CHAPTER 5.3

INVESTMENT IN ECONOMIC COMPETENCIES

KEY FIGURES

2%
of EU investments in economic competencies as a % of GDP

5/30
most valuable brands are in the EU

What can we learn?

- **Economic competencies, such as management quality, organisational structure and workforce training, are essential ingredients** to reap the full productivity benefits from investments in both tangible and other intangible assets, especially in a fast-changing world.
- **Economic competencies are contributing to economic and labour productivity growth** in Europe.
- **The EU underinvests in economic competencies relative to the United States**.
- **Intra-EU differences in investments in economic competencies persist** which may exacerbate inequalities in innovation.
- **Brand strength and recognition is increasingly bringing value to companies**. Over time, there has been an enormous rise in brand value especially in technology and disruptive digital industries where Europe has a 'weaker' presence. Today, the 'top 30 brands' are mainly found in the United States and China.
- **Many software and digital applications behind the widespread success of digital disruptive industries have some 'EU origin'**.

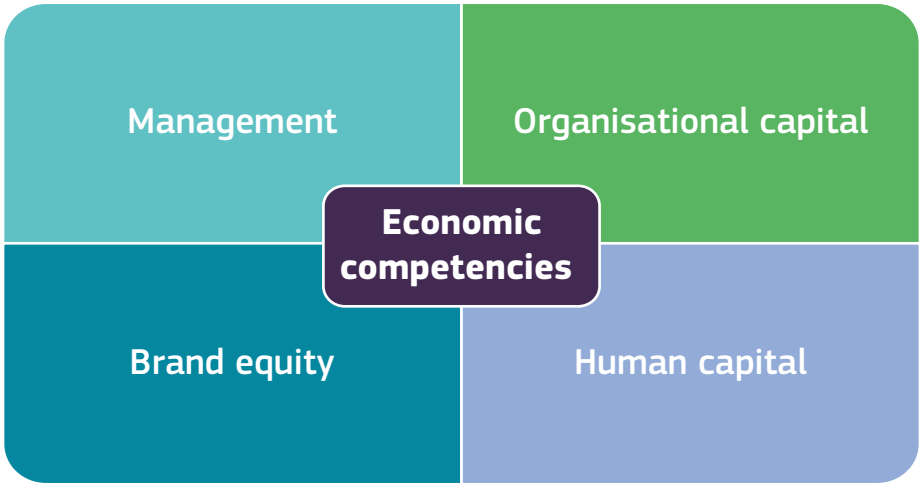
What does it mean for policy?

- **Incentivise investments in training, mentoring, coaching and other activities that promote lifelong learning and soft skills**, such as the capacity to adapt and adopt new technologies in a fast-changing world.
- **Support the strength of the 'made in EU' technological brand on the global scene**, including the communication of successful EU innovations that underpin widespread software and tech applications in the digital age.
- **Produce further cross-country and cross-sector evidence** as well as analytical work **on management quality and its impact** on business productivity.

Economic competencies, such as management quality, organisational structure and workforce training, are essential ingredients for reaping the full productivity benefits from investments in both tangible and other intangible assets, especially in a fast-changing world. As highlighted in Chapter 2 - Changing innovation dynamics in the age of digital transformation, because of digitalisation, innovation is moving at an unprecedented speed. In such a fast-changing world, organisations need to increasingly adapt and create structures that are flexible enough to accommodate new market and technology trends that could put them in the lead in the new era. This includes building a company culture that promotes 'resilience in discomfort', allowing for experimentation, collaboration, creativity and critical thinking and, if necessary, acquiring new competences to cope with change. Managers play a key role in shaping just how strategic and agile an organisation is. In other words, good management provides a vision for the company, defines strategic objectives and the right incentive structure to guide and motivate the workforce. In this context, higher management quality has been documented to be productivity-enhancing for a company (see, for example, Bloom, Sadun and Van Reenen, 2016). In addition, management quality correlates positively with both larger ICT adoption rates and productivity resulting from using ICT capital (see, for example, Andrews et al. (2018)). Furthermore, the uptake of advanced technologies affects the production process workflow and the relative costs of acquiring or communicating information, which implies that implementing such technologies often needs organisational innovations that match technological innovation (OECD, forthcoming). In this respect, skills and competences should be aligned with the production process and the changes it may be subject to. Thus, training and preparing the workforce is essential.

The so-called 'economic competencies' include brand aspects (advertising and market research), knowledge embedded firm-specific human capital and organisational capital following the framework in Corrado et al. (2005), as represented in Figure 5.3-1. This chapter highlights the importance of exploring complementarities between economic competencies and other intangible and tangible assets for firm performance and productivity. These competencies relate to the resilience and agility of teams and companies to recognise and embrace the opportunities brought by new technologies. Stehrer et al. (2019) analysed the role of these supplementary intangibles and found that economic competencies (which are outside the boundaries of national accounts) have a statistically significant impact on growth, which is robust both before and after the crisis and more visible in business services than in manufacturing.

