

DIGITAL ECONOMY

Digital divide and development

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Introduction

The so-called digital economy, understood as that economy based on Information and Communication Technology (ICT), has developed out of the incorporation into society of the Internet phenomenon. The incorporation of new and improved tools in communication and information has affected the behaviour of all economic agents.

This phenomenon has attracted the attention of governments, which are increasingly aware of the impact the development of the digital economy is having, and agendas are increasingly being put forward in order to develop coherent strategies in this area to encourage economic and social development, especially in the area of the Organization for Economic Cooperation and Development (OECD) (OECD, 2015).

ICT is becoming more powerful, more accessible and more widespread throughout the world. Currently, it can be said that ICT plays an important role in determining competitiveness, the development of countries and the welfare of society in general. This has been integrated into the professional and personal spheres of our way of life, allowing for the better interconnection of economic agents. In addition, there are increasingly more services and objects related to the Internet, producing a convergence between ICT and what is known as the digital economy. On the other hand, it is observed that ICT is generating unprecedented spillover effects that influence the actions of consumers, firms and the public sector, as pointed out by Lohse et al. (2000). From data obtained for the US, these authors conclude that the passage of time and the extent of Internet use should lead companies to prepare their expansion plans over the network in order to obtain an even more varied audience. An audience which is less focused on groups with high levels of education, resources, and that is highly trained in the use of the latest technologies. The latter corresponds to the first group that incorporated Internet use into their lifestyle.

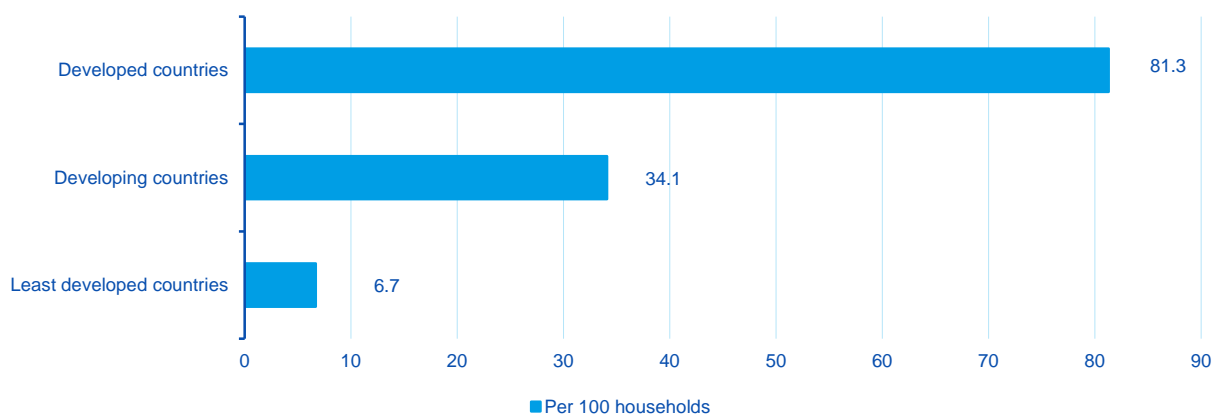
ICT has strong potential to transform economies and societies through improved productivity, reduced costs of information and transaction, the creation of new models of collaboration to increase the efficiency of workers and improve their quality of life, promote innovation, improve education and access to basic services. Specifically, the Internet of Things (IoT) and large volumes of data have the potential to address major development challenges. New opportunities in the era of IoT include how this type of Internet can contribute to sustainable development. These new trends not only affect the personal behaviour of consumers, but have a big impact on economic development and wealth creation. The massive use of IoT in all economic sectors implies a shift in paradigms, since it is possible to monitor hundreds of elements in a simple way and to act predictively thanks to data analysis. Some specific domains in which this technology has a high potential are health, monitoring climate change, energy and disaster management. Specific examples range from unmanned aerial vehicles (drones) for precision agriculture to transportation and electricity networks in "Smart Cities". However, despite advances in the analysis of data related to ICT, it still seems that it has not been possible to adequately estimate the economic impact of this phenomenon. Economists such as Feldstein (2015) and Davies (2016) consider the hypothesis that there is a problem regarding the measurement of production, that it does not allow for the capture of improvements resulting from the use of ICT ("mismeasurement hypothesis"). This hypothesis could explain the apparent contradiction that exists today between low growth in GDP and productivity per worker worldwide, and the expanding use of ICT and the digital economy.

Economic agents are aware of the need to develop a digital economy that increases their profits and allows them to address challenges such as the reduction of unemployment and the fight against poverty. To do this, what is needed is not just a government willing to implement policies and carry out actions in favour of the digital economy, but also the development of close cooperation between all economic agents, as well as high quality infrastructures that allow communication within and outside its borders. So that this process of technological change can be realized, the best use of Internet connectivity is required. Given the limited infrastructure in different developing countries, it is a challenge that requires political attention. Also the large volumes of data management are a challenge for national statistical offices and regulatory authorities that needs to be addressed. Wide accessibility to ICT for all agents, confidence in system security, proper training of the population and a business community committed to innovation are key determinants in order to obtain the maximum benefit from the existence of ICT.

Currently 3,200 million people have an Internet connection (43% of the world population), according to ITU (2015). However this amount is not distributed evenly among countries. Depending on the level of development of countries, there are large inequalities which ideally should be disappearing (Figure 1). In 2015, 46% of households worldwide had Internet access, compared to 44% in 2014 and only 30% in 2010. There is still a lot of work to be done in order to achieve the goal of bridging the gap between the least and most developed countries in the world.

All the foregoing translates into great economic and social opportunities. The impact of ICT on the economy and society is not only a question of access, but also one of use¹. This study focuses on analysing the asymmetries that occur in the use of ICT and the Internet in particular between developed and emerging countries. The analysis deals with the study of the gap between developed countries, which are considered leaders in the digital economy (more advanced in the use and development of ICT). On the other hand, it takes a set of emerging countries which are globally representative to compare their evolution.

Figure 1
Households with internet access by groups of countries (%)



Source: BBVA Research and ITU

1: According to the World Economic Forum, (WEF) 2015, there is a high correlation between the use and impact of ICT (0.94).

Macroeconomic scenario: the digital divide between the developed and emerging world

Both sides of the market (users from the demand side and telcos and technology from the supply side) push the frontier of knowledge forward in a broad sense. With the interconnection of both groups, new technologies emerge and Internet access increases (via price and/or technological improvement) which foster the use of the same.

Behind the use of the Internet, there is a services market that reflects the interconnection between demand and supply. Knowledge of network users' consumption patterns and their present and future development is one of the most important elements in the innovation process in bidding companies. This is as true in those telcos and technology companies whose core business is based in ICT, as it is in other companies whose line of business is conditioned to a greater or lesser extent by changes in this technology, which for them represents a new channel of communication and a source of information.

The academic literature on the theoretical side, has studied these patterns of behaviour, generating some discussion about whether ICT creates new patterns or if it is possible to adapt existing ones to a new set of products and services. The discussion raised by Scott Morton (2006) is a good example of this line of thought. However, from an empirical point of view, it is more complicated to implement general works in this field, since it is not always possible to provide data of sufficient quality for analysis.

Internet access is a necessary but not sufficient condition for it to be put to use. In turn, using the Internet is key to taking advantage of the opportunities created by new technologies. Frequency of Internet use shows a facet of the degree of network knowledge, which provides the basis for other measures that allow assessments about the depth of applied Internet knowledge to expand and improve. One example is the purchase of goods and services through the network and the use of electronic banking services².

The evolution of ICT and the digital economy in general has been positive in recent years, but not all countries have recovered equally from the effects of the crisis that took place between 2007 and 2009³. According to the latest data provided by ITU (2015), there is a strong potential for increased use of ICT and the Internet that could help generate growth from innovation in goods, services and business models in all sectors.

Information from the World Economic Forum (WEF) was used to carry out this work, namely that referencing "The Global Information Technology Report 2015" (WEF, 2015), and data relating to ICT situation indicators was also taken from the latter.

The data on Internet use came from the World Bank database, which understands an Internet user as being anyone with access to the global network and is measured per 100 individuals.

