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Productivity and Digitalisation in Europe: Paving the Road to Faster Growth

By Bart van Ark

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Policy Brief

Productivity and Digitalisation in Europe: Paving the Road to Faster Growth

By Bart van Ark

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INNOVATION ECONOMICS

‘Productivity growth is the key to returning to a sustainable growth path in Europe.’

While Europe struggles to recover from crisis and works to bring down high unemployment rates, the real challenge facing policymakers and citizens alike is the search for a path to sustainable growth in the medium and long terms. Before the onset of the economic and financial crisis in 2008, the EU-28 grew at a healthy annual average of 2.6%. However, if one adds the crisis years to the calculation, average growth from 1995 to 2013 was only 1.8 %. Now, The Conference Board – a global research and business association which publishes some of the world’s most widely watched business indicators – projects a base scenario for Europe according to which it will only grow at 1.4% in the post-crisis period (2014-2019) – almost half of its pre-crisis average and well off of the equivalent forecast (2.4%) for the United States.[1] The estimate is based on prevailing trends in the underlying economies’ principal sources of growth – labour, capital and productivity.

So is Europe condemned to slow growth, with all of the negative fallout this implies – including high unemployment, fragile public finances and low consumer and investor confidence? In this paper, we will analyse the sources of Europe’s slow recovery. We will look to give policymakers a better understanding of where new sources of growth might be found, and how the policy levers could best be pulled to deliver it. Specifically, we will argue that productivity growth is the key to returning to a sustainable growth path. And we will show that – as productivity growth is a compounding measure – small improvements on an annual basis make large differences over the long term. If managed correctly, Europe could raise its annual growth rate to as much as 2% per annum in the 2014-2020 period – a palpable gain of more than one half percentage point, mostly driven by faster productivity growth, which would deliver manifold knock-on improvements in many areas of daily life.

When looking at ways of boosting productivity, we will zoom in on what we believe is the crucial role of the digital single market. How can greater adoption of Information and Communications Technology (ICT) – and greater integration throughout the EU in the online market – be used to drive the productivity growth Europe needs? How can we create a virtuous circle in which a single market for digital services feeds consumer and business demand, which drives innovation (through adoption of digital technologies), supports productivity (through the adoption of said technology), generates GDP growth (through improvements in productivity), and creates the demand for jobs that generates the income for consumers to obtain the products and services being produced?

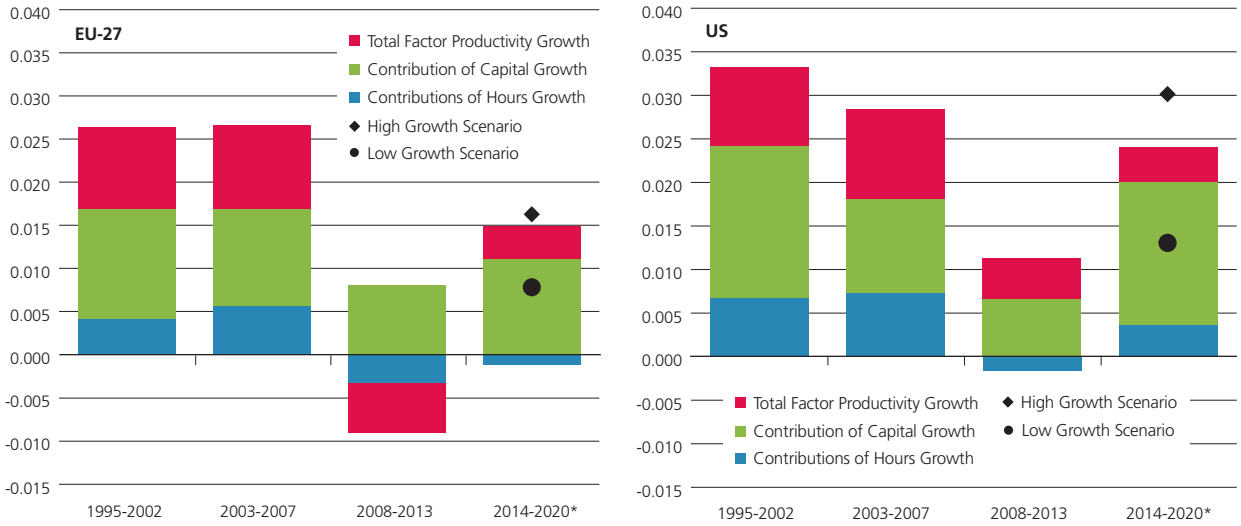
The double-dip recessions of 2008-2009 and 2012-2013 are not the main reason for Europe’s dismal outlook, even if the combined downturns and subsequent economic stagnation have potentially eroded some sources of long-term growth, such as skills and ICT investment. Sadly – and despite the gargantuan effort to improve Europe’s economic governance system – the so-called “never-waste-a-good-crisis” mantra didn’t provide much opportunity to reverse the slowing trend. If anything, the conditions for a structural improvement of Europe’s economy may have worsened since the onset of the financial crisis in 2008-2009, as labour, investment and productivity growth all weakened substantially over the course of the past few years.

