompanying the

## Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions

## Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery

{COM(2021) 350 final} - {SWD(2021) 352 final} - {SWD(2021) 353 final}

*Internal market, Industry, Entrepreneurship and SMEs*

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# The ecosystem at a glance

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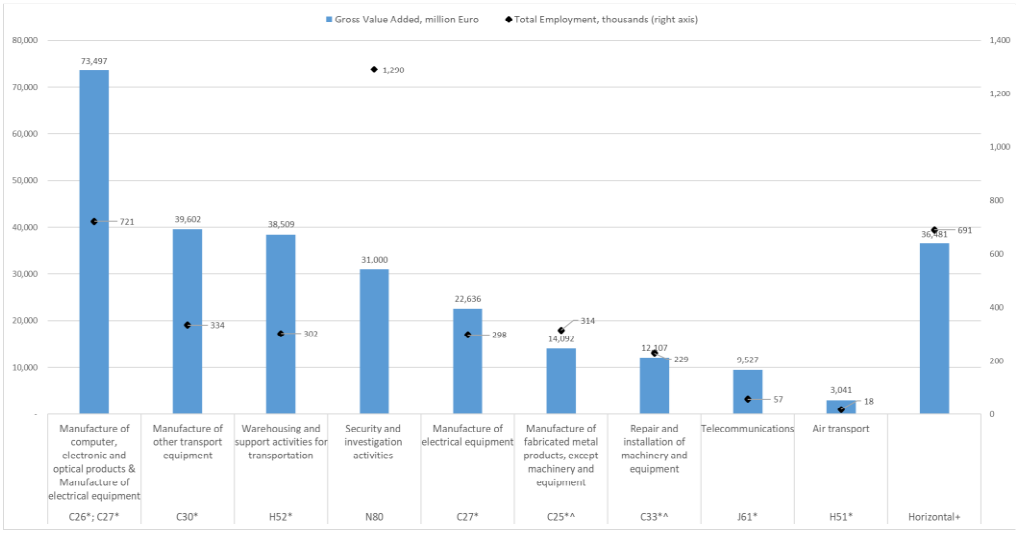
| ***Sectors included in the ecosystem*** | **The Aerospace and Defence ecosystem covers manufacturing companies in aeronautics, space and defence; space operators and data and service providers; research institutes.**<br>This ecosystem's core manufacturers generate a turnover of EUR 250 billion (125 for aeronautics, 12 for space and 110 for defence)[154], with globally competitive companies. Its complex supply chains are composed of large system operators and integrators down to high-tech specialised SMEs. In defence, and partly space, EU Member States define the needs and act as the primary customers for a wide-range of products. European technology institutes and academia play a particularly important role in this ecosystem due to its high-tech nature, and act as knowledge transfer channels.<br>  <br><br>**Notes**: The bar labelled Horizontal refers to activities which contribute to all ecosystems such as professional services and utilities; see Annex 4 of the SWD on Monitoring the Implementation of Industrial Policy. *Sector only partially attributed to the ecosystem; ^Includes additional share added on top of horizontal component; +Excludes contribution of C25 and C33.<br>**Source**: Eurostat, National Accounts. Data from 2018 (or latest year available). |
| ***SME dimension*** | **SMEs and start-ups represent an important part of the Aerospace and Defence ecosystem since they perform many niche, complex and innovative tasks in the manufacturing supply chain.** In civil aeronautics, they represent more than 80% of all companies, providing, amongst others, high-tech material processing and engineering services. In addition, SMEs are strongly represented in the downstream space sector and New Space start-up companies are developing at a fast pace, where innovative applications are developed. Defence-related SMEs are also key enablers of innovation and growth of the defence sector as a whole. More than 2,500 SMEs play a central role in the complex defence supply chains across Europe. |

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| ***Current challenges*** | The ecosystem faces an unprecedented crisis due to COVID-19, with turnover reduction up to EUR 50 billion for aeronautics (40%), EUR 28 billion for defence (25%) and EUR 3 billion for space (25%)[155]. Massive job cuts are ongoing (e.g. in civil aeronautics) and will continue if no investment perspective is provided. Some companies critical to the supply chains may become targets for non-EU takeovers. Air travel may not recover 2019 levels before 2024[156]. This may oblige industry to maintain reduced production rates of new aircraft in the next decade. This will impact the entire since civil aeronautics |

[154] Passenger air transport is not included in this ecosystem, but in Tourism
[155] https://www.europarl.europa.eu/meetdocs/2014_2019/plmrep/COMMITTEES/ITRE/DV/2021/04-13/IPOL_STU2021662903_EN.pdf
[156] International Air Transport Association

| | |
|---|---|
| | represents 50% of its turnover. Space and defence will be particularly affected by public sector spending cuts. Companies involved in defence face an increasing problem of access to financing. **The full impact of the crisis is expected by industry to come with 2-4 years delay**, due to a combination of long lead times in this industry, and the dependence on public procurements. In addition, demand from export markets is dramatically reduced (among others due to the oil price fluctuations and to increasing technology-related disputes between the US and China). |
| ***Forward-looking assessment*** | **The EU aerospace and defence industry is currently highly competitive on the global market, but needs a stronger investment capacity to continue the development of the disruptive technologies necessary to deliver on the green deal (in particular the greening of aviation) and address digital challenges of Europe. It also requires a less fragmented home market in defence and space.** This industry supplies the EU with crucial capacities for open strategic autonomy: border surveillance, secure diplomatic communication, law enforcement, fisheries control, climate variable monitoring, smart mobility and crisis management all depend on aerospace and defence technologies. Although global markets for aeronautics are expected to grow on the longer term[157], it is uncertain if the EU aerospace and defence industry can maintain the competitive and technological edge in the next five years. This is exacerbated by the expected loss of skills due to lay-off of personnel in the coming years. |
| ***Global context*** | **Competing industry on other continents benefit from a massive, stable and predictable home markets of public procurement, and sponsoring of their national industry.** This has a distorting effect on the global level playing field. Many foreign markets are largely captive markets favouring home industries (e.g. launchers). |

[157] www.iata.org/pax-forecast

# Mapping of policy tools in more detail

## Funding and budgetary programmes

RRF Depending on national priorities, the RRF can be an important tool for enhancing the resilience of EU strategic industrial value chains, as well as their digitalisation. National Recovery and Resilience Plans can support the investments required to develop green aircraft technologies. Member States could include investments in their Recovery and Resilience Plans commensurate with their country recommendations and challenge.

CRII+/ERDF/ESF/CEF There is a need to **communicate on funding and investments opportunities** into aerospace and defence industry, for example for smart specialisation. The **Connecting Europe Facility** can finance (i) the **uptake of space services** and applications relevant for energy, transport, smart cities, protecting climate and environment; and (ii) the initial phase of the **EuroQCI** (Quantum Communication Infrastructure) system, contributing to the development of the secure connectivity initiative.

The existing synergies between border management and civil protection and the Aerospace and Defence Ecosystem will continue to increase. Those are EU-level procurements of assets and services (see also section on Strategic Procurement). There is a need to **ensure that for security-related aspects a capability–pull relationship is developed with EU industry, so that EU standards can be set and maintained**.