If we look at the evolution in the use of the Internet from a time perspective for the period covering the last 25 years, it could be argued that such use is occurring asymmetrically. We took information about Internet use in 160 countries around the world, from 1995-2015, in order to analyse the gap in Internet use. In this sample there are countries such as Finland, Iceland and Norway, which since the beginning have maintained significantly higher levels of Internet use than other countries, and other countries like Sierra Leone, Tanzania and Guinea that have systematically registered values close to 0%. Figures 2 and 3 show the behaviour of the gap in Internet use. The graphs at the top left of Figures 2 and 3 show how the gap in

2: In surveys such as the one carried out in Spain by the INE (Survey on Equipment and Use of Communication and Information Technologies in Households, ICT-H) or at European level by Eurostat (Community Statistics on Information Society, CSIS), internet use is a necessary condition so that the survey respondents can provide answers about other actions that can generate higher added value, such as the purchase of products on the network or the use of specialized services (for more information see, Correa et al., 2015 and Box 4 in BBVA Research, 2016).

3: The proportion of goods and services related to ICT on total value added of OECD countries has remained stable, and world trade of ICT has continued to increase, especially in services (OECD, 2015). Risk investment in ICT is increasing, getting considerably close to the values obtained during the dot-com company bubble.

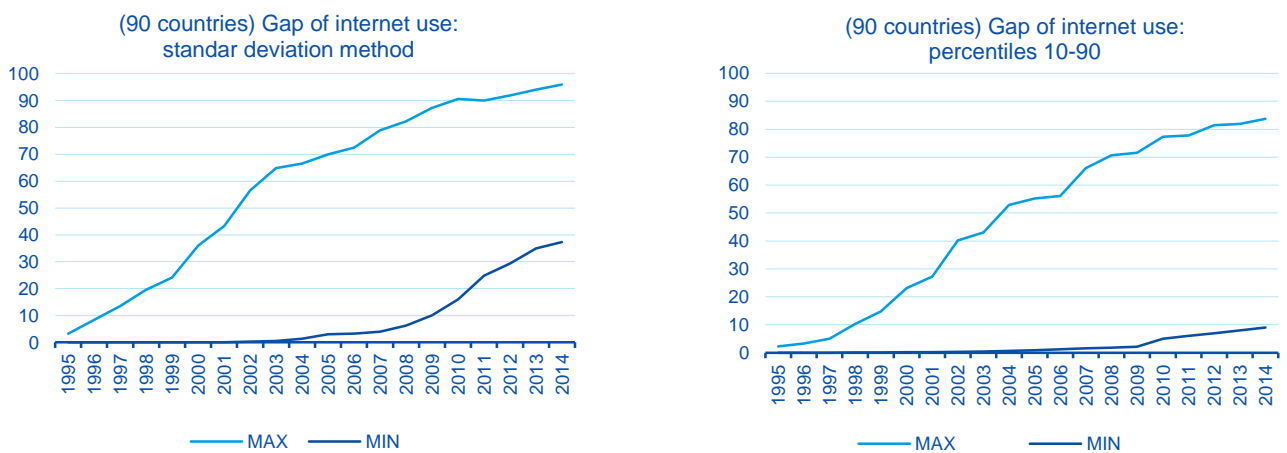
Internet usage has changed, once those countries considered as outliers are eliminated, that is, after the elimination of countries whose Internet use is outside the range of plus/minus two standard deviations. For this sample of 90 countries, the gap in Internet usage has been closing since 2006 as countries with lower usage rates have started a noticeable escalation, which means that minimum levels have moved away from levels of around zero, to stand at levels close to 40%. This process generates gap growth rates which are negative. On the other hand, in countries with higher Internet usage rates its growth is stabilized because this activity has been democratized throughout society. The phenomenon of convergence is purely mathematical, since it is derived from the combination of a saturation process in the most advanced societies and a large margin of improvement available to those most backward countries.

The following figures show the gap in Internet usage between intermediate percentiles, this time eliminating the countries that in a given year are in the upper and lower percentiles, in order to analyse the changes in the evolution of the gap in groups of countries that have shown some similar Internet usage figures throughout the entire period. The graphs at the top right and bottom left of Figures 2 and 3 seem to indicate that, in 2014, the gap was still widening over time between the 10th percentile and the 90th percentile, and between the 20th percentile and the 80th percentile, as in the graph at the top left in Figure 2, before 2007. However, the pace of growth has slowed since 2009. When the group of countries is reduced to those between the 30th percentile and the 70th percentile (the graphs on the bottom right of Figures 2 and 3), we see that the gap grows until 2009, and remains constant in successive years. This result clarifies the existence of a global dual phenomenon in Internet use, which is discussed in the next section.

In order to take these conclusions into account and for the purpose of giving a more illustrative comparison between observations, we will limit the study to two groups of countries, depending on the degree of digital development they experienced in 2014:

- **The digital powers:** this group consists of countries located in the top twelve in the *Readiness Ranking*, WEF, 2014. These countries are Sweden, the USA, the UK, South Korea and Germany. The study will also examine the Spanish case as a country with a high level of ICT development, though below these powers.
- **Emerging countries:** made up of Latin American countries (Chile, Colombia, Peru, Brazil and Mexico), Asia (India and China), Turkey and two African countries (South Africa and Nigeria).

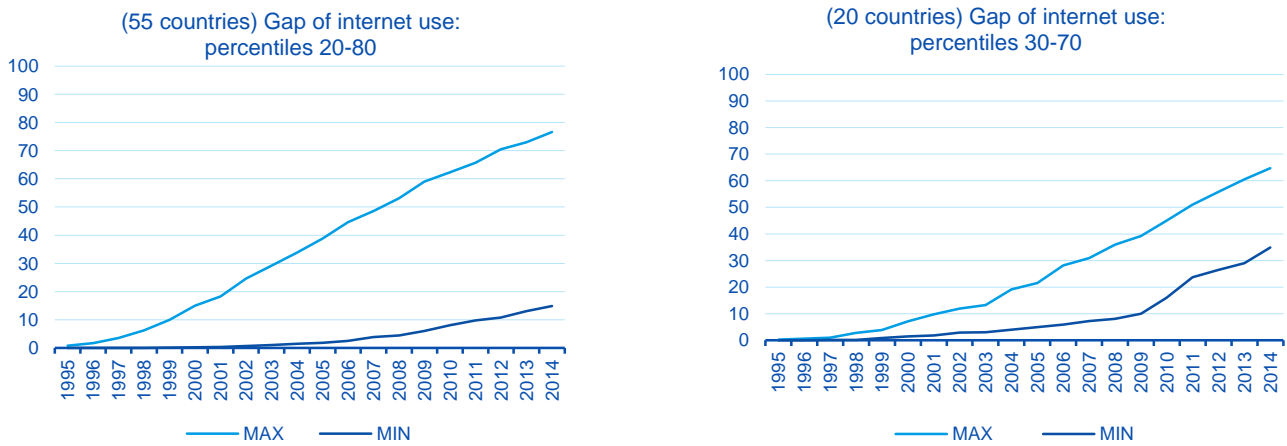
Figure 2
Evolution of gap in Internet usage (%) (After removing outliers according to described procedure)*



*: Any country considered an outlier for at least a year is removed from the sample
 Source: BBVA Research and World Bank

Figure 2 (cont.)