Figure 5.3-1 Visual representation of different economic competencies



Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit based on Corrado et al. (2015)

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-1.xlsx

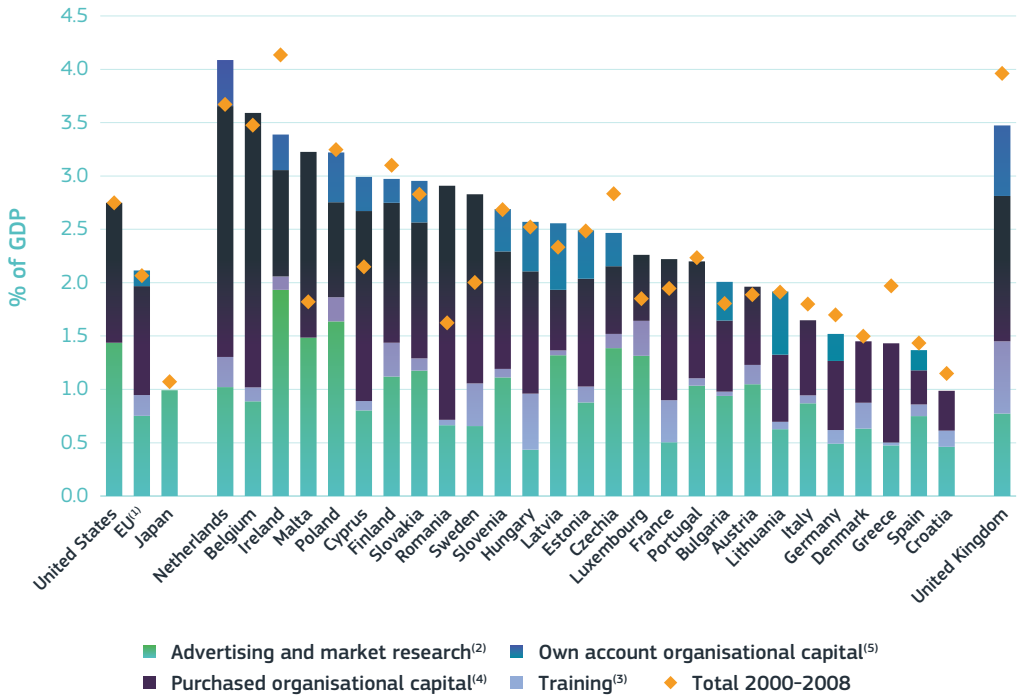
1. Europe appears to underinvest in economic competencies relative to the United States despite the positive contribution of these intangibles for growth

The United States appears to outperform the EU in investing in economic competencies. Moreover, intra-EU differences persist which may hinder future productivity developments and exacerbate innovation inequalities. Figure 5.3-2 compares countries in terms of gross fixed capital formation in economic competencies – purchased and own-account organisational capital, brand aspects (advertising and market research) and (vocational) training – as a percentage of GDP over the periods 2000-2008 and 2009-2017. Overall, relative investments in these supplementary intangibles seem to have slightly increased in the EU as a whole, although this only appears to be the case in half of the EU Member States. Despite this increase, the United States still outperforms the EU with aggregate investments in advertising and market research and organisational capital of 2.8 % of GDP compared to only 2.1 % in the EU in the period 2009-2018. Heavier investments in relative terms by US companies to promote their brands contribute to this gap.

Within the EU, the highest shares of investments in economic competencies are in the Netherlands, Belgium, Ireland, Malta and Poland where investments were higher than 3 % of GDP between 2009 and 2017. The United Kingdom also stands out as a top investor in economic

competencies in Europe, investing 3.5 % of GDP. On the contrary, the shares of investments were lowest (below 1.5 % of GDP) in Croatia, Spain, Greece and Denmark. Relative investments in brand equity were the largest in Ireland where large multinational companies are also present. In addition, Hungary had the largest relative investments in training, while purchased organisational capital investments were the highest in relative terms in Belgium. These intra-EU disparities call for an assessment of the bottlenecks to firm investments in the lowest-investing countries. This is crucial to boost both absorption capacity and the uptake of new, productivity-enhancing technologies.