Horizon Europe (including European Partnerships) Under Cluster 4 'Digital, Industry and Space', topics on space can contribute to **reducing strategic dependencies** for strategic value chains; **enhance the competitiveness** of the EU space sector in **fostering innovation and new technologies (New Space)**, and **support start-ups (Cassini)**. The **climate-neutral aviation objectives in** Cluster 5 'Climate, Energy and Mobility' will support the development of a next generation of clean aircraft (ultra-high efficient, hybrid- electric or hydrogen-powered aircraft). This will enable the European aeronautics industry to significantly contribute not only to achievement of the European Green Deal objectives but also to the greening of air transport worldwide. Institutionalised European Partnerships (e.g. in Clean Aviation, Integrated Air Traffic Management and Clean Hydrogen) will play a prominent role, supporting the integration and demonstration of disruptive technological innovations. In particular, the Clean Aviation partnership will ensure technological and industrial readiness of innovations to support the launch of disruptive new products by 2035.

Digital Europe Programme The Digital Europe Programme will support the **testing of the interface between the EuroQCI space and terrestrial components**, including support for the validation of systems and components, and test the technology in ground and lower-altitude experiments. This action will also benefit the secure connectivity initiative as it should also feature the innovative quantum technology built through the EuroQCI initiative[158], and improve quality control. It will support European Digital Innovation Hubs to stimulate SMEs and a broad, EU-wide uptake of space services and applications.

InvestEU CASSINI Space Entrepreneurship Initiative[159] will set up a dedicated space investment facility under InvestEU to **increase the number of space companies raising VC significantly over** the next seven years. It will channel investment guarantees via EIF to Europe-based Venture Capital Funds focusing on

[158] https://ec.europa.eu/digital-single-market/en/news/future-quantum-eu-countries-plan-ultra-secure-communication-network [159] First announced in the EU SME Strategy, see: https://ec.europa.eu/defence-industry-space/eu-space-policy/space-research-and-innovation/cassini_fr

space-related investments. The EIB's lending policy currently largely precludes the financing of defence-related and carbon-intensive industries, including aeronautics. **Aviation-related activities, defence/dual-use and space services, data and applications could benefit from inclusion under the Taxonomy Regulation**. Adaptation of the EIB lending criteria would be needed to be inclusive for the defence sector within the limits of the Treaties. A joint SME/RID equity product implemented by the EIF will support equity funds investing in strategic technologies in the area of space and defence.

Access to Finance **Aerospace and defence industries face increasing difficulty to access public and commercial loans as well as venture capital investment, hindering their potential for innovation, scaling-up and integration in supply chains.** The main problem is a reputational issue for investors, though there is an increasing requirement to the transition towards carbon-neutrality. At the same time, several funding schemes already exist at the EU level that can fund dual-use (e.g. ESIF) and defence applications (e.g. EDF). The **CASSINI Space Entrepreneurship Initiative will improve access to ventureand growth capital** through a dedicated space investment facility under InvestEU, and in addition launch matchmaking activities with potential customers and VC investors. The possible inclusion of economic activities related to aviation and space – including the construction and entry into service of new generation aircraft and space services, data and applications – in the EU Taxonomy could benefit the ecosystem.

EU Space Programme and European Defence Fund The EU space programme will implement its different space components (Galileo, EGNOS, Copernicus, SSA and GOVSATCOM) to **provide secure space-related data, information and services without interruption**. It will reinforce the EU supply chain autonomy and resilience for the space sector. A **new EU flagship for Secure Space Based Connectivity**[160] will be developed to strengthen EU's open strategic autonomy, resilience and technological non- dependence by (i) providing ubiquitous high speed broadband coverage in Europe, and (ii) secure, cost- effective, reliable connectivity for governmental and commercial services to address identified market failures. **The European Defence Fund will support collaborative defence R&D projects** between legal entities to foster the competitiveness, innovative capacity and efficiency of the defence industrial base; will open up national defence supply chains and ensure greater involvement of SMEs and start-ups; and will fund disruptive technologies.

## Supportive regulatory environment

Single Market Surveillance The revised market surveillance regulation (EU) 2019/1020 will enable a considerable improvement in efficiency of the market surveillance of **online sales and imports of consumer drones**. It will contribute to ensure the compliance of consumer drones with the requirements of the existing legislation[161], while ensuring that the EU drone sector remains competitive on the global market.

Main Single Market barriers within the ecosystem In support of reducing the main Single Market barriers within the ecosystem, the Directives on Defence and Sensitive Security Procurement (Directive 2009/81/EC) and on intra-EU transfers of defence-related products (Directive 2009/43/EC) have not yet reached their full potential to open up defence supply chains that remain fragmented along national borders. Enhanced efforts by all actors to be made to enforce the Defence Procurement Directive and to

[160] Recently announced in the Action Plan on Synergies between Civil, Defence and Space Industries, COM(2021) 70 final
[161] Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems, Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft.

**ensure a stronger and more harmonised uptake of the Directive on intra-EU transfers and facilitate the transfers of defence-related products within the EU**.

Standardisation The **development of hybrid civilian-military standards** are important to reduce cost-burden for European industry. Relevant European standardisation bodies may need to **assess and prepare for the standardisation requirements of future aircraft towards carbon-neutrality** as standards on new technologies and products such as for LH2 tanks and distribution systems do not exist yet. Improvement of aircraft connectivity should also be supported. At the international level, EU engagement in the development of **standards for a number of emerging key technologies** (such as quantum communication) and policies (Space Traffic Management)[162] will be important. Key applications like Galileo, as well as Copernicus's passive sensors, require protection from interference. This includes minimising interference from other radio services, which could be aided by harmonising spectrum use and applying appropriate specifications for radio receivers and transmitters.

Digital transformation The ecosystem is a **major contributor to digital solutions and technologies**, for example through satellite communications and services provided by the EU space programme and through the European Defence Fund priorities on **digital transformation in defence**.

Green transformation Space is a major contributor to the green transformation, for example through **monitoring of greenhouse-gasses, and by services provided by the EU space programme that enable greener transport** (e.g. shorter routing in marine transport) and support to greener agricultural production. As set out in the Commission's Sustainable and Smart Mobility Strategy[163], for aeronautics, the transition to carbon-free aviation will proceed along multiple paths, including the introduction of sustainable aviation fuels, efficiency gains, more flexible routing and the introduction of new propulsion technologies (notably electric, hydrogen or emerging new sources of energy). These measures requirethe mobilisation of large amounts of capital and a high degree of cross-sectoral coordination (aeronautics, airlines, airports, energy producers and distributors, certifying agencies, regulators, etc.). Strategic engagement of key actors in the ecosystem can increase awareness and knowledge-base, while also facilitating the implementation of green and circular practices, two of the aims of the new 'incubation forum on circular Economy in European defence'[164], launched and managed by the European Defence Agency and co-funded by the Commission's managed LIFE Programme.

Strategic Public Procurement Public procurements from EU aerospace and defence industry are key industrial policy tools at EU and Member State level. Contrary to other major global industrial actors, the **EU industry lacks a reliable and predictable home market for space and defence, in the form of large demanding anchor customers**.

Intellectual Property The **cost of patenting in EU is much higher than in USA**, which may limit, especially by SMEs, the use of this protecting tool and/or their capability to monetise their know-how. The fragmented legal framework hampers the exploitation of industrial/commercial potential.