1 Throughout this paper, we use the United States as a benchmark because it is the world’s largest industrialised economy and by many accounts the world’s most innovative large industrial economy. The purpose is to hold up the US economy as a benchmark, not as an economic model. A deeper discussion of the problems particular to the US economy is beyond the scope of this paper. See also Wim Overmeer and Bart van Ark, *Global Economic Growth Scenarios 2020: The Impact of Investments and Reforms across Seven Major Regions* (New York: The Conference Board, 2014).

‘A commitment to productivity growth through innovation and digitalisation is key to achieve the Europe 2020 goals.’

Charts 1a and 1b: Average annual GDP growth in the European Union-27, including base-, high- and low-growth scenario (1995-2020)

EU-27 refers to the European Union excluding Croatia. *Conference Board forecast



Sources: The Conference Board Total Economy Database (http://www.conference-board.org/data/economydatabase/), The Conference Board Global Economic Outlook (http://www.conference-board.org/data/globaloutlook.cfm) and Growth Scenarios Analysis, Overmeer and van Ark (2014)

In reality, slowing growth in the labour force and a strong drop off in productivity growth are the main reasons for Europe’s weak growth outlook beyond 2014.[2] See Charts 1a and 1b above for more.

However, it is worth noting that growth performance during the crisis has differed substantially between European Union member states. Later in this report, we will describe four distinct groups of European countries, each of which are following different reform paths and interact differently with – and contribute to – global value chains. We will show how countries in the “Integrated Value Chain” group delivered by far the largest total factor productivity improvement even as growth slowed throughout the crisis period.

While the differences between the country groups as well as individual countries are in part explained by the composition of their sectoral economic activities, the diversity in performance suggests that 1) there is no unique “European” problem making growth more difficult than anywhere else in the advanced world, and 2) there are lessons to be learned from more and less successful growth strategies within Europe.

2 Europe is not alone in seeing a slowing growth trend ahead. In the US, GDP growth had already begun to slow before the onset of the crisis in 2008-2009, and the base scenario suggests weak productivity growth in the US, too. However, with somewhat more favourable demographic projections and especially faster investment, the base projection of US growth from 2014 to 2019 suggests an average growth rate of about 2.4% per year versus 1.4% in Europe.

‘The combined downturns and subsequent economic stagnation have potentially eroded some sources of long-term growth, such as skills and ICT investment.’

What’s more, despite huge political challenges, there is no shortage of possible policy solutions to accelerate Europe’s growth trend. While many current European policies aim at stabilising financial market conditions and establishing a credible path of fiscal and monetary policy, there is much to be done beyond that. The implementation of structural policy measures, ranging from more investment in hard and soft infrastructure to smarter regulation, more innovation and greater room for entrepreneurship, will hugely matter to improve structural conditions. The five headline targets set out in Europe 2020 Agenda – create more jobs, accelerate innovation, improve energy efficiency, strengthen education and reduce poverty exclusion – are fundamental components of any successful strategy to deliver positive social change and accelerate growth.[3]

But when looking at the decomposition of sources of economic growth, it turns out that productivity is the Achilles’ heel – and not lack of investment, as is sometimes argued – in Europe’s growth picture. Before the crisis, between 1995 and 2007, the contribution of capital to EU-27 GDP was about 50%, higher than in the US (where the figure was 47%). The 2014-2019 projections suggest a role for capital in the EU-27 which will be at least as large relative to GDP as in the US. While Europe and the US could both surely use more investment in the current phase of recovery, policymakers would be well advised to focus on getting a higher return on the investments they make – i.e., productivity – if they want to put their countries on a long-term path to sustainable economic growth.