Figure 5.3-2 Investment in economic competencies as a percantage of GDP, 2009-2017 with breakdown and total for 2000-2008



Science, research and innovation performance of the EU 2020

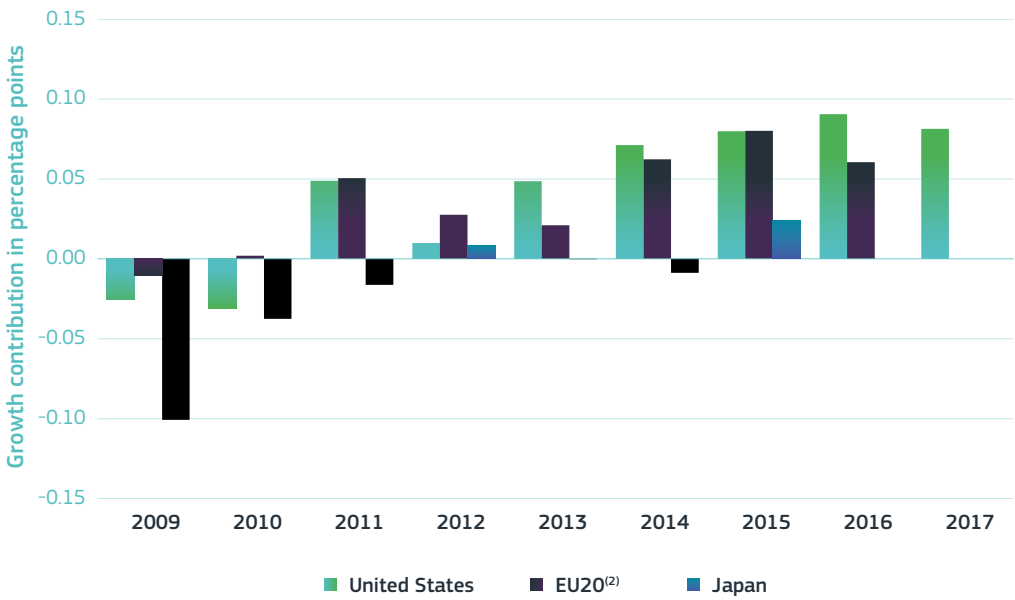
Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit based on EU KLEMS 2019 (analytical database)

Notes: (1)EU was estimated by DG Research and Innovation. (2)JP: 2009-2015; HR: 2009-2016. (3)Data not available for US, JP and MT. HR, UK: 2009-2016. (4)Data not available for JP. HR: 2009-2016. (5)Data not available for US, JP, BE, DK, EL, FR, HR, IT, LU, MT, AT, PT, RO and SE. UK: 2009-2016.

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-2.xlsx

Overall, the contribution of economic competencies to both economic growth and productivity growth has increased over time in Europe. When looking at the contribution of economic competencies as a whole to value-added growth as well as labour productivity growth per hour worked, it is possible to observe that overall it has increased since 2009 (Figure 5.3-3 and Figure 5.3-4, respectively) even though the contribution remains small when compared to other assets (see, for example, Chapter 3.1. Productivity puzzle and innovation diffusion). Stehrer et al. (2019) found a statistically *significant role tangible ICT and intangible economic competencies play in facilitating both value-added growth and labour productivity growth*. In 2015, a one percentage point increase in economic competencies resulted in almost a 0.1 percentage point increase in value added and productivity growth in the EU. Moreover, when compared to the United States and Japan, it seems that the contribution of economic competencies to labour productivity growth remained more resilient and stable in Europe as the post-crisis period appears to have had a less favourable effect in the United States and Japan than in Europe.

Figure 5.3-3 Contribution of intangible economic competencies[(1)] to value-added growth in the EU, United States and Japan in percentage points, market economy, 2009-2017



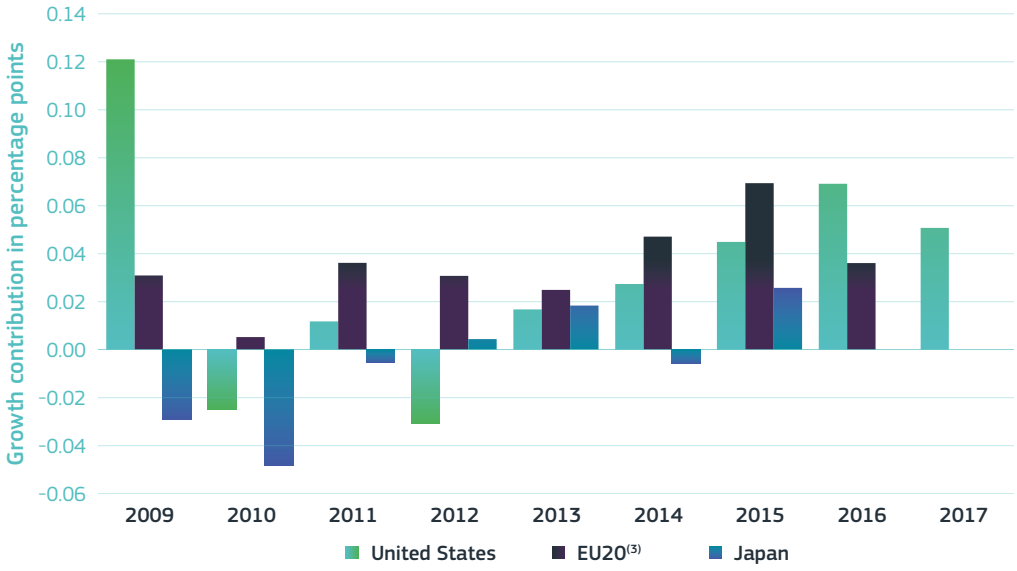
Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit based on EU KLEMS 2019 (analytical database)