## International partnerships and dialogue

Strategic Partnerships (Critical Materials and input) To ensure a global level playing field in space, Europe needs to engage in the debate on setting international rules and standards for using

[162] See recent Action Plan on Synergies between Civil, Defence and Space Industries, COM(2021) 70 final

[163] COM(2020) 789 final

[164] https://eda.europa.eu/what-we-do/eu-policies

space.**Establishing strategic partnerships** will be an ongoing effort, including in areas such as raw materials in order to address dependencies on raw materials and to reinforce the resilience of the space value chains.

Regulatory dialogue / cooperation Many companies in this ecosystem can only survive if they have access to global markets. **Economic diplomacy efforts** can support making the most of the potential of the EU Space programmes (Galileo, EGNOS, Copernicus) as market openers to facilitate EU companies' access to markets and procurements in third countries.

## Networks and governance

Industrial Networks The aerospace and defence industry is represented in the recently launched European Raw Materials Alliance and it could benefit from the Industrial Alliance on Microelectronics[165]. Ensuring market readiness for disruptive zero emission aircraft (e.g. hydrogen-powered aircraft) will require a high degree of cross-sectoral coordination (aeronautics, airlines, airports, energy producers and distributors, certifying agencies, regulators, etc.). Coordination with Member States and industry will be important to support this transition[166]. In addition, working on the next generation of EU launchers and technologies would require a shared approach between the European Space Agency, EU Member States/Space Agencies, and industry (traditional and new space).

Clusters cooperation **There is an active aerospace and defence cluster** where work is ongoing with uneven progress so far. The European Aerospace Cluster Partnership gathering 42 aerospace clusters in 17 countries has strongly contributed to the competitiveness of the aeronautics supply chain by promoting collaboration between regions and industries. Moreover, the **European Network of Defence- related Regions**brings together various EU defence-related clusters and regional organisations to exchange best practices and information, in particular to the benefit of their client SMEs. **Cooperation between research and development actors and the aerospace and defence industry** would need to improve in order to produce innovative products and technologies. Clusters can play a key role by promoting collaboration between these main actors. Industry cooperation should neither result in delaying the introduction of new technologies nor in the crowding out of other innovative market players.

Pact for skills **Aerospace and defence entered the Pact for Skills as pioneers in November 2020**. A partnership between all stakeholders was formed to upskill 200,000 employees and reskill 300,000people to enter the supply chain, a public and private investment of EUR 1 billion in the next 10 years[167]. Industry efforts to implement the ecosystem's skill's agenda should continue to be encouraged and supported, including through funding from the RRF, REACT-EU and EU programmes such as ERDF or ESF+.

Enterprise Europe Network Intensified efforts to **rely on the EEN to disseminate awareness-raising materials on funding for defence SMEs** as well as to facilitate matchmaking/B2B at defence-related events.

[165] On 7 December 2020, 20 Member States signed a declaration expressing their interest to work together in order to bolster Europe's electronics and embedded systems value chain with a strong focus on processors and semiconductor chips, see: https://ec.europa.eu/digital-single-market/en/news/joint-declaration-processors-and-semiconductor-technologies

[166] see Sustainable and Smart Mobility Strategy, COM(2020) 789 final, p. 5

[167] file:///C:/Users/subirnu/AppData/Local/Temp/1/ASD-1.pdf and More on the Pact for Skills on https://ec.europa.eu/social/main.jsp?catId=1517&langId=en

# 1.Aerospace and Defence Ecosystem

**3.92 million people employed (direct employment)[152]**

**1.99% of EU value added (EUR 241 billion)**

**3.2 million firms 99% of SMEs**

## Transformative initiatives

**Strategic dependency risk monitoring**

A systematic monitoring of risks associated with strategic dependencies in **products, services, critical technologies, actors and skills** in order to take targeted measures to deliver on reinforcing open strategic autonomy in the ecosystem.

**Secure space connectivity**

**An EU space flagship[153]** providing secure space-based connectivity for governmental and commercial sector services, including better connecting key infrastructure, support for crisis management and external actions, surveillance and mass market.

**Cassini space entrepreneurship initiative**

**To promote opportunities for start-ups** via business acceleration, incubation, seed-funding and for SMEs with finance for growth and pre-commercial/innovative procurement.

## Towards an EU policy toolbox fit for purpose

European Space Programme and European Defence Fund These provide opportunities to support resilience, open strategic autonomy and connectivity, as well as climate action, using space infrastructure and services built and operated by EU industry. They include R&D actions with defence applications to foster competitiveness, (disruptive) innovation, and efficiency of the European defence industrial base including SME's and start-ups. **A stronger European defence industrial base and EU as a global space power will contribute to an EU with a global impact.**

Pact for Skills The skills partnership under the Pact is an opportunity to upskill and reskill EU workers for the high-tech Aerospace and Defence industry of the future. It supports ~~**high skilled jobs**~~ **in a high-tech industrial ecosystem.**

Horizon Europe (including European Partnerships) Provides opportunities to accelerate the development of climate-neutral aviation technologies and reduce EU strategic dependencies in space value chains; enhance the competitiveness of the EU space sector in fostering innovation and new technologies (New Space, quantum, zero emission aircraft), and support start-ups (Cassini). **R&D partnerships proposed under Horizon Europe in the domains of space, clean aviation and integrated Air Traffic Management will play a key role.**

Strategic Public Procurement It provides opportunities for first contracts, EU as anchor customer, and procurement of innovative solutions. It supports a **stronger home market for space and defence industry.**

Industrial Networks A possible **Alliance on Zero Emission Aviation** would aim to ensure market readiness for disruptive aircraft configurations (hydrogen, electric, etc.) developed by the European industry to green air transport and contribute to Europe's 2050 climate neutrality objective, bringing together all actors necessary to solve the bottlenecks and promote the necessary investments. A possible **Alliance on Space Launchers** would aim to ensure a globally competitive, cost-effective and autonomous EU access to space, by establishing a shared roadmap for the next generation of European launchers, bringing together the European Space Agency, Member States and industry, addressing supply and demand.

[152] Figures for employment and value added are based on Eurostat National Accounts and SME shares on Eurostat Structural Business Statistics.

[153] See recent Action Plan on Synergies between Civil, Defence and Space Industries, COM(2021) 70 final

## 2. Agri-Food Ecosystem

**16.3 million people employed**[168]

**4.84% of EU value added (EUR 585 billion)**

**599,000 firms 99.4% of SMES**

## Transformative initiatives

**Ensuring the sustainability transition of the ecosystem**

InvestEU will address the financing gap faced by SMEs and mid-cap companies in the agri-food ecosystem. This will **stimulate capital expenditure in green and digital technologies** to decarbonise and accelerate the sustainability transition of the ecosystem.

**Boosting agri-food SMEs digital uptake**

Achieving the Commission's aim of 100% broadband internet access in rural areas by 2025[169] will allow **SMEs to access online marketplaces boosting recovery**. Adequate support for SMEs is key to help them address the lack of digital infrastructure and to achieve the digital transition of the agri-food ecosystem.