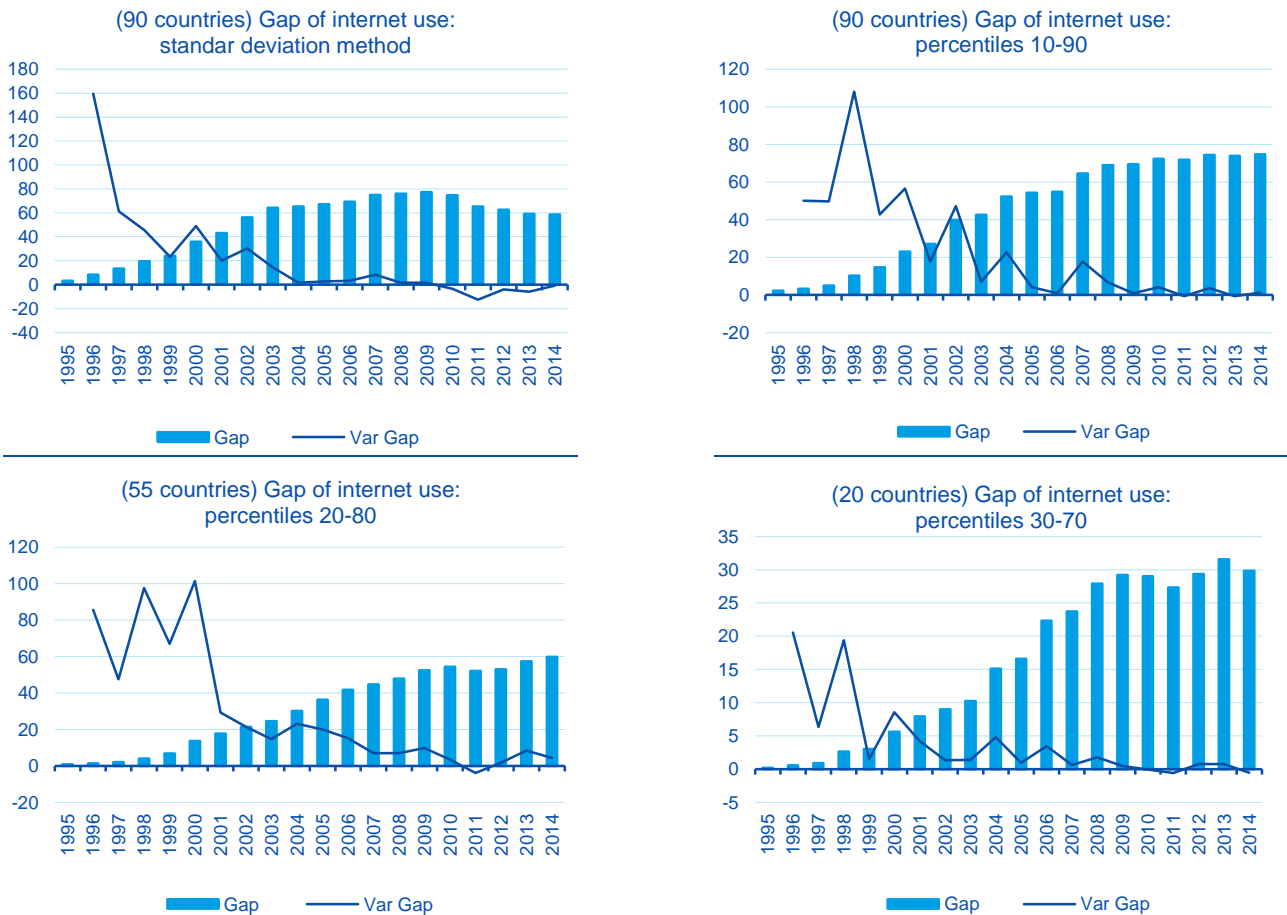
Evolution of gap in Internet usage (%) (After removing outliers according to described procedure)*



*: Any country considered an outlier for at least a year is removed from the sample
 Source: BBVA Research and World Bank

Figure 3

Variation rate (%) in Internet usage gap (After removing outliers according to procedure described)*



Source: BBVA Research and World Bank

In order to close the gap between developed and developing countries, people have been working in different fields both at the national level and in supranational bodies. An example of this is *Connect 2020*. This is a strategic program adopted by ITU member countries in 2014⁴ that focuses on four goals: growth, inclusion, sustainability and innovation. Each of these pillars has specific associated goals. Forecasts about the proportion of households with Internet in 2020 come up with a figure of around 56% (ITU, 2015). This is on the way to surpassing one of *Connect 2020*'s objectives, that of increased Internet access for 55% of households worldwide by 2020. However, in terms of individuals, forecasts suggest that only 53% will be online by 2020, a figure that is below *Connect 2020*'s target of 60%.

In addition to the differences between these countries, there are also differences within each country. The growing gap between old and new generations and between rural and urban areas is backed up by evidence (Alonso and Arellano, 2015). *Connect 2020* sets out with the objective that by 2020, 90% of the rural population should have broadband coverage. Given that in rural areas coverage is currently at 30%, compared with 90% in urban areas, it is clear that the focus should be on rural broadband coverage over the next five years. These differences are a source of inequality since ICT is a strong maximizing force regarding the potential for growth and, therefore, an element of convergence⁵. Also regarding gender issues, there is a global gap of 11% in the usage of Internet between men and women.

Evolution of Internet usage as a developmental element

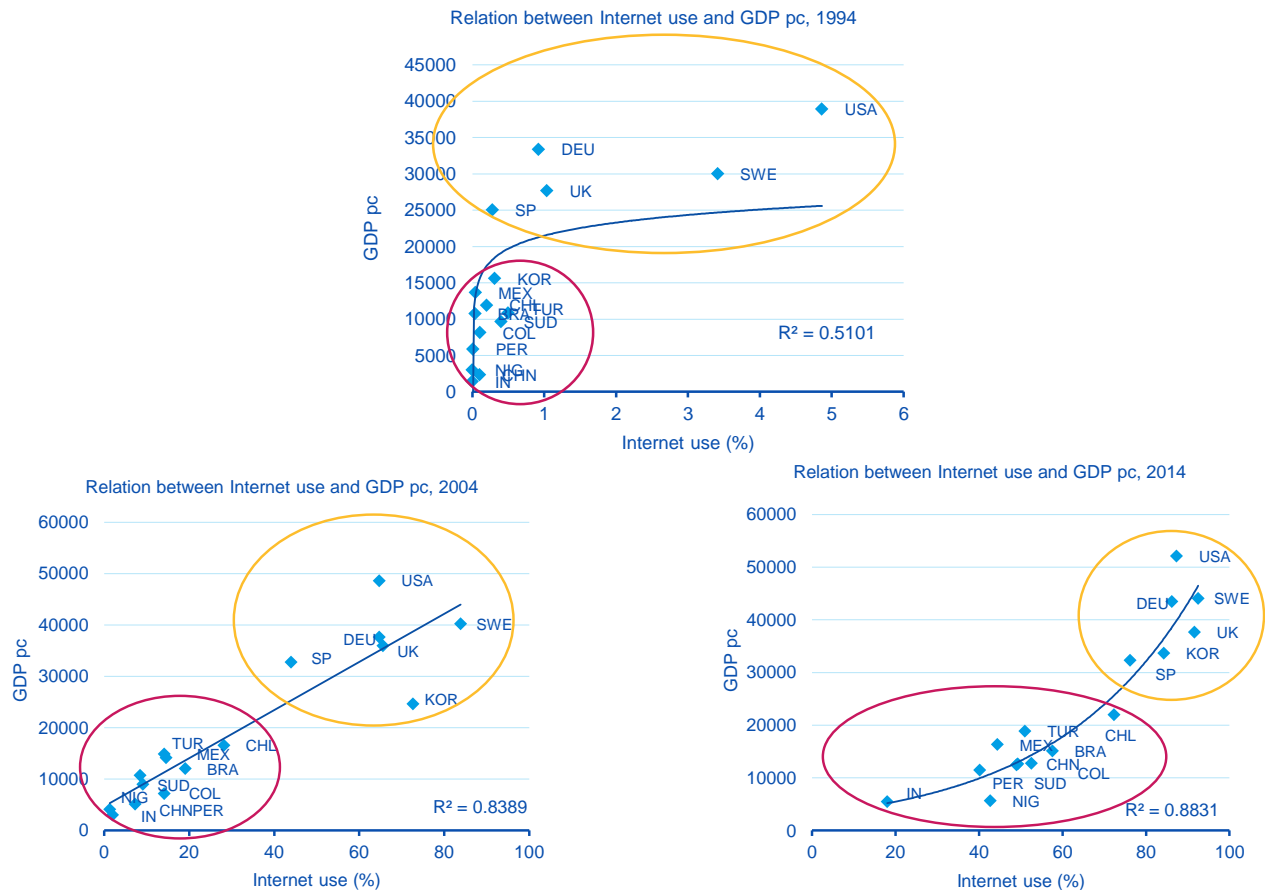
There are notable differences in Internet use, which are closely linked to the developmental level of countries. The very process of the diffusion of technology and its relation to GDP per capita leads to a temporary comparative such as that shown in Figure 4. Referencing different moments in time, a transformational phenomenon that goes from a concave shape in 1994 to a different convex one in 2014, via a more linear relationship observed in 2004. This result reflects the change from the Internet being used as an indicator of economic development, to that of it being a necessary but not a sufficient developmental indicator. The same phenomenon of diffusion among individuals that is evident with a new product or technology is also seen among countries, distinguishing between innovators and imitators: innovators are those countries adopting or buying the new product or technology regardless of the behaviour of others. The imitating countries begin to consume or adopt such products when they see that the innovators have gained improvements from doing so, then they think that they can also experience this improvement by adopting the technology.

Considering the classification of countries into two groups was more logical according to GDP per capita for 2004, where the differences between the group of digital powers and that of emerging countries were more pronounced. In 1994, only the countries that adopted Internet usage before differed clearly from the rest (US and Sweden), meaning that the group of digital powers was very large and barely differentiated as against the group of developing countries. In 2014, what started to generate was a process of concentration in the digital powers and a growing dispersion in the group of emerging countries. At the same time, the distance between the two groups is reduced.