The data tells an interesting story why the EU-27 did not achieve the same GDP growth as the US despite the higher contribution of capital to growth in the pre-crisis period. There were two principal reasons for this. First, ICT makes up a much smaller share of total investment in the EU-27 than in the US. This, in turn, leads to a much smaller contribution from ICT capital to GDP growth. In the EU, ICT capital accounted for about 18% of GDP growth in the 1995-2007 period, versus 24% in the US. Second, the impact of ICT on the growth of total factor productivity – a measure of the efficiency with which all growth resources in the economy are being utilised – was less in Europe than in the US. Aggregate total factor productivity rose at 0.7% in both regions, but the effect of ICT on total factor productivity growth in Europe was much smaller than in the US due to ICT’s relatively smaller size in total investment.[4] Amazingly, only about one-third of total factor productivity growth in the EU market sector can be ascribed to so-called “network effects” from ICT between 2001 and 2011.[5] By contrast, network effects account for between 40% and 60% of total factor productivity growth in the US market sector.

3 However, there will be many difficulties in achieving this ambitious agenda, particularly when the actual growth rate is not much more than 1%. Fiscal and monetary constraints and weak confidence make the necessary investments in the economy hard to achieve and create pockets of opposition to structural reforms that are required. For more on the Europe 2020 Agenda, visit http://ec.europa.eu/europe2020/index_en.htm.

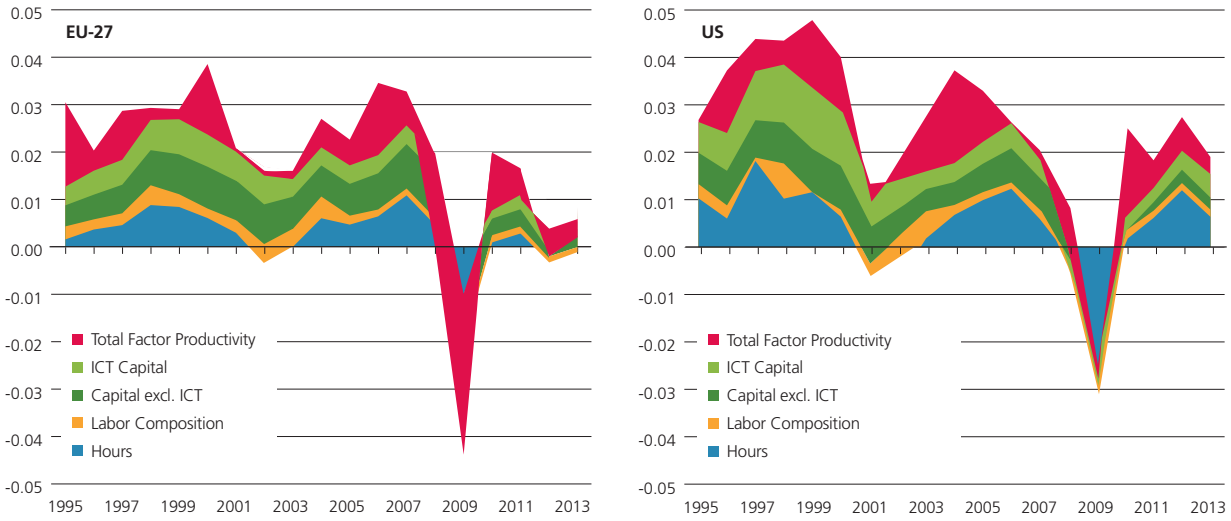
4 Regarding the euro area, the contribution of ICT to GDP growth is 17% while total factor productivity growth from 1995-2007, at 0.5%, was lower than in the EU-27.

5 These network effects include a combination of higher returns to scale due to more connectivity between businesses, and innovative adaptations from ICT across the economy. See Carol Corrado and Kirsten Jäger, *Communication Networks, ICT and Productivity Growth in Europe*, The Conference Board Report for Telefónica S.A., (New York: The Conference Board, 2014).

‘In a digital single market with more vibrant demand, businesses have more room to grow.’

Charts 2a and 2b: Contributions to average annual GDP growth in the EU (1995-2013)

EU-27 refers to the European Union excluding Croatia



Source: The Conference Board Total Economy Database (http://www.conference-board.org/data/economydatabase)

We believe that a major improvement in structural growth conditions in Europe could be brought about by a strengthening of productivity growth, driven foremost by ICT.

Delivering on this commitment would be one of the most effective ways to create better conditions for a faster long-term growth performance from Europe’s economy.