**Promoting global sustainability of the food system**

It can provide new opportunities for the agri-food ecosystem. The implementation of the Farm to Fork Strategy, of the Chemical Strategy and the ongoing review of the EU agri-food promotion policy will address the need to **increase safety and sustainability of the food system** and will support its global competitiveness.

### Towards an EU policy toolbox fit for purpose

Digital Europe Programme The **Digital Europe Programme will offer further support for SMEs to grasp the opportunities offered by new technologies.** It can especially boost the digital transformation of the sector through strategic initiatives to build capacity in skills, data infrastructure and technologies, and innovation support.

Pact for skills Actions under the Pact can be beneficial for **upskilling and reskilling workforce in the ecosystem.** The Pact represents an opportunity to address for example the shortage of first line supervisors and managers experienced by agri-food companies.

RRF **Ensuring sufficient support for food service will allow operators to re-open, recover and adapt their model to the 'next normal'.** The RRF will offer the necessary support for companies, in the agri-food ecosystem, including SMEs, to invest in sustainable practices and achieve their green recovery.

Green transformation The Farm to Fork strategy[170] presents an excellent opportunity for the green recovery of the agri-food ecosystem. One of the first deliverables is the **development of a**

[168] Figures for employment and value added are based on Eurostat National Accounts and SME shares on Eurostat Structural Business Statistics.
[169] Communication - A Farm to Fork strategy for a fair, healthy and environmentally-friendly food system, COM/2020/381
[170] COM/2020/381 final

[197] EU regions have joined forces to exploit complementary strengths across Europe, build synergies and enhance the development of and investments in EU value chains.

## 3. Construction Ecosystem

**24.9 million people employed[198]**

**9.6 % of EU value added (EUR 1,158 billion)**

**5.3 million firms 99.9% of SMEs**

# Transformative initiatives

### Boosting confidence of property owners and investors to accelerate renovation and build efficient buildings[199]

The Renovation Wave[200] aims to **renovate 35 million inefficient buildings by 2030 and to fuel a switch away from fossil to renewables and waste heat** through a mix of policy instruments, funding and technical assistance. This is an opportunity to modernise the operation, human capital and technological basis of construction ecosystem, as it will need to deliver these renovations.

### An updated and functioning EU regulatory framework for a Single Market of sustainable construction products

The **revision of the Construction Products Regulation**[201] will facilitate the harmonisation of technical rules and trade of safe and sustainable construction products across the EU.

### Tapping into the large potential of new data driven business models in construction

The digitalisation of data along the value chain will allow the development of **new business based on data,** improve the productivity and environmental performance of the construction ecosystem and of the built environment as well as boost novel services.

## Towards an EU policy toolbox fit for purpose

Access to Finance As buildings represent more than 50% of the total investment needs to achieve climate targets, the EU's **Sustainable Finance Taxonomy** is expected to strengthen criteria in financial incentives for more ambitious renovation and decarbonisation of the building stock.

RRF The **flagship 'Renovate'** strongly encourages Member States to put forward **investment and reform plans to renovate and decarbonise existing buildings**. It could also support the implementation of the **Affordable Housing Initiative** to promote efficient and circular processes, boost social engagement models to empower residents and stimulate cultural innovation at district level.

Industrial Networks The industry-lead Construction 2050 'alliance' and the European Cluster Collaboration Platform **enhance opportunities** for collaboration with market operators at all levels. The **New European Bauhaus** initiative will support creative and interdisciplinary collaborations to (re)design the built environment and future ways of living.

Standardisation Standards being proposed by the European Standardisation Organisations have the potential to better support the implementation of EU policies and legislation. In particular, **standards will need to include information about environmental performance, climate resilience and accessibility for persons with disabilities**.

Digital Innovation Hubs DIHs under the Digital Europe Programme are **key to support the digital transformation of construction SMEs in order to improve their processes, products and services[202].**

[198] Figures for employment and value added are based on Eurostat National Accounts and SME shares on Eurostat Structural Business Statistics. Data from 2018.
[199] Improved energy and resource efficiency of public and private buildings will contribute to the doubling of the renovation rate and the fostering of deep renovation (COM(2020) 575 final)
[200] 'A Renovation Wave for Europe - greening our buildings, creating jobs, improving lives', COM(2020) 662 final
[201] Ibid, page 6.
[202] Digital Transformation Scoreboard 2018: In the Digital Intensity Index construction is below 10%, meaning that the sector has a very slow absorption rate of digital technologies.

[218] More on the Pact for Skills: https://ec.europa.eu/social/main.jsp?catId=1517&langId=en

## 4. Cultural and Creative Industries Ecosystem

**8.02 million people employed** [219]

**3.95% of EU value added (EUR 477 billion)**

**1.2 million firms 99.9% of SMEs**

# Transformative Initiatives

**Scale up**

Cultural and Creative Industries (CCI) companies need to make the EU their native market to overcome fragmentation and be competitive globally. Different tools support the companies in CCIs to scale up and access markets beyond national borders. For example **Europe's Media in the Digital Decade: an action plan to support recovery and transformation (MAAP)** envisages several measures to achieve that, including engaging digital tools and new business models (e.g. collaborative platforms and leveraging private investment).

**Digital, entrepreneurship and managerial skills**

CCI are made up of creative, administrative and technical workers, as well as entrepreneurs. It is of crucial importance to equip and continuously upskill all of them in digital, entrepreneurial and managerial skills to ensure innovative content and business models. A comprehensive approach to these issues is proposed in the **2020 Skills Agenda for Europe (Pact for Skills) and the MAAP.**

**Immersive content**

By 2030, immersive content has the potential to add about EUR 1.3 trillion to the global economy[220] and Europe has an advantage thanks to its large cultural diversity and heritage as well as its highly skilled professionals. The activities envisaged under the **MAAP aim to ensure that European market players can reap their benefit**s.

## Towards an EU policy toolbox fit for purpose

Horizon Europe is the key tool to advance in innovation, in particular creativity-driven innovation (e.g. **Cluster 2**) and in digitisation, e.g. through a **Media Data Space** to support advanced solutions for the creation, distribution and consumption of new media products; a **VR Media Lab** to foster innovation in the VR/AR Media field; greater support for **XR technologies;** better protecting, restoring and promoting European **cultural heritage.**

InvestEU InvestEU will support access to finance of the CCIs in particular through the Guarantee Facility for loans and MediaInvest, a new dedicated equity platform. This support will aim to increase the capacity of the CCIs, in particular independent SMEs, to operate beyond national borders and scale up.

RRF The **Member State Recovery Plans** offer an opportunity to support CCIs recovery and growth by addressing the twin (green and digital) transitions. In particular, measures to boost the production and distribution of creative digital content and services can contribute to the goal of allocating 20% of the RRF expenditure on digital transition.

Main Single Market barriers within the ecosystem As regards the revised **Audiovisual and Media Services Directive**, Member States must ensure full implementation, while media regulators must implement and monitor the correct application of the new rules in practice, and enforce them where necessary.

Intellectual Property Full and timely implementation by the Member States of the **2019 Copyright Directive and the update of the EU design protection legislation** is essential, together with an effective enforcement of rights.

[219] Figures for value added are based on Eurostat National Accounts and estimates from DG CNECT. Figures for employment are based on Eurostat National Accounts. Number of firms and SME shares based on Eurostat Structural Business Statistics.