4: ITU member countries in 2014 were Australia, Austria, Belgium, Benin, Canada, Democratic Republic of the Congo, Croatia, Czech Republic, Denmark, England, Estonia, France, Germany, India, Ireland, Israel, Italy, Ivory Coast, Japan, Kenya, Latvia, Liberia, Macedonia, New Zealand, Netherlands, Nigeria, Norway, Poland, Portugal, Romania, Russia, Scotland, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Tanzania, Togo, Uganda, USA and Wales.

5: If measures aimed at inclusion are not taken, the differences in Internet use could cause the progressive increase in this gap. An example would be to ensure universal access to high-speed Internet.

Figure 4
Relationship between Internet usage (%) and GDP per capita (€) (1994, 2004, 2014)



Source: BBVA Research and World Bank

Figure 5 shows the different growth rates of Internet use for all countries considered.

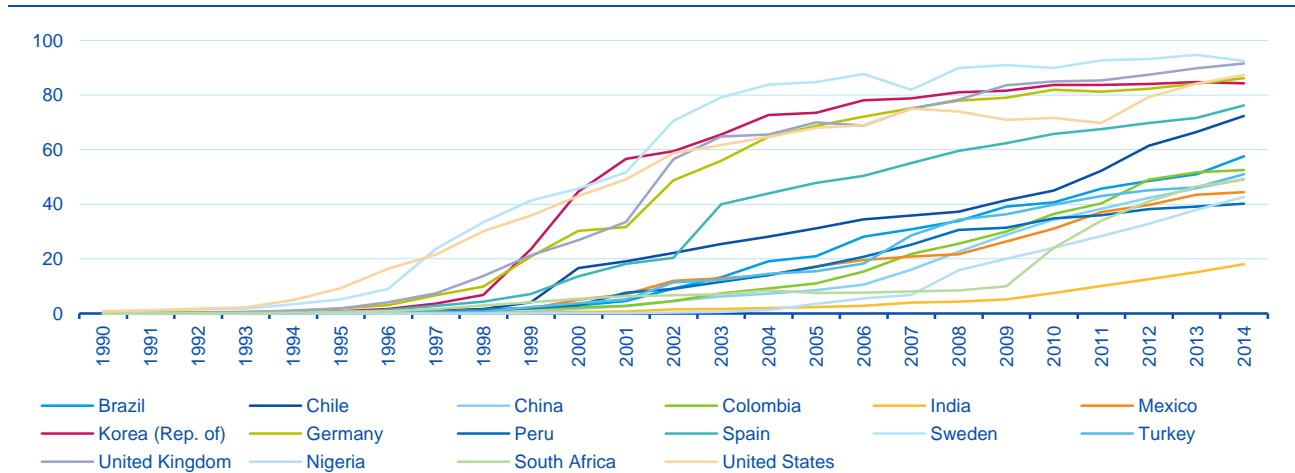
The future development of the digital powers shows striking differences from the intra-group behaviour during the period 1990-2015. The moment of greatest growth in Internet use is heterogeneous in time and intensity⁶. This difference in behaviour reflects a dichotomous behaviour in the adoption of innovations, between those that generate innovation and are developing at a steady pace and over long periods of time (like the US between 1995 and 2002). While those in the second instance immediately adopt an innovation initiated by others (like South Korea). In this event, Sweden would constitute an intermediate case.

Regarding Internet usage, various countries within this group of digital powers have led it. Given the available data, the US initially led the expansion in Internet use until the second half of the 1990s. In Sweden between 1996 and 1998, there was a large growth above what was normal, putting it above the US, except in 2001 (when South Korea experienced a major expansion between 1998 and 2001). The rest of the analysed period is dominated by Sweden.

6: Figure A.3 in the Appendix shows Internet usage as an index with 1990 as the base year. As it can be seen, South Korea focused its expansion in Internet use between 1998 and 2001. An example of a behaviour difference can be seen in countries such as Sweden and the US, which experienced a less intense growth in use than countries like South Korea, but this was more constant over time (Figure A.4, with 2005 as the base year).

The period between 2001 and 2002 can be seen as time of far more generalized expansion, with significant increases in Sweden, UK, Germany and to a lesser extent in the US.

Figure 5
Evolution of Internet use (%)

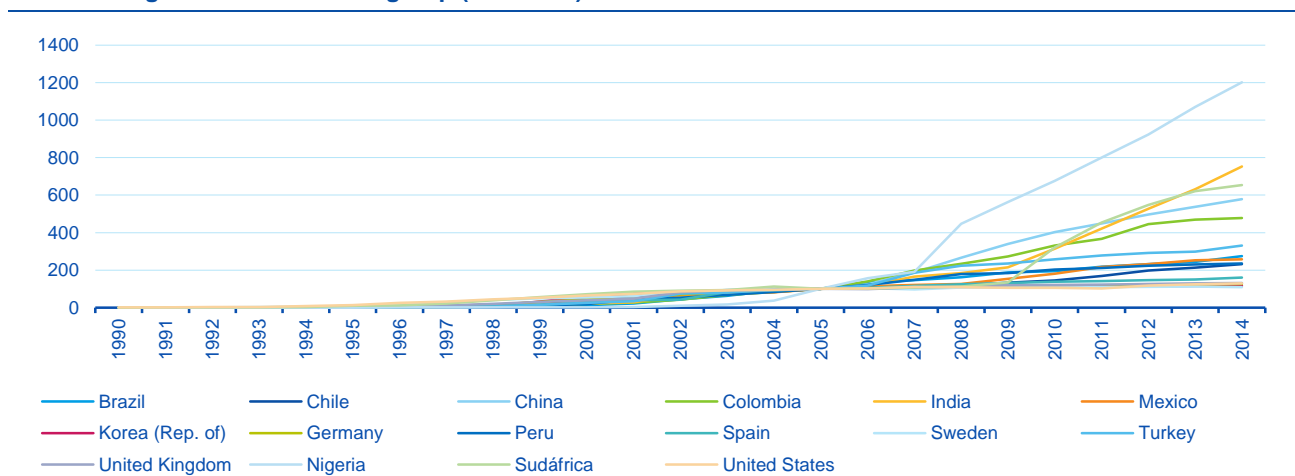


Source: BBVA Research and World Bank

In the last decade of the period considered (with percentages of Internet usage above 80% on average), Figure 5 shows higher growth and more sustained Internet use in the UK, allowing it to approach Sweden’s leading position. The amount of the growth in the United Kingdom is only surpassed by the USA from 2011 onwards, which recovers part of the disadvantage generated in the period 2007-2011.

Spain’s behaviour with respect to the digital powers shows a delay in the adoption of Internet use in various ways. With a behaviour similar to that of Chile until 2002, after a delay of a year, Spain experienced the great growth that occurred within the European digital powers. Since 2003, it has experienced a minor but constant growth throughout the rest of the period. This behaviour reduced the differences with respect to the leaders in 2014 (Sweden and the UK). However, the level of Spain in 2014 corresponds to that of the U.S., Germany and the UK in 2007, to that of South Korea in 2006 and that of Sweden in 2003.

Figure 6
Internet usage rate for the whole group (2005=100)



Source: BBVA Research and World Bank

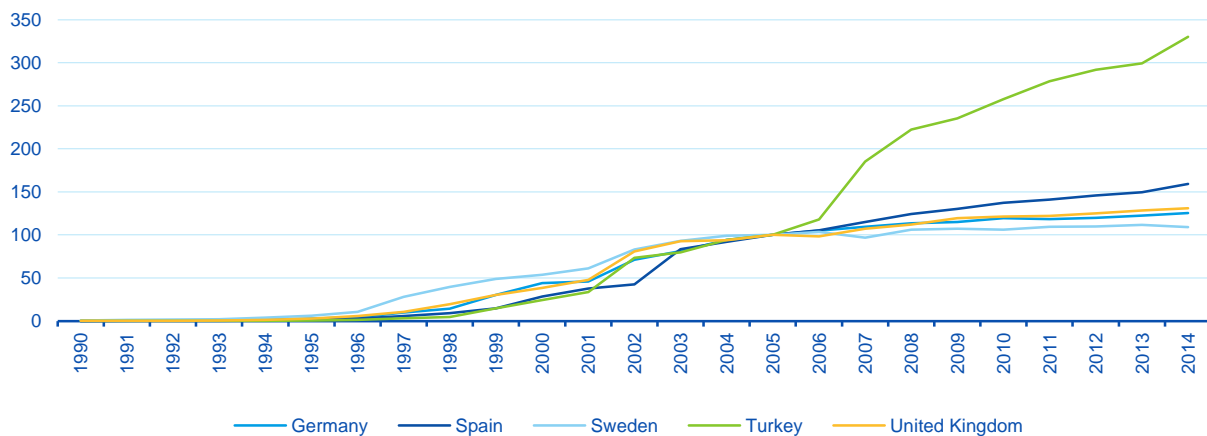
If an exclusively European comparative including Turkey (Figure 7) is undertaken, there are notable differences in speed that arise between European digital powers, which start from higher figures compared to Spain and Turkey. Spain experienced the process of dynamic expansion in Internet usage before Turkey, as can be seen by comparing Figures 7 and 8. Compared to 1990, the two countries have had similar cumulative growth. However, the initial levels were quite different between the two countries, which means that in 2014 the difference was more than 25 percentage points.