Notes: (1)Economic competencies include: advanced and market research, purchased organisational capital, and (vocational) training. (2)EU20 average includes BE, CZ, DE, DK, EE, ES, FR, IT, LV, LT, LU, HU, NL, AT, RO, SI, SK, FI, SE and UK.

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-3.xlsx

Figure 5.3-4 Contribution of intangible economic competencies[1] to labour productivity growth[2] in the EU, United States and Japan in percentage points, market economy, 2009-2017



Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit based on EU KLEMS 2019 (analytical database)

Notes: [1]Economic competencies include: advanced and market research, purchased organisational capital, and (vocational) training. [2]Labour productivity growth is measured as value added per hour growth. [3]EU20 average includes BE, CZ, DE, DK, EE, ES, FR, IT, LV, LT, LU, HU, NL, AT, RO, SI, SK, FI, SE and UK.

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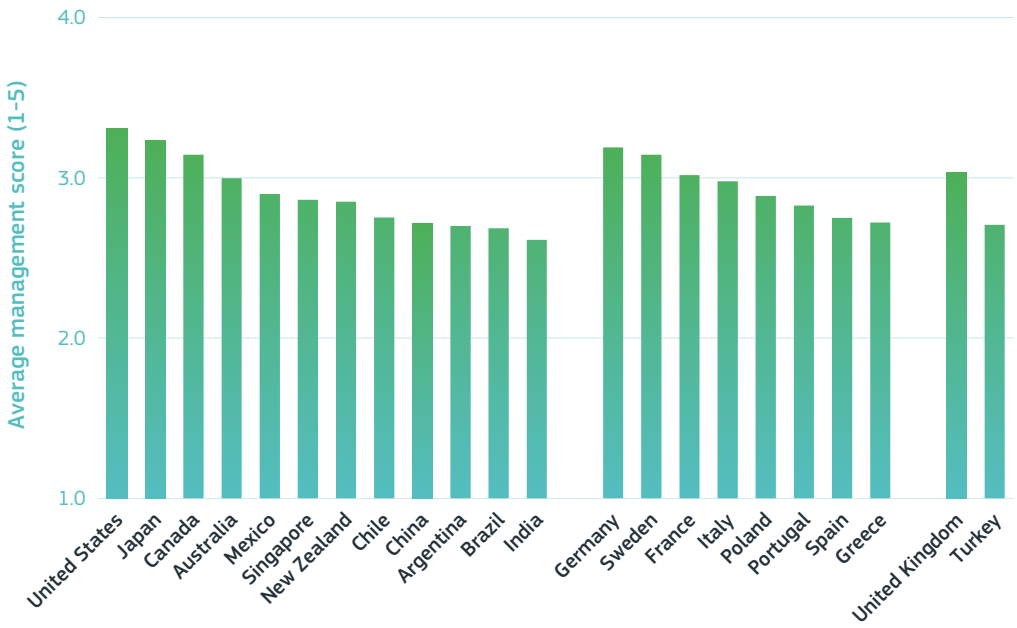
Stronger management capabilities can foster the adoption of new productivity-enhancing technologies and thus help to cope faster with change within an organisation. Research points to the existence of differences in management quality across countries, although more recent and wider cross-country coverage is needed. Bloom and Van Reenen (2016) put forward the idea that some forms of management practices can be seen as a '*technology*', since they can be instrumental in increasing total factor productivity (TFP). OECD (forthcoming) lists other studies that have found that the *dispersion in managerial practices can account for up to one third of TFP differences between countries and across firms within countries*. Bloom et al. (2019) investigated management practices in US manufacturing plants and found a large dispersion of management across plants. In addition, the authors concluded that these management practices explained more than 20 % of the variation in productivity, *a similar, or greater, percentage than that accounted for by R&D, ICT, or human capital*. Finally, right-to-work laws and learning spillovers were found to improve management scores.