[220] PWC, Seeing is believing, 2019, https://www.pwc.com/seeingisbelieving

## 5. Digital Ecosystem

**6.8 million people employed**[232]

**5.17% of EU value added (EUR 625 billion)**

**1.2 million firms 99.8% of SMEs**

# Transformative initiatives

### Develop and deploy EU strategic digital technologies, capacities and infrastructures

On the supply side, scaled-up, coordinated and targeted investments in the digital ecosystem are needed to enhance digital capabilities and support the **development of key sustainable, secure and trustworthy general purpose digital technologies and infrastructures**[233] needed by businesses across all industrial ecosystems and by public administrations. **By 2030, all European households will be covered by a Gigabit network, with all populated areas covered by 5G**[234].

### Boost the adoption and diffusion of digital technologies across the EU's businesses

The network of European Digital Innovation Hubs, along with the AI-on- demand platform, the AI Testing and Experimentation Facilities and the EU- wide Data Spaces create unique synergies that help both less digital- savvy SMEs and disruptive innovators capture the real value of the data economy and deploy AI-based tools and services by providing them with innovation services and access to technical expertise. **The aim is that by 2030, 75% of European enterprises have taken up cloud computing services, big data and Artificial Intelligence**[235].

### Enhance digital skills and tackle the shortage of ICT specialists in Europe

**Funding programmes, dedicated reforms and investments** and **existing initiatives** (e.g. the Pact for Skills, the Digital Skills and Jobs Coalition) play a key role in promoting joint action for training, reskilling and upskilling, to enable workers to meet the needs of a labour market in transition and increase the pool of digital specialists. **By 2030 there will be 20 million employed ICT specialists in the EU, with convergence in the relative proportions of women and men**[236].

## Towards an EU policy toolbox fit for purpose

RRF **At least 20% of RRF funding** will be invested in digital. It is an unprecedented opportunity to boost the digital transition across the EU, through a number of high-impact multi-country projects combined with EU funding programmes to build **pan-European advanced digital capacities and infrastructures.**

Digital Europe Programme The Programme enhances the **deployment** of **advanced digital technologies and infrastructures** in key areas, as well of advanced digital skills. It will also support the broad adoption of digital technologies by SMEs and public administrations. Synergies with other programmes, e.g. Horizon Europe and Connecting Europe Facility, will cement this effort.

Digital transformation Through current and upcoming legislative initiatives[237] the Commission aims at building a **robust regulatory framework based on fundamental EU values and rights and on robust safety requirements** in order build confidence for all to embrace digital solutions, a level-playing field for businesses and to foster the full potential of the data economy.

InvestEU It bring financial instruments to support the development of sustainable digital infrastructures and the digitalisation of businesses through dedicated **InvestEU**

Industrial Networks An Industrial alliance on **Industrial Data**, **Edge and Cloud** would strengthen Europe's presence in the next generation cloud supply. Member States agreed to cooperate and engage in efforts to co-invest in semiconductor technologies across the full value chain to this end[238]. An **Industrial Alliance on Microelectronics & Processors[239]** would mobilise industrial partners to establish strategic roadmaps, and research and investment plans to develop capacities for processor design, deployment and fabrication.

[232] Figures for employment and value added based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics.

[233] Including AI, cloud and edge computing, supercomputer and quantum computer, cybersecurity and blockchain.

[234] 2030 Digital Compass: the European way for the Digital Decade, COM(2021) 118 final, p.6.

[235] 2030 Digital Compass: the European way for the Digital Decade, COM(2021) 118 final, p.10.

[236] 2030 Digital Compass: the European way for the Digital Decade, P.5

[237] e.g. Digital Services Act, Digital Markets Act, upcoming regulatory framework for AI following the 2020 White Paper

[238] See Member State Declaration "Building the next generation cloud for businesses and the public sector in the EU" https://ec.europa.eu/digital-single-market/en/news/towards-next-generation-cloud-europe

[239] See Member State Declaration 'A European Initiative on Processors and semiconductor technologies' https://ec.europa.eu/digital-single-market/en/news/joint-declaration-processors-and-semiconductor-technologies

**windows**.
mpanies and public administrations. DIHs will offer a seamless service with the EEN and Clusters.

## 6. Electronics Ecosystem

**1.79 million people employed**[259]

**1.06% of EU value added (EUR 128 billion)**

**104,000 firms 98.9% of SMEs**[260]

# Transformative initiatives

**Underpinning technology for a secure, trusted, powerful data ecosystem and the new applications of AI**

Reinforce processors and semiconductor technologies for data processing, communications and related data infrastructures, and new applications for AI to capitalise further on a digital transition of all sectors and ensure a secure and trusted data ecosystem.

**New chips to drastically improve the energy performance of data- processing in digital systems, including electric mobility**

Driven by AI and the shift towards edge-computing, digital applications will require high computational power together with reduced energy consumption. Developing powerful and energy-efficient processors and semiconductor components is both a challenge and an opportunity for EU industry.

**Mobilisation of the European electronics industry to take action in specific areas, notably in processor technologies**

Mobilise Europe industry on emerging critical processor and semiconductor technologies, and consolidate innovation-driven leadership in areas of proven expertise, such as automotive, as well as in new innovative digital areas via a joint European strategy and investment in key infrastructures and capabilities.

## Towards an EU policy toolbox fit for purpose

Horizon Europe (including European Partnerships) Reinforcing potential to innovate across the value chain and lay the ground to transfer innovation to future industrial deployment.

RRF Offering Member States unprecedented opportunities to invest in specific areas, namely digital components (processor and semiconductor technologies). The RRF's stated ambition is to double, by 2025, the production of cutting-edge semi-conductors in Europe and to produce 10 ies more energy efficient processors.

Industrial Networks Mobilising a wide range of public and private sector actors to join forces to achieve key industrial policy objectives on processors and semiconductor technologies for digital applications across key sectors. A large number of Member States[261] have signed a declaration expressing their interest to work together in order to bolster Europe's electronics and embedded systems value chain with a strong focus on processors and semiconductor chips.

Pact for Skills Addressing critical skill gaps in existing and emerging digital technologies, requiring an overall public and private investment of EUR 2 billion providing upskilling and reskilling opportunities for 250,000 people (2021-2025) in Europe's electronics clusters[262].

IPCEI A potential new IPCEI would help drive innovation to the stage of first industrial deployment in processor and semiconductor technologies (design ecosystem, supply chain capabilities, first industrial deployment of advanced semiconductor technologies,

[259] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics. Data from 2018.
[260] This figure is only based on the number of firms, distribution of turnover or value added will result in a different picture
[261] Joint declaration on processors and semiconductor technologies, https://ec.europa.eu/digital-single-market/en/news/joint-declaration-processors-and-semiconductor-technologies
[262] See: https://ec.europa.eu/social/main.jsp?catId=1517&langId=en

## 7. Energy-Intensive Industries Ecosystem

**7.8 million people employed** [270]

**4.55% of EU value added (EUR 549 billion)**

**548,000 firms 99.4% of SMEs**

# Transformative initiatives

**The EIIs will need a substantial amount of decarbonised energy at an internationally competitive price**

The transition of EIIs to climate neutrality requires access to substantial amounts of decarbonised energy across the EU. The cost of decarbonised energy will be crucial for international competitiveness of the EU's EIIs.