As regards the group of emerging countries, intra-group behaviour is more homogeneous and presents minor differences with the exception of Chile, India and South Africa. Although their evolution over time is as diverse as in the previous group (Figure 9). From 1999, when a sharp acceleration in the rate of Internet use was experienced, Chile showed different behaviour to that of the other emerging countries considered. The difference with respect to Brazil, which leads the other countries in the sample, has fluctuated over time between a minimum of less than five percentage points between 2008 and 2010 to a peak of nearly 15 percentage points in 2014, just four percentage points from Spain.

As expected, the members of the rest of the group of emerging countries show that countries with lower rates of use since the early twentieth century (India, China and Colombia) are those with the greatest growth in usage. Although in the case of India, this growth is insufficient to reduce the gap with other countries. China and Colombia recovered lost ground compared to other countries and, in 2014, had a level of nearly 50%, similar to that of Brazil and Turkey. Conversely, Mexico and Peru with a better comparative situation than China and Colombia in the early twentieth century, showed percentages in 2014 closer to 40%, because of a more modest cumulative growth (Figure 9).

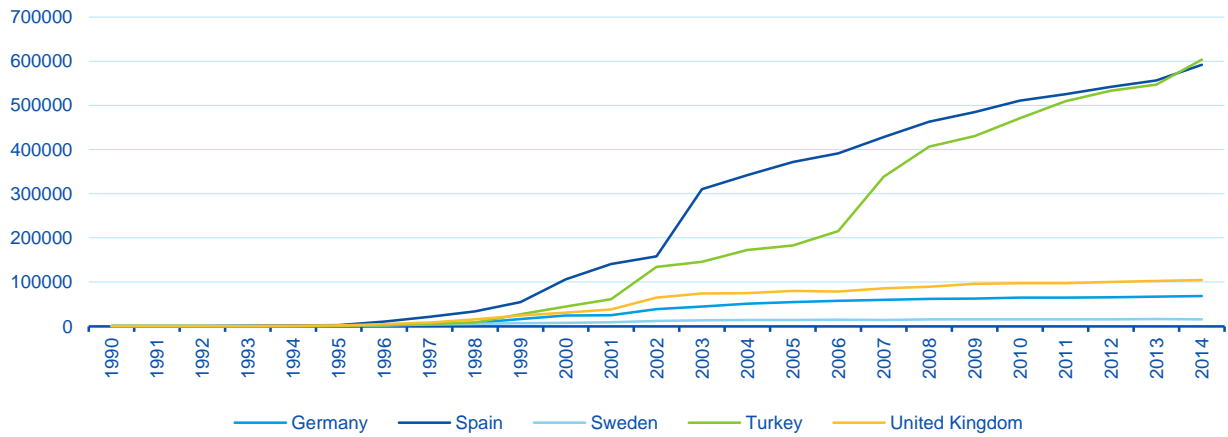
In addition to intra-group differences, the inequality in the level of Internet use among so-called leaders and some emerging digital reference countries, even in 2014, is remarkable. Although the convergence rate was higher in the last decade of the study period considered for emerging countries (as seen in the Internet usage indicator based on 2005 presented in Figure 6), the gap is far from closing up.

Figure 7
Internet usage rate for European countries in the group (2005=100)



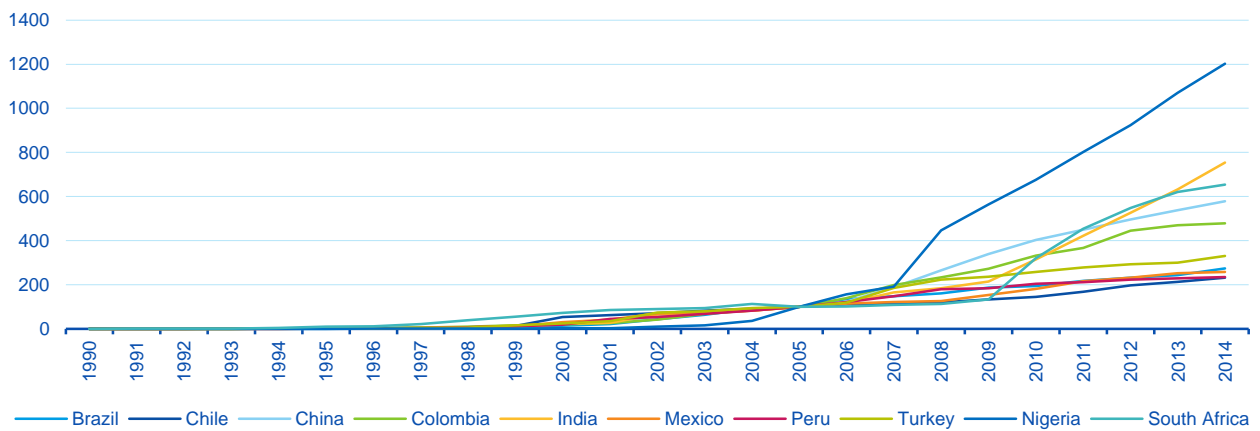
Source: BBVA Research and World Bank

Figure 8
Internet usage rate for European countries in the group (1990=100)



Source: BBVA Research and World Bank

Figure 9
Internet usage rate for emerging countries in the group (2005=100)



Source: BBVA Research and World Bank

While the process of convergence is evident, it is necessary to adopt additional measures to ensure that the objectives of growth and digital inclusion are achieved in developing countries, and especially in those that are less well developed. *Connect 2020* aims to ensure that at least 50% of households in developing countries and 15% of households in the least developed countries have access by 2020. The ITU estimates that only 45% of households in developing countries and 11% of households in the least developed countries will have access to the Internet by that date.

These Internet usage results appear to be conditioned by several factors:

- Factors of an individual character, such as those identified by Alonso and Arellano (2015), related to consumer behaviour when adopting an innovation and the time frame in which it occurs. The adoption of an innovation depends on aspects such as the relative advantage of the innovation compared to existing

products, its compatibility with the lifestyle habits of the potential adopter, the difficulty inherent in its use or the possibility of using prior to buying it.

- Aggregated factors such as the environment and preparation are discussed below.

Is a country ready or not? Factors that determine a country's degree of preparation for the digital world

This section focuses on analysing those factors at the aggregate level that could determine the different levels of Internet use in countries. In particular, it is intended to assess each country's digital development conditional on its (political, regulatory and business) environment and preparation (infrastructure, digital content, prices and required training).

Environment

The first step, in order to be able to use ICT is that the environment is conducive to it. By the environment, we mean the institutional circumstances in which relations between economic agents take place. According to WEF data, which are shown in Table 1, digital powers enjoy a very favourable environment characterized by a high level of judicial independence as well as a high level of protection regarding intellectual property. On the business and innovation side, the availability of the latest technologies is very important as is the intensity of local competition. One aspect that could be improved in these powers is the availability of venture capital in ICT.

Overall, it appears that the political and regulatory environment offers better conditions than the business and innovation environment for this group of countries, although there are exceptions such as the USA, which has remarkable access to the latest technologies. At the opposite end of the scale, there is South Korea, where the political and regulatory environment fails to achieve the quality of other countries in the group mainly because of the minimal effectiveness of their legislative bodies and the level of judicial independence.