Overall, management quality in the manufacturing sector was found to be higher in the United States, Japan, Canada, Germany and Sweden. At the same time, there seems to be room for improvement

in how businesses are managed in southern Europe, notably in Greece, Spain and Portugal (Figure 5.3-5). Unfortunately, the availability of cross-country and comparable data on management practices is still limited, which means more research is needed to identify and address bottlenecks in management quality in Europe.

Figure 5.3-5 Average management scores in manufacturing by country, 2004-2014



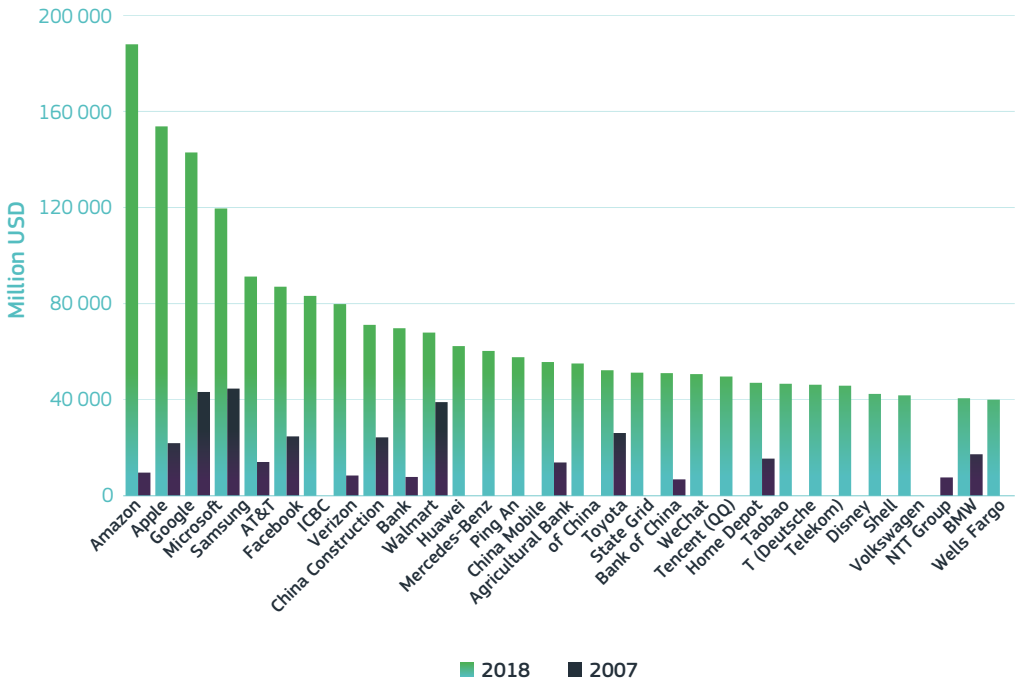
Source: Bloom, N., Sadun, R., & Van Reenen, J. (2016)
Note: Unweighted average management scores; all waves pooled (2004-2014): management scores are between 1 and 5.
Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-5.xlsx

2. Efforts to promote 'made in EU' brands on the global scene lag behind international competitors

Brand strength and recognition is increasingly bringing value to companies by boosting customers' loyalty and attracting new ones. As indicated in Corrado (2005), firms can increase their brand equity by advertising their brands or by researching the market. This is an important strategy to ensure consolidation of the customer' base and to work towards expanding it. In addition, digital firms care as much (if not more) about their brand since the pace of change is unprecedented due to digitalisation. As noted in Blix (2015), speed in building brand recognition and consumer loyalty is essential for the survival of digital firms especially because services in some areas may be very similar and the need to stand out from the competition may therefore be even stronger.

Over time, there has been an enormous rise in brand value, especially among companies operating in the digital and tech space. Figure 5.3-6 highlights the remarkable increase in brand value between 2007 and 2018, in this case in the top 30 most valuable brands. In particular, it is interesting to see that some companies like Amazon were not in the top 30 in 2007, while the company's brand was the leader in value in 2018, with the brand value increasing by 1 856 % in just one decade. Moreover, Facebook was created in 2004 and has made it into the top most-valuable brands. Others, such as Huawei, were not in the list of most valuable brands in 2007 but became highly valuable in 2018. The EU is mainly represented in the rankings by companies in the automotive and oil industry from Germany and the Netherlands.