**Creating markets and stimulating demand for green and circular products is key for accelerating the twin transition**

The markets for green products are still underdeveloped both within the EU and globally. Creating markets for green and circular products is **the key step for large-scale green transition of the EIIs Ecosystem.** Actions under the Circular Economy Action Plan and the Sustainable Product Initiative[271] will be important in this regard. Public buyers can play a role in creating demand.

**Full scale transition of EIIs to climate neutrality will require to address unprecedented investment challenge**

The EII ecosystem needs to accelerate investments into research and innovation, demonstration, and the rollout of breakthrough technologies. It is a **precondition for the full scale green transition of the EIIs**. Actions under Horizon Europe, Recovery and Resilience Facility will be important for some aspects of this.

## Towards an EU policy toolbox fit for purpose

Green transformation A combination of all relevant policy tools could be used to create lead markets for green and circular products and support the business case for private investments. No single tool will be sufficient, but **availability of large amounts of decarbonised energy at a globally competitive prices** is at the top of the list.

Digital transformation **Digitalisation of EIIs requires major changes** in (1) collection and use of industrial data and (2) development of digital product passports to increase traceability of material flows and (3) Artificial Intelligence and High-Performance Computing based simulation and prediction to enable better integration of renewable energy sources into EIIs and improve the quality, efficiency and speed of safety and sustainability assessments.

Access to Finance Needs to reflect industry's needs during the transition to climate neutrality. **De-risking of initial investments through tools like Contracts for Difference** need to be explored.

Industrial Networks Important for **enabling transition, pooling resources and sharing risks**.

[270] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics.

[271] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12567-Sustainable-products-initiative

# 8. Energy – Renewables Ecosystem

**1.2 million people employed[283]**

**1 % of EU value added (EUR 122 billion)**

**111,000 firms 99.4% of SMEs**

## Transformative initiatives

### Scaling up investments in renewables to achieve the 2030 climate targets

The **renewables market needs to double** and at least an **estimated EUR 50 billion per year is needed in both production of and infrastructure for renewables to achieve the increased climate ambitions for 2030**. Significant growth in the use of renewables in transport, industry and buildings is needed, as well as increases in public and private investments in R&I[284] and public procurement. The Recovery and Resilience Facility includes a 'Power Up' flagship to direct investments towards renewables.

### Transforming towards an integrated energy system

The **decentralised nature of renewables** will require seamless data exchange between producers, infrastructure, aggregators and storage providers, together with consumers and their appliances all through an **energy data space.** Better data-driven energy services to consumers, interoperable appliances, services, platforms and management systems will be crucial for an integrated energy ecosystem. A Digitalisation of Energy Action Plan is scheduled for 2022.

### Strengthen the European renewables ecosystem as global leader in technology development

The European supply chain will need to be strengthened to facilitate access to rapid growing markets within the EU and globally, including activities to **support the supply and end-of-life options for the critical raw materials for renewables production, digitalisation, and for the production of batteries and electrolysers**. The Clean Energy Industrial Forum has been re-launched to support the competitiveness of the industry.

## Towards an EU policy toolbox fit for purpose

InvestEU Catalysing private investment is key to **increase the financing needed** for accelerating renewables supply and uptake in industry, buildings, and transport to achieve the greenhouse emission reduction targets for 2030.

Main Single Market barriers within the ecosystem Creating a **common European market for renewables** is key to ensure investor certainty and cost-effective deployment. **Permit procedures** in Member States are perceived as one of the biggest obstacles to this growth potential, as they are lengthy and complex (particularly the ones also involving environmental impact assessments).

Strategic Public Procurement The **uptake of renewables in buildings and transport applications can be facilitated through public procurement**, especially by triggering additional investments in renewables and the development of integrated energy systems.

Green transformation The current EU target of at 32% renewables by 2030 will need to be increased under the revision of the renewable energy directive. The introduction of **new certification schemes for all renewable and low-carbon fuels[285]**, including renewable hydrogen, will allow more transparency to the end-consumers, and can entice the rapid penetration of renewables in

end-use sectors like industry, buildings and transport.

Digital Europe Programme Digitalisation of the energy sector is critical for delivering an integrated energy system, provide a cost-effective transformation towards a decarbonised energy system, and maintain European leadership in renewable energy technologies and integrated energy systems. This requires the rapid development of **energy data spaces**, **interoperable smart energy solutions, platforms, management systems**, and tools to provide **better data-driven energy services as well as facilitate energy infrastructure planning**.

[283] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics. Data from 2018.
[284] (COM (2020) 953)
[285] EU strategy on energy system integration, COM(2020) 299 final

[299] (COM (2020) 953)
[300] More on the Pact for Skills: https://ec.europa.eu/social/main.jsp?catId=1517&langId=en

## 9. Health Ecosystem

**24.8 million direct employment[301]**

**9.5% of EU value added**

**493,000 firms**
**99.7% of SMEs**

# Transformative Initiatives

**Boosting EU resilience and open strategic autonomy in the health area**

The **structured dialogue initiative** announced in the pharmaceutical strategy for Europe will identify the causes and drivers of potential **vulnerabilities, and of potential dependencies of medicines supply chains**. The pharmaceutical strategy will also explore **how to tackle unmet needs** (e.g. antimicrobials, rare diseases). The **HERA Incubator** will help address the threats of new COVID-19 variant and the **Task Force for Industrial Scale-up of COVID-19 vaccines** will help to detect and respond to bottlenecks in production and supply of key inputs in real-time.

**Capacity building & digital upskilling to foster innovative healthcare services**

The current human and financial **capacity constraints** of healthcare systems need to be addressed, especially in light of future health emergencies and EU's ageing population. **Skilling of health workers** for the digital transformation is also a critical issue. **Proportionality tests before adoption of new regulation of professions, twinning exercises and dissemination of good practices** could help to foster innovative health care services.

**Build a healthier society & empower citizens via advances in eHealth & leveraging the health data potential**

The biggest opportunities in the coming years will stem from the **digital health technologies**. The upcoming **Regulation on Artificial Intelligence, legislative proposal on the European Health Data Space** and **standardisation** will bring more clarity to **health data** sharing, the **use of AI**, eliminate regulatory barriers and support a common EU-approach in the use of telemedicine services. The **Data Governance Act** proposal enables secure health data sharing.

## Towards an EU policy toolbox fit for purpose

RRF can be used to address many of the Health ecosystem needs via **investments and reforms** of national health systems, strengthening resilience and crisis preparedness, primary care, increasing access to services, addressing the supply chain vulnerabilities as well as digital skills of healthcare workers, tele- medicines solutions and research, development and innovation

Strategic Public Procurement facilitates the purchase of **innovative and affordable health technologies[302], including green and digital solutions.** Public procurement plays a key role in bringing the EU industry, research centres, and EU and national regulatory authorities together and facilitates public- private cooperation with a view to address the needs of public health and health systems.