As shown in Table 2, the context in which ICT is developed for the group of emerging countries is generally not too favourable in the political, regulatory or business environments. Notable are the cases of Chile and Turkey, which have the most favourable business environments within the group. The political and regulatory environment is hampered by the variable of bureaucratic procedures. The number of days taken to enforce a contract is on average 700.84 days, while for the group of digital powers it is nearly one-half of the average (360.40 days). India and Colombia are the most disadvantaged countries by this indicator, with over a thousand days being required to enforce a contract. By contrast, Mexico needs fewer days than Germany. The group of emerging countries is improving in the establishment of laws related to ICT, especially Chile and China, where the number of patents is increasing significantly. As for the environments of business and innovation, which are more favourable than political environments in emerging countries, once again Chile stands out. The availability of the latest technologies is a favourable development in general for all emerging countries in the analysis⁷. The rate of enrolment in tertiary education is lower than 50% on average, being even lower than 25% in India. As with the digital powers, the availability of risk capital in the area of ICT is limited. On the African continent, South Africa stands out due to its environment, with very similar levels to those of Chile, which is the most favoured country in terms of developmental level. Conversely, Nigeria presents the worst environment.

One of the major signs of progress in this area is that the number of Internet users in developing countries has nearly doubled in the past five years. With regard to the group of countries considered in this study, Latin

7: Emerging countries should pay more attention to the number of days required to start a business (24.84 days compared to the 9.22 days on average required in the digital powers). For more disaggregated information, see WEF (2015).

America is the region which is moving at high speed toward the development of a digital economy, although it has not yet reached the level of more advanced regions such as Europe, USA or South Korea. Chile is the leading country in the region, with a similar level of ICT development in all the areas discussed, or even better according to some indicators than in countries such as Spain. The evolution of Peru should be noted, it has gone from 106th to 90th place, between 2012 and 2015, on WEF's *IT performance* ranking. Emerging economies such as Brazil, Colombia and China are trying to promote the development of telecommunications, infrastructures and the ICT sector in general. Above all, these countries are trying to promote the use of ICT in the government and in the business world, especially in SMES. In addition, improvements in public administration, education, health and transport pose a major challenge for these regions. Similarly, the strengthening of security and privacy are salient aspects that need to be improved. Another aspect of vital importance is the need to promote the training of the population in the field of ICT, as well as the inclusion of older people and certain disadvantaged social groups. These measures require strong support from the public sector.

Table 1

Indicators of the situation of ICT for digital powers, 2015

Indicators	Sweden	UK	USA	Korea	Germany
A. Sub-index of environment	5.31	5.54	5.26	4.64	5.14
1 Political and regulatory environment	5.42	5.69	5.05	4.13	5.35
2 Business and innovation environment	5.20	5.38	5.47	5.15	4.93
B. Sub-index of preparation	6.38	5.88	6.07	5.99	6.20
3 Infrastructure and digital content	7.00	6.34	7.00	6.63	6.60
4 Affordability	6.43	5.67	5.61	5.82	5.92
5 Skills	5.72	5.63	5.60	5.52	6.08

Source: The Global Information Technology Report 2015 (WEF)

Table 2

Indicators of the situation of ICT for emerging countries, 2015

Indicators	Brazil	Chile	Mexico	Peru	Colombia	Turkey	China	India	Nigeria	South Africa
A. Sub-index of environment	3.49	4.81	3.86	3.69	3.65	4.39	3.89	3.61	3.40	4.76
1 Political and regulatory environment	3.42	4.30	3.67	3.05	3.39	3.93	3.96	3.56	3.05	4.97
2 Business and innovation environment	3.56	5.32	4.06	4.33	3.92	4.85	3.82	3.66	3.75	4.54
B. Sub-index of preparation	4.31	4.70	4.97	4.26	4.90	5.34	4.67	4.55	2.98	3.98
3 Infrastructure and digital content	4.49	4.54	3.74	3.29	4.25	4.56	3.16	2.63	2.32	3.51
4 Affordability	4.57	4.54	6.69	5.13	5.57	6.64	5.57	6.95	4.13	4.06
5 Skills	3.86	5.02	4.46	4.35	4.89	4.82	5.28	4.08	2.48	4.38

Source: The Global Information Technology Report 2015 (FEM)

Preparation

The preparation of countries for the use of ICT is one of the most important aspects. This concept encompasses both issues of availability of infrastructure and digital content, such as the price level of ICT-related services and requirements of the population in terms of skills.

The favourable environment prevailing in digital powers means that there is adequate and widespread preparation for ICT throughout the population. In this respect, this group of countries is characterized mainly

by the quality of its infrastructure and digital content. Prices for access to different technologies are relatively affordable⁸. As far as the population's training, Germany is outstanding with regard to the other countries in the group. However, they all enjoy a high quality education system, while South Korea still has room for improvement.

The combination of a favourable environment and preparation for taking advantage of ICT, means that its use will be high, individual use being the most widespread among the countries in the group, especially due to high Internet access levels in households (90% on average contrasting sharply with the levels in emerging countries, which on average are below 50%). Regarding the use of ICT by businesses, it positively emphasizes the use of Internet in the relationship between consumers and businesses (business-to-consumer), followed by the technological absorption capacity at business level. One aspect that digital powers could improve is the training of workers in ICT and in the capacity for innovation. In general, the use of ICT at governmental level is high compared to emerging countries. Germany shows signs of lagging behind compared to other digital powers due to reduced government services online and the online participation of citizens in decisions.

In the group of emerging countries, Turkey is highlighted, because of the sheer affordability of prices as a result of a liberalized and very competitive ICT market. On average, within that of preparation, affordability is the most favourable aspect. This is followed by skills and finally infrastructure and digital content, which still need to improve, especially in the production of electricity, Internet speed and the present level of security. Regarding the population's skills, it is worth pointing out that it is necessary to improve the quality of the education system. Despite reaching higher levels in Chile and China, especially the latter is characterized by access to quality education only for the social elite, and there is great inequality in this regard. Nigeria is the country where the population has a major disadvantage in terms of skills, affordability, infrastructure and digital content.

Derived from an unfavourable environment for the development of ICT and especially the low quality of the education system in this area, the use of ICT is still significantly below that in digital powers. Regarding single use, it is particularly low in India, where only 15% of the population uses the Internet. In addition, there is a significant gap between rural and urban areas meaning that there is great heterogeneity in the use of Internet as an element of development. On average, in the emerging group, less than half of households have Internet access or own a computer, which contrasts with percentages above 85% in the case of digital powers. However, what stands out with regard to these powers is that there are similar levels of mobile subscriptions and in the use of social networks.

Affordability - the key role of prices

The cost of services related to ICT is shaping up as perhaps the most critical constraint for connecting the population of the economies of developing countries.

It seems that world prices of mobile telephony will continue to fall in relative and absolute terms. In 2015, the biggest falls were in mobile broadband, this has made the service more affordable on average by between 20% and 30% worldwide. Between 2013 and 2014, mobile broadband prices fell by more than 25% in less developed countries.

Mobile broadband has become the most dynamic segment in the telecommunications market, with rates of double-digit growth in the number of subscribers over the last eight years. In addition, competition has not only increased the variety of packages available, but has also lowered prices. However, there is ample evidence that despite this significant drop in prices, high relative prices remain a barrier to broadband services. That is why one of the objectives of the *Connect 2020* program provides that the cost of broadband

8: In the USA, the price of broadband has recently been significantly increased.

services does not exceed 5% of the average monthly income in developing countries by the year 2020. In early 2015, 111 economies (out of 160 with available data) including all the world's developed countries and 67 developing countries had achieved the target. However, 22 developing countries still have broadband prices corresponding to more than 20% of its gross national product per capita.

As regards fixed broadband in the last two years, it has seen price increases, which had been falling steadily since at least 2008. This increase in prices is particularly marked in less developed countries. A worrying trend given that in these countries the fixed broadband services that feed the digital economy are currently already unaffordable. In 2014, the average fixed broadband basket price reached 98% of per capita gross national product, which in 2013 was above 70%. A sudden jump that is not going to improve the already limited use of fixed broadband in less developed countries.

Conclusions

There is no doubt that ICT is a major engine of growth in the world economy. Increasingly, interaction between economic agents is based more on ICT and especially on the Internet. This study provides an overview of the evolution of Internet use in different countries and at different points in time.

The analysis shows that over the last twenty years, there has been rapid expansion in the use of Internet, both heterogeneous and at different speeds, and it is difficult to establish a single pattern to illustrate global trends. For that reason, this observatory has put forward a representative selection of countries around the world, which has allowed us to display in the best way possible any related behaviours among subgroups of countries.

Those most innovative countries, such as the USA and Sweden, have experienced the process of widespread Internet use throughout society before others. The immediate followers of these countries are also developed economies, and in this case, the effect of per capita GDP on its spread has been a major factor, especially at the beginning of the century. However, the phenomenon of diffusion between digital powers, including Spain, has been heterogeneous in time and speed.