Figure 5.3-6 Brand value change in the top 30 most valuable brands in 2018 relative to their value in 2007



Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit based on Brand Finance- Global 500 2019 and Brand Finance - Global 500 2008

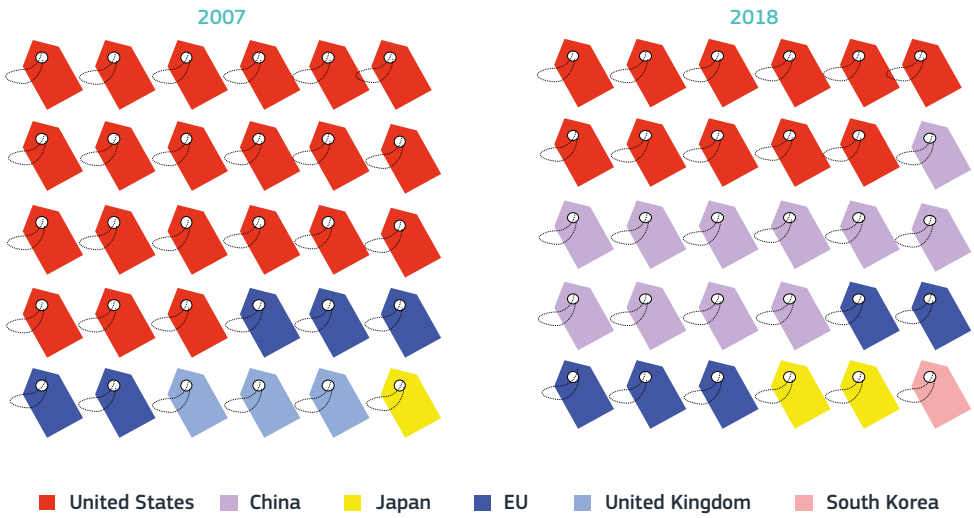
Note: Brand value is the net present value of the estimated future cash flows attributable to the brand. Brands are ranked by brand value according to Brand Finance methodology.

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-6.xlsx

When focusing on the European market only, the EU's top 20 most valuable brands only include two technology companies. Statista (2019)[1] shows that besides the automotive and oil industries which dominate the top 10 EU most valuable brands, only Bosh and Siemens (both from Germany) represent technology companies in the top 20. This contrasts with the reality in the United States where tech companies such as Apple, Google, Amazon, Microsoft, Facebook and IBM dominate the top 10[2].

Today, most of the 'top 30 brands' are found in the United States and China. Figure 5.3-7 shows the distribution of the top 30 brands by brand value in 2007 and in 2018, according to Brand Finance. While in 2007 the top valuable brands were found in the United States (21 out of 30), in 2018, Chinese brands were also leading in brand value. In particular, in 2018, both the United States and China each had 11 brands in the top 30, compared to only five in the EU (Mercedes-Benz, Deutsche Telecom, Shell, Volkswagen, BMW) – i.e. four from Germany and one from the Netherlands. Tech companies dominate the top 10 brands, most coming from the United States.

Figure 5.3-7 Geographical distribution of the 'top 30 brands'(1), 2007 and 2018



Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit based on Brand Finance- Global 500 2019 and Brand Finance - Global 500 2008

Note: (1)Brand value is the net present value of the estimated future cash flows attributable to the brand. Brands are ranked by brand value according to Brand Finance methodology.

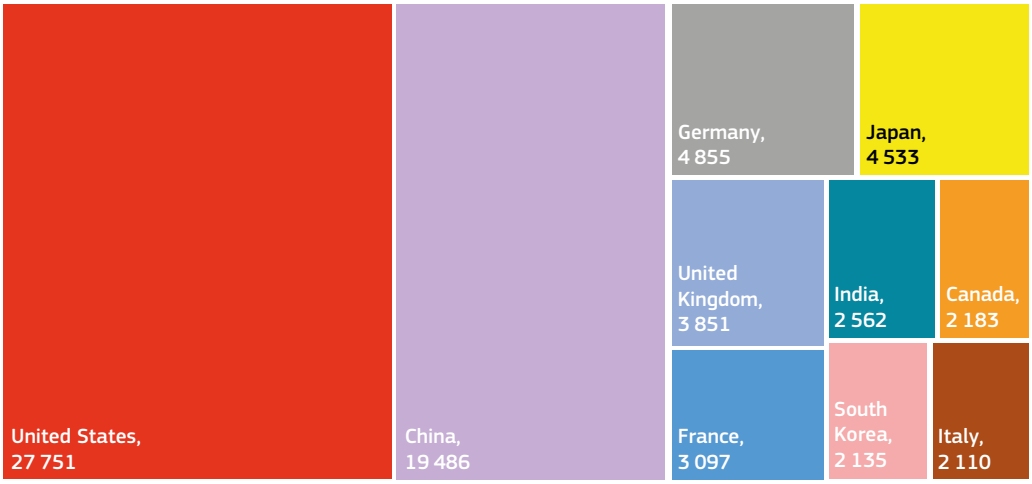
Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-7.xlsx

1 https://www.statista.com/statistics/643747/brand-value-of-the-leading-20-most-valuable-euro-brands/

2 https://www.statista.com/statistics/259061/10-most-valuable-north-american-brands/

The combined nation brand value is the largest in the United States, followed by China. In the EU, the brand value of German, French and Italian brands positions these three Member States in the top 10 most valuable nation brands. Cumulatively, US brands are worth more than USD 27 trillion, the largest value worldwide. This compares with around USD 19 trillion in China and USD 10 trillion in the EU which aggregates the brand value in Germany, France and Italy.