Industrial Networks such as industrial alliances, European Clusters Alliance, European Enterprises Network and Pact for Skills may be useful tools to **co-design and implement solutions** to current challenges: COVID-19 demand peaks, lack of skills, lack of reliable **intelligence on supply chains, raw material dependencies**, technological, political and governance challenge in the **health tech field.**

Strategic Partnerships in the health area could help to identify and **address vulnerabilities** of global supply chains of medical goods such as personal protective equipment, medical devices, pharmaceuticals that are of a key element of the EU's resilience and crisis preparedness. **The EU has already started to work with WTO members** to increase the cooperation and facilitate trade in health goods.

[301] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics.
[302] WHO definition: A health technology is the application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures and systems developed to solve a health problem and improve quality of lives.

[316] https://ec.europa.eu/health/human-use/strategy/dialogue_medicines-supply_en
[317] More on the Pact for Skills: https://ec.europa.eu/social/main.jsp?catId=1517&langId=en

## 10. Mobility – Transport – Automotive Ecosystem

**14.6 million people employed[318] (at least 16 million including indirect jobs)**

**7.5% of EU value added (EUR 906 billion)**

**1.8 million firms 99.7% of SMEs**

# Transformative initiatives

### A Fit For Purpose Legal Framework

**The recently adopted Sustainable and Smart Mobility Strategy set out a predictable pathway for the ecosystem. Together with existing initiatives, they foresee major legislative adaptations (Euro7, CO2 standards, FuelEU Maritime, Rail Freight Corridors regulation, Combined Transport and batteries regulation).** The ecosystem as a whole has to face huge investments both in legacy and green technologies at the same time. In the automotive sector alone, each car maker will have to spend up to €50 billion to address automation, connectivity and electrification challenges[319]. Clarity on legal framework is therefore a must.

### Shift To Clean Mobility

So far, the **European Battery Alliance catalysed more than EUR 20 billion of private and public investment from 60 companies in 12 Member States. It shows how strategic dependencies can be successfully addressed.** It is expected that by 2025, EU battery cell production would reach **200-300** GWh. This would allow to produce 4 to 6 million electric vehicles[320]. The Clean Hydrogen Alliance will also be key for the whole ecosystem.

### Fostering Automation

EU already has a legal framework for the approval of autonomous vehicles (General Safety Regulation) and for increased interoperability and capacity of rail transport (European Rail Traffic Management System). **Ensuring the deployment of key digital enablers and removing barriers to data sharing will be critical to improve efficiency and develop new market opportunities.** A vehicle will soon generate up to 4,000 gigabytes per day[321].

Towards an EU policy toolbox fit for purpose

Industrial Networks Any possible future alliance will benefit from the success of the European Battery A sustainable and circular value chain.

Pact for Skills The green and digital transformation will have huge impact on employment as well as up/re-skilling. Skills will be needed in chemistry (batteries), electronics, cyber security and artificial intelligence, as well as basic digital skills for the whole workforce.

RRF EU Recovery and Resilience Fund will help Member States to invest and launch reforms plans that will contribute to roll out recharging and alternative refuelling infrastructure as well as fleet renewal. **The RRF's stated ambition is to build, by 2025, one million out of the three million charging points needed in 2030 and half of the 1000 hydrogen stations needed.** Better integration and interaction of the different modes of mobility (and the needs of different transport users) will also be critical.

[318] Figures for direct employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics. Data from 2018.
[319] McKinsey
[320] Data represents expected production (based on announced industry investments), with average battery capacity of 50kWh. Sources: Benchmark Minerals Gigafactory Tracking, Innoenergy, Own calculations on basis of announced investments
321 Intel.

# 11. Proximity, Social Economy and Civil Security Ecosystem

**22.9 million people employed**[345]

**6.54% of EU value added (EUR 791 billion)**

**3.1 million firms 99.9% of SMEs**

## Transformative initiatives

**Green transition, e.g. through upgraded social infrastructure and integrated local cooperation**

Many actors in this ecosystem are pioneers in delivering on green transition in a fair and affordable manner. Supporting social economy, in particular by promoting enabling framework conditions and cooperation with other local actors, as well as with the public sector and mainstream business will encourage inclusive green growth and quality job-creation, e.g. via socio-economic **regeneration** of disadvantaged areas. Addressing investment gaps in **social infrastructure and skills** will have a direct impact on local carbon emissions and quality of social services.

**Innovation capacity, access to effective digital solutions and digital skills**

All subsets of the ecosystem need tailor-made **digital training** for its employees. EU instruments could enhance the **innovation capacity** of **entrepreneurs and help them develop solutions** that address local and societal challenges. Access **to effective technology solutions** adapted to social and local purpose could be facilitated, e.g. 'Tech4good'.

**A Social Economy Action Plan for inclusive growth and jobs**

The **Action Plan,** planned in 2021 will enhance social investment, support social economy actors and social enterprises to start-up, scale-up, innovate create quality jobs and enhance labour market participation. The objective is to boost the potential of the social economy to contribute to sustainable and inclusive growth and a fair recovery.

## Towards an EU policy toolbox fit for purpose

Ecosystem strategy The measures which will be announced by the **Social Economy Action Plan** will promote awareness, visibility and recognition of social economy and support all stakeholders in building socially-mindful value chains. They will include targeted actions to strengthen its place in the EU **industrial landscape**, improve social economy access to finance and to markets, to support the greening and digitisation of the social economy, as well as initiatives designed to scale **SMEs** and replicate social innovations.

ERDF, ESF+, EAFRD, EaSI and RRF These funds provide opportunities to Member States to mobilise public-private investments to develop all parts of the ecosystem. This can help them to scale up, build innovation capacity and upgrade social infrastructure and services. RRF could address investment and reform needs with a priority for 'renovation'/affordable housing, 'reskilling and up- skilling' and 'modernising'.

Inclusive Green Transformation Joint investment models can boost proximity and social economy's potential to develop **innovative services/products** in the field of green and ecological transition. These entail **cooperation and engagement** with public authorities, civil society and the wider business community, e.g. through 'Local Green Deals'. Investments and partnerships to modernise social infrastructure, tackle investment gaps and deliver on renovation and regeneration of (sub)urban spaces will be supported under the **Renovation Wave, Affordable Housing Initiative** and **New European Bauhaus**.

Pact For Skills The pact for skills will leverage public and private engagement to **upskill/reskill the workforce within the ecosystem**, in view of the green and digital transformation and build businesses' (social) innovation capacity. Together with a blueprint for sectoral skills, this pact will also reinforce the social economy's role in the labour **market integration of vulnerable people.**

[345] Figures for employment and value added are based on Eurostat National Accounts and SME shares on Eurostat Structural Business Statistics. Data 2018. These figures only captures part of the 'social economy' and 'proximity' concepts, as sectoral overlaps with other ecosystems occur and specific data on social economy shares in NACE are not available. Therefore, this estimate covers aggregated NACE code analysis.

[365] More on the Pact for Skills on https://ec.europa.eu/social/main.jsp?catId=1517&langId=en.
[366] More on Erasmus+ Blueprint for Sectoral Cooperation on Skills in Work Integration Social Entreprises (WISEs) is available on https://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details/#project/621509-EPP-1-2020-1-BE-EPPKA2-SSA-B.
[367] A 'living' hands-on-guide, built on success stories from the Intelligent Cities Challenge network, to provide cities with concrete reskilling practices and learning experiences.
[368] Vocational Education Training & Life Long Learning.