In recent years, a process of convergence has been taking place between developed countries, and those developing with regards to Internet use. This process is derived from the combination of a saturation process in the most advanced societies, and from there being a lot of room available for improvement in the most backward countries. It is noted that the income effect is becoming less decisive in Internet use, especially among developed countries. However, extending ICT toward developing countries remains a challenge. In this scenario, major international institutions together with national public bodies have a great role to play: in helping to mobilize capital and revise regulations to promote ICT, and in attracting innovation to improve productivity and economic development.

As for the necessary conditions, so that the use of ICT generates the expected results in terms of growth and social welfare, they include heterogeneous regulatory and political environments. As regards the preparation of citizens and businesses, the gap between the developed world and developing countries is even greater. This set of indicators is key, because it lays the groundwork for greater and better use of ICT.

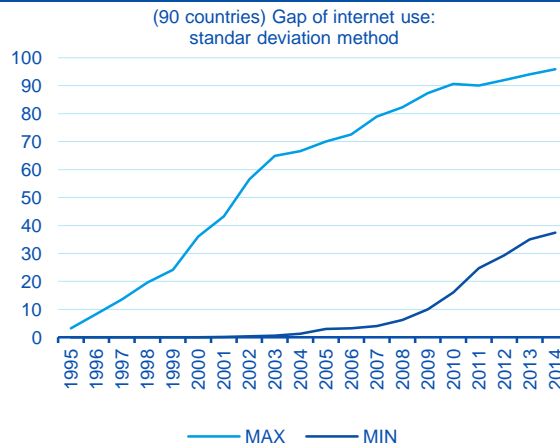
Despite advances in the analysis of data related to ICT, it still seems not to have been possible to adequately estimate the economic impact of this phenomenon. What role will ICT play to help end poverty and fight inequality? How can ICT promote sustainable development? They are not easy questions to answer. The No.1 objective of the UN's Sustainable Development Goals, the eradication of poverty, could be achieved inasmuch as the use of basic digital financial services reaches the extreme poor. On the other hand, objective number 3, that of health and welfare, could be facilitated through mobile data applications. Further research on the issues that determine the adoption of ICT in different countries and environments is needed. This would help shed light on the economic policy objectives that need developing.

Appendix

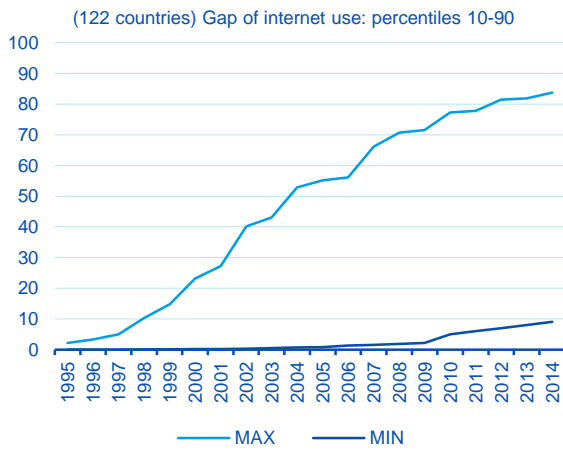
Figure A.1

Evolution of the gap in Internet use. (After removing outliers according to procedure described)*

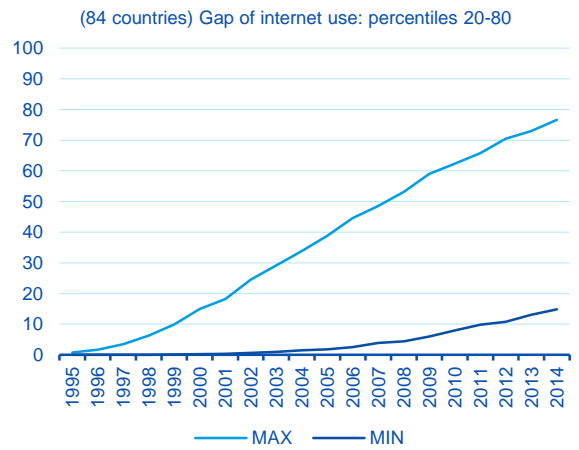
Standard deviation



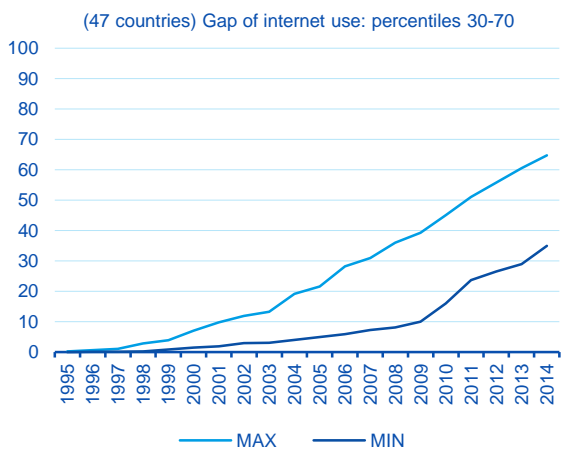
10-90



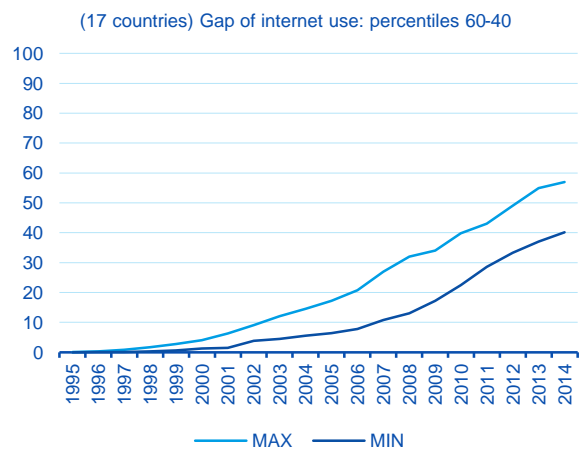
20-80



30-70



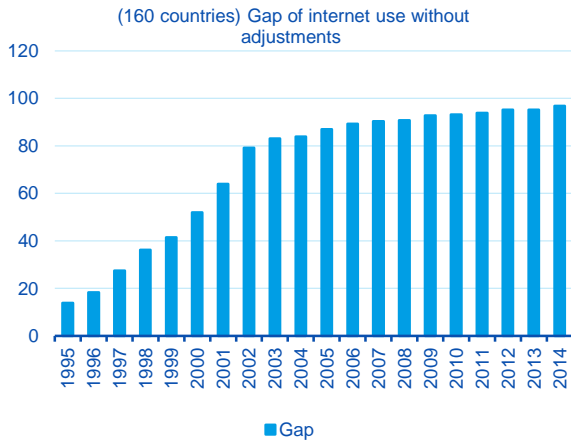
40-60



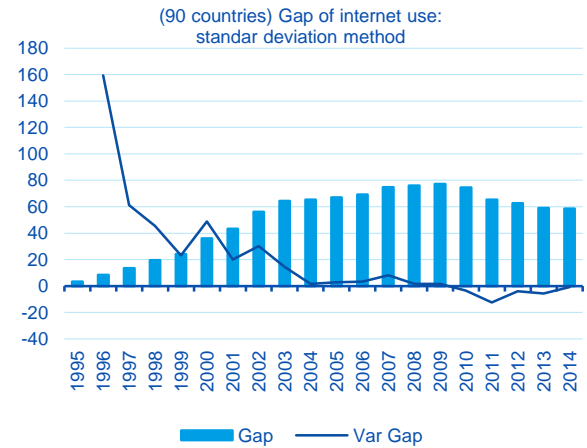
*: Any country considered an outlier for four or more years during the period is removed from the sample
Source: BBVA Research and World Bank

Figure A.2
Variation rate (%) in Internet usage gap (After removing outliers according to procedure described)