Figure 5.3-8 Most valuable nation brands worldwide in 2019, USD billion



Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit, based on Statista and Brand Finance Nation Brands 2019, (https://www.statista.com/statistics/322423/most-valuable-nation-brands/)

Note: Brand Finance measures the strength and value of the nation brands of 100 leading countries using a method based on the royalty relief mechanism employed to value the world's largest corporate brands.

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-8.xlsx

Better communicating Europe's excellent science and innovation not only improves the public perception of science and technology but also contributes to a stronger 'EU identity' and the upgrade of the 'EU brand' on the global scene. As discussed in Chapter 6.1 - Scientific performance, Europe produces excellent science. In this context, communicating scientific results and their impact on society is key. Box 5.3-1 describes how the live showcase of the first-ever image of a black hole mobilised European and international attention. The image was taken by the Event Horizon Telescope, a global scientific collaboration involving EU-funded scientists. The Community Research and Development Information Service (CORDIS)[3] is the European Commission's primary source of results from the projects funded under the EU's Framework Programmes for Research and Innovation (FP1 to Horizon 2020). In this way, impactful projects and success stories of EU-funded research projects can be shared around the world. Horizon Europe will build upon the many achievements of its predecessors.

3 https://cordis.europa.eu/en

BOX 5.3-1 Communicating science: the first-ever image of a black hole taken by Event Horizon Telescope, unveiled live to the world by the European Commission

Extract from EC press release – First-ever image of a black hole, 10 April 2019

'(On 10 April 2019), the Commission revealed the **first-ever image of a black hole taken by Event Horizon Telescope, a global scientific collaboration involving EU-funded scientists**. This major discovery provides visual evidence for the existence of black holes and pushes the boundaries of modern science.

Black holes are extremely compressed cosmic objects, containing incredible amounts of mass within a tiny region. Their presence affects their surroundings in extreme ways, by warping spacetime and super-heating any material falling into it. The captured image reveals the black hole at the centre of Messier 87, a massive galaxy in the constellation of Virgo. This black hole is located 55 million light-years from Earth and has a mass 6.5-billion times larger than our sun.

This major scientific achievement marks a paradigm shift in our understanding of black holes, confirms the predictions of Albert Einstein's General Theory of Relativity and opens up new lines of enquiry into our universe. The first image of a black hole successfully captured was unveiled in six simultaneous press conferences across the globe today.

EU funding through the European Research Council (ERC) has provided crucial support to the EHT. In particular, the EU has provided funding for three of the leading scientists and their teams involved in the discovery, as well as supported the development and upgrading of the large telescope infrastructure essential to the success of the project.'

Many software and digital applications behind the widespread success of digital disruptive industries have some 'EU origin'. Box 5.3-2 illustrates three examples – Linux (open source programme), MP3 (audio and media format) and Python (programming language).

BOX 5.3-2 Communicating innovation: examples of EU innovations behind widespread digital products and services - Linux, MP3, Python

LINUX: created by Linus Torvalds (Finland)

Extract from https://en.wikipedia.org/wiki/History_of_Linux, hyperledger.org and https://opensource.com/article/19/8/everyday-tech-runs-linux

'In 1991, while studying computer science at **University of Helsinki**, Linus Torvalds began a project that later became the **Linux kernel**. He wrote the program specifically for the hardware he was using and independent of an operating system.

The **largest part of the work on Linux is performed by the community**: the thousands of programmers around the world that use Linux and send their suggested improvements to the maintainers. **Various companies have also helped not only with the development of the kernels, but also with the writing of the body of auxiliary software**, which is distributed with Linux. Some examples are Dell, IBM and Hewlett-Packard.

The **Open Source Development Lab** (OSDL) was created in 2000, as an independent non-profit organization which pursues the goal of optimizing Linux for employment in data centers and in the carrier range. On 22 January 2007, OSDL and the Free Standards Group merged to form The Linux Foundation, narrowing their respective focuses to that of promoting Linux in competition with Microsoft Windows.