## 12. Retail Ecosystem

**29.8 million people employed**[369]

**11.5% of EU value added (EUR 1,385 billion)**

**5.5 million of firms 99.9% of SMEs**

# Transformative initiatives

**A fairer and safer digital space supportive of the digital transformation of the ecosystem**

COVID-19 has sped up the digital transformation of the ecosystem. Online sales have sharply increased during the pandemic. Digital solutions would need to be accessible to help companies, in particular SMEs, embrace the digital transform ation. Implementation of the proposed regulations for digital services and markets (DSA/DMA) will provide for a fairer and safer digital space and a supportive regulatory environment for all.

**Continuation of the COVID-19 related financial support will help companies maintain employment and adjust their business models**

Support measures could minimise the ongoing disruption in the ecosystem caused by COVID-19 lockdowns, , increase retailers' resilience and help them recover. Help and **rapid investment will** assist retailers in their transition to **online presence and sales.** Retail is important for the cohesion of rural and urban areas, in particular in preserving the vitality of city centres.

**Development of solutions supporting the greening of the ecosystem**

Swift development of sustainable solutions will contribute to the green transition of the ecosystem and a stronger and more resilient Single Market. To improve the green performance of the ecosystem attention could be paid to the uptake of the circular economy and the use of green technologies.

## Towards an EU policy toolbox fit for purpose

Funding and budgetary programmes The EU provides support measures, in particular for retail and wholesale SMEs and start-ups, for their digital and green **infrastructure and skills' development, mainly through funding programmes** (e.g. RRF, Digital Europe) used for investment in technologies and trainings, access to network, cloud and data, **Digital Innovation Hubs,** etc.

Enforcement of Single Market Rules Enforcement of existing Single Market rules, in particular on the free movement of goods and services and on the freedom of establishment, and adoption of the DSA/DMA are important for the recovery and resilience of the ecosystem.

Industrial Networks Retail and wholesale companies are part of cooperation networks (existing industrial alliances[370], Enterprise Europe Network, Pact for skills roundtables) and stakeholder platforms (the European Circular Economy Stakeholder Platform Coordination Group) and there is potential in their presence in industrial clusters.

[369] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics.

[370] e.g. industrial alliances such as the Circular Plastics Alliance and the European Clean Hydrogen Alliance

[386] McKinsey *The future of work in Europe*; for total wholesale and retail sectors; at risk means facing reduction of hours or pay, or temporary or permanent layoffs; https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-in-europe#nga_section_header_main_0_universal_1

## 13. Textile Ecosystem

**4 million people employed**[387]

**0,70% of EU value added (EUR 85 billion)**

**267,000 firms 99.5% of SMEs**

# Transformative initiatives

**Boosting EU market for sustainable & circular products**

The Commission will adopt a **comprehensive EU Strategy for Sustainable Textiles**[388] **in 2021**. It will strengthen industrial innovation and boost the EU market for sustainable and circular textiles, including the market for textile reuse and drive new business models. The Strategy will encompass the whole value chain.

**R&I funding to support innovation pathways**

**EU/national research and innovation funding is crucial to respond to future market demands** such as material innovation, safe and sustainable product design, new business models, as well as recycling. This is relevant for the competitiveness of all segments of the ecosystem.

**Investments to support textile recycling**

Member States will need to implement new mandatory collection of textile waste set by the revised EU Waste Framework Directive as of 2025. In this context, and **to boost the EU market for sustainable and circular textiles,** support is needed for investments in collection, sorting and recycling plants.

## Towards an EU policy toolbox fit for purpose

Pact for skills A pact on skills aims to develop the **skills needed for the green and digital transition. Skills needs are identified for design, product development, technical textiles production, digitalisation, sustainability and the circular economy.** The aim is to mobilise relevant stakeholders to address challenges in terms of up/reskilling the workforce.

Green transformation **The EU strategy for sustainable textiles** is expected to set out a direction for the green transformation of the ecosystem, in terms of environmental footprint, circularity and sustainable lifestyles. In parallel, the Commission has launched an impact assessment to identify potential policy measures regarding the **unintentional release of microplastics in the aquatic environment** during washing of synthetic textiles.

Single market surveillance **To ensure that imported clothes comply with EU legislation,** under the Intellectual Property Action Plan[389], the Commission will support Member States' customs authorities in improving customs control by reinforcing customs risk management. With regard to market surveillance, the European Chemicals Agency announced that inspectors in Member States will check textile products for compliance with restrictions for hazardous substances[390].

[387] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics.

[388] As announced in the Circular Economy Action Plan - https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf

[389] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0760&from=EN

[390] https://echa.europa.eu/-/eu-inspectors-to-check-consumer-products-for-hazardous-substances

## 14. Tourism Ecosystem

**20.3 million people employed**[399]

**7% of EU value added (EUR 850 billion)**

**3.2 million firms 99.8% of SMEs**

# Transformative initiatives

**Ensuring better tourism data sharing to make the ecosystem more resilient and sustainable**

As data is spread across the ecosystem (tourism destinations, businesses and public authorities), **clear rules on tourism data access and sharing** could facilitate interoperability, stakeh older cooperation and investment in digital skills.

**Leveraging EU funds to enable a sustained recovery and meet tourism investment needs**

The COVID-19 crisis reduced drastically the investment capacity of the tourism ecosystem. EU funds could be leveraged to **invest in sustainable, safe and seamless travel**, as well as **technologies enhancing tourist experiences**.

**Carbon-neutral destinations to contribute to EU climate goals**

Delivering on **carbon-neutral destinations** requires incentives for public and private green investments, better knowledge- sharing between regions/cities, as well as tools to improve transparency, such as monitoring tools, carbon footprint trackers, auditing schemes (e.g. EMAS) and the use of labels (Ecolabel).

## Towards an EU policy toolbox fit for purpose

Ecosystem strategy Setting a long-term vision for the ecosystem in a '**European Agenda for Tourism 2050**'[400], underpinned by shared priorities and agreed milestones between Commission, Member States and stakeholders.

CRII+/ERDF/ESF/CEF Increasing public-private investment to help the ecosystem **meeting its investment needs** for greener business models and access to digital market places, starting with CRII+/ERDF/ESF/CEF and investments mobilised under RRF.

Pact for skills **Upskill/reskill** the **workforce** for the green and digital transformation and evolving market trends through a tourism-specific 'Pact for skills' between industry, Vocational Education & Training providers and employment agencies[401].

Intellectual Property Assess the feasibility of protecting **Geographical Indications (GI) for non-agricultural goods** as these are a way for some lesser-visited destinations to market themselves[402].

Standardisation Develop an EU deliverable on health protocols for tourism establishments and services to rebuild consumer confidence.

[399] Figures for employment and value added are based on Eurostat National Accounts and number of firms and SME shares on Eurostat Structural Business Statistics
[400] as announced in COM(2020)550, Tourism and transport in 2020 and beyond.
[401] More on the Pact for Skills on https://ec.europa.eu/social/main.jsp?catId=1517&langId=en
[402] COM/2020/760 final

**Graph 1: More sensitive ecosystems for the purposes of this staff working document**


Source: European Commission

Note: Circles represent a selection of more sensitive ecosystems for the purpose of this staff working document