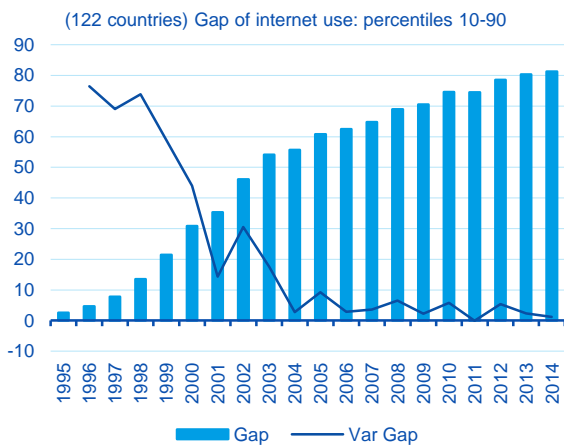
All countries



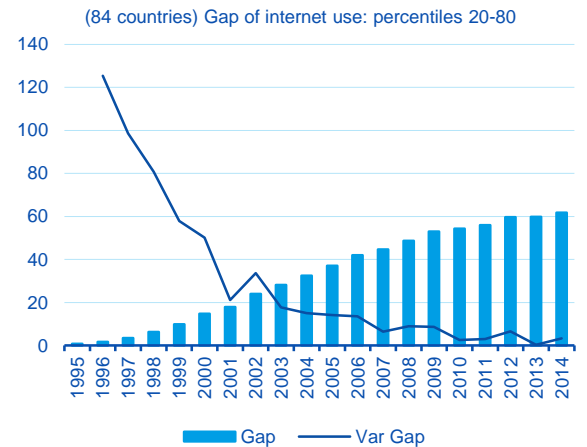
Standard deviation



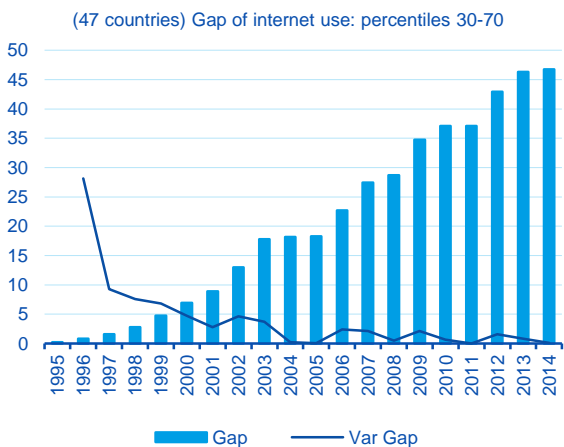
10-90



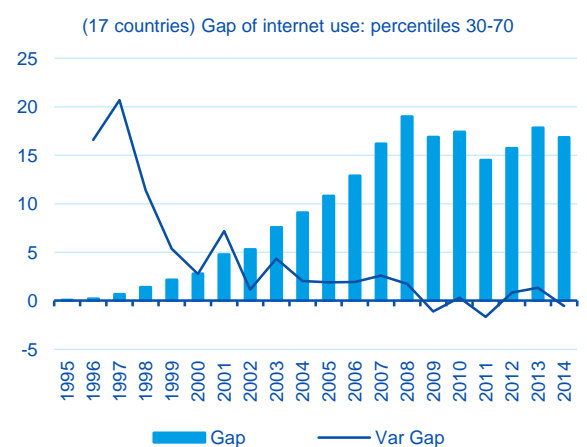
20-80



30-70

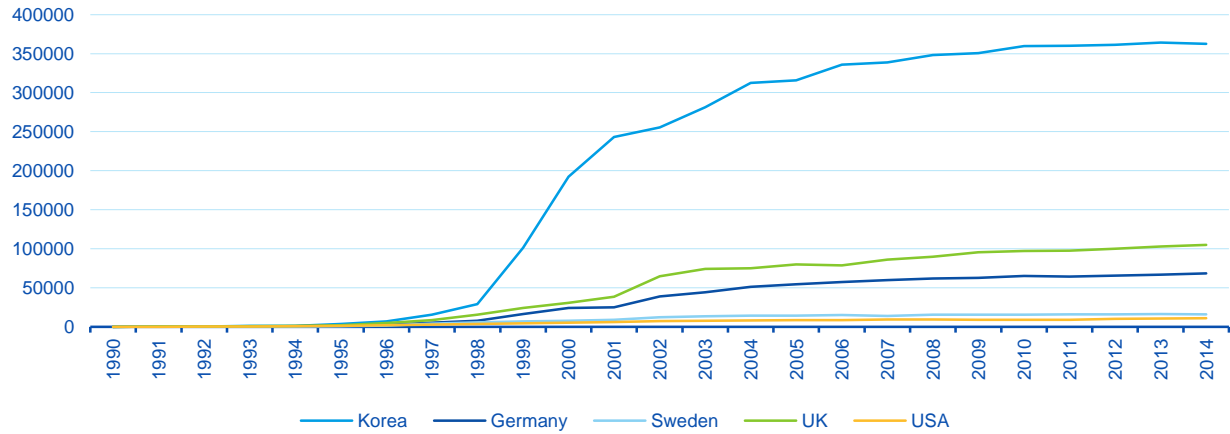


40-60



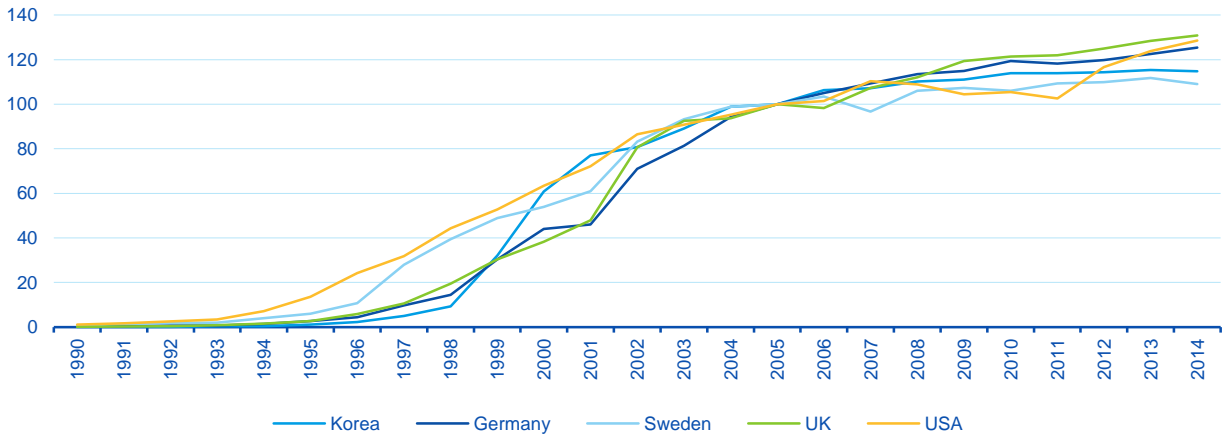
Source: BBVA Research and World Bank

Figure A.3
Index of Internet use in the digital powers (1990=100)



Source: BBVA Research and World Bank

Figure A.4
Index of Internet use in the digital powers (2005=100)



Source: BBVA Research and World Bank

Bibliography

Alonso, A. and Arellano, A. (2015), "Heterogeneity and the Spread of the Digital Economy: the Spanish case" ("Heterogeneidad y difusión de la economía digital: el caso español"), Working Document BBVA Research, No. 15/28, BBVA Research, Madrid, October 2015. Available at: <https://www.bbva.com/publicaciones/heterogeneidad-y-difusion-de-la-economia-digital-el-caso-espanol/>

BBVA Research (2016), *Situación España. First Quarter 2016*. BBVA, Madrid. Available at: <https://info.bbva.com/es/data/8663022016/Situacion-Espan%CC%83a-1T16.pdf>

Correa, M., García, J. R. and Tabanera, A., (2015), "E-commerce and consumer habits in Spain: the importance of online banking" ("Comercio electrónico y hábitos de consumo en España: la importancia de la banca on-line"), Digital Economy Observatory, BBVA Research, 26 January 2015. Available at: https://www.bbva.com/wp-content/uploads/2015/01/observatorio_comercio_electronico_vf_maq2.pdf.

Davies, G., (2016), "The internet and the productivity slump", Gavin Davies' blog, *Financial Times*, 3 April 2016. Available at: <https://next.ft.com/content/b34e318e-6ffb-332a-96ac-5ce3de2b4e59>

Feldstein, M., (2015), "The U.S. Underestimates Growth", *The Wall Street Journal*, 18 May 2015. Available at: <http://www.nber.org/feldstein/wsj05182015.html>

FEM (2015), *The Global Information Technology Report 2015: ICTs for Inclusive Growth*, FEM, Geneva. Available at: http://www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf

ITU (2015), ICT Statistics. Nations specialized agency for information and communication technologies. <http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx>

Lohse, G., Bellman, S. y Johnson, E., (2000), "Consumer Buying Behavior on the Internet: Findings from Panel Data", *Journal of Interactive Marketing*, 14 (1), pp. 15-29.

Scott Morton, F., (2006), "Consumer Benefit from Use of the Internet", en: A. B. Jaffe, J. Lerner y S. Stern (eds.), *Innovation Policy and the Economy*, 6, NBER, MIT Press.

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