Many companies, organizations and technologies run on Linux: NASA's Pleiades supercomputer, Amazon's services – from Amazon Elastic Compute Cloud (Amazon EC2) to Fire TV – SteamOS (gaming), Instagram, Facebook, YouTube, Twitter, New York Stock Exchange, the Pentagon, Apple's iCloud, Google's Chrome OS, Android, and many others.'

The Linux Foundation is also pioneering important developments in the field of blockchain. In particular, the Foundation hosts the 'Hyperledger' project – an open source and global collaborative effort created to advance cross-industry blockchain technologies.

Figure 5.3-9 Examples of software and applications running on Linux

Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit, based on opensource.com and Wikipedia.org

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-9.xlsx

MP3: developed by the Fraunhofer Institute (Germany)

Extracts from https://www.mp3-history.com/

'mp3 encodes and stores music. An mp3 file takes up just 10 percent of the storage space of the original file, meaning music can be quickly transferred over the Internet and stored on mp3 players.

The idea for audio encoding and initial basic research in the field arose at Friedrich-Alexander University Erlangen-Nuremberg. Starting in 1987, a large team drawn from the university and the Fraunhofer Institute for Integrated Circuits IIS in Erlangen worked on developing the mp3 standard.

Marketing the new technology was just as important as its development in the late 1980s and early 1990s. Developers at **Fraunhofer** searching for mp3 technology applications came up with the **vision of portable music players that would allow music fans to store their entire music collections**. Though their ideas were initially ridiculed, the Fraunhofer team overcame the established industry's resistance and turned mp3 into a global success.

Fraunhofer does not sell any mp3 products to end users and does not provide end user support for mp3 devices and software. **iTunes (Apple) and Windows Media (Microsoft) integrate the Fraunhofer mp3 software**. In 2017, Technicolor's mp3 licensing program for certain mp3 related patents and software of Technicolor and Fraunhofer IIS has been terminated.

mp3 is more than a technology; mp3 is a cultural phenomenon and an example for successful research, development and marketing in Germany.'

Figure 5.3-10 Examples of audio and media applications running on MP3

Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit, based on Fraunhofer

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-10.xlsx

PYTHON: designed by Guido van Rossum (Netherlands)

Extracts from https://medium.com/@johnwolfe820/a-brief-history-of-python-ca2fa1f2e99e, https://en.wikipedia.org/wiki/Python_(programming_language

'Python is an interpreted, high-level, **general-purpose programming language**. It was originally conceptualized by Guido van Rossum in the late 1980s as a member of the **National Research Institute of Mathematics and Computer Science situated in the Netherlands**. Initially, it was designed as a response to the ABC programming language that was also foregrounded in the Netherlands. The language was released in 1991. Rather than having all of its functionality built into its core, Python was designed to be highly extensible. This compact modularity has made it particularly popular as a means of adding programmable interfaces to existing applications.

Since 2003, **Python has consistently ranked in the top ten most popular programming languages** in the TIOBE Programming Community Index where, as of December 2018, it is the third most popular language. It was selected **Programming Language of the Year** in 2007, 2010, and 2018. An empirical study found that scripting languages, such as Python, are more productive than conventional languages, such as C and Java, for programming problems involving string manipulation and search in a dictionary.

Large organisations that use Python include Wikipedia, Google, Yahoo!, CERN, NASA, Facebook, Amazon, Instagram, Spotify. The social news networking site Reddit is written entirely in Python.'

Figure 5.3-11 Examples of organisations using Python

Science, research and innovation performance of the EU 2020

Source: DG Research and Innovation, Chief Economist - R&I Strategy & Foresight Unit, based on medium.com and Wikipedia.org

Stat. link: https://ec.europa.eu/info/sites/info/files/srip/2020/parti/chapter53/figure-53-11.xlsx

3. Conclusions

Economic competencies are important complementary intangible assets to other intangibles, such as R&D, and to tangible assets like investments in machinery. For example, strategic management can lead to the uptake of novel technologies that can make a company lead in the future. Moreover, investing in the workforce's cognitive and soft skills makes organisations more resilient when coping with change. At the macro level, evidence shows that **economic competencies are indeed contributing to both labour productivity and economic growth**. As regards that growth-enabling role, the fact that the **EU underinvests in economic competencies relative to the United States** may limit its productivity growth.

Furthermore, the era of globalisation and digitalisation means fiercer competition than ever. Hence, companies better at boosting their reputation and marketing their products, services and business models are likely to attract a larger market share. For this reason, **the United States' clear leadership position in brand value, particularly in technology companies, means that the EU needs to step up its game and become better at promoting its brands on the global scene**. At the same time, it needs to reinforce its technology and digital leadership by enabling the right business environment for EU digital companies to flourish, which are also very R&D-intensive.

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