‘Countries in the “Integrated Value Chain” group delivered by far the largest total factor productivity improvement.’

Why productivity matters for growth

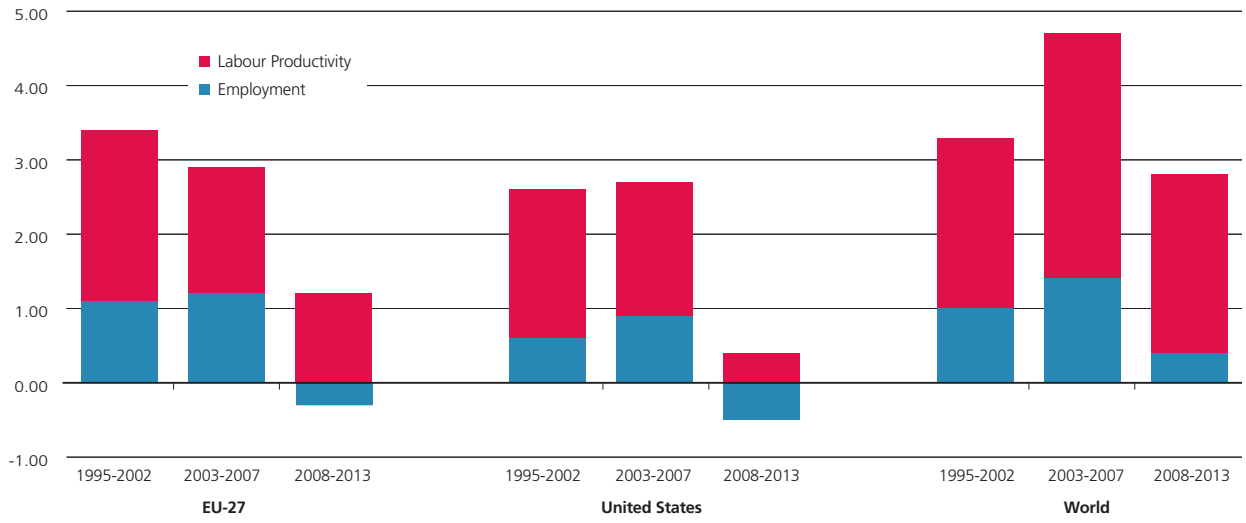
At the onset, it is important to grasp one vital fact: in the longer term, improved economic conditions as represented by a rise in GDP can only be sustained through growth in labour productivity. Labour productivity growth, measured as output per person employed, accounts for the vast share of GDP growth in Europe, the US and throughout the global economy (see Chart 3 below for more). When adjusted for the decline in working hours that most economies experience as they develop, output per hour worked in Europe is even more important as a share of GDP growth.
Over the longer term, productivity growth typically becomes the more important driver of economic growth, more than job creation.[6]

The impact of productivity on growth is very important and should not be ignored, even when small on an annual basis. As we argued above, growth is a compounding measure, which means that small annual improvements really add up over longer periods of time. This simple truth is often underappreciated by policymakers and business leaders who feel under pressure for quick results.

In the same way that it can add to long-term growth, a long-term slowdown in productivity growth is a big problem for realising sustainable growth in production, because it causes a gradual erosion of the economy’s ability to generate growth or prevent a decline.

Chart 3: Contributions of employment and labour productivity to average annual GDP growth in the EU, the United States and the world (1995-2013)

EU-27 refers to the European Union excluding Croatia



Source: The Conference Board Total Economy Database (http://www.conference-board.org/data/economydatabase/)

6 Unfortunately, in the short term, productivity growth isn’t always kind to jobs, which is an obvious concern in times of high unemployment. But even longer term, the trade-off between productivity and job creation raises concerns, as evidenced from the recent debates among economists, technologists and policymakers on employment shifts arising from the recent wave in big data analytics, cloud computing and mobile. See Erik Brynjolfsson and Andrew McAfee, *Race Against The Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy* (Lexington: Digital Frontier Press, 2011). See also the results from the *Cross Atlantic Roundtable on IT and Labour Market Disruptions*, a workshop with economists, business professionals, journalists and government officials from North America and Europe which convened in New York in March 2014, organised by the European Commission and hosted by The Conference Board and Cornell University ILR School (https://www.conference-board.org/crossatlanticroundtable/)

‘There is no unique “European” problem making growth more difficult than anywhere else in the advanced world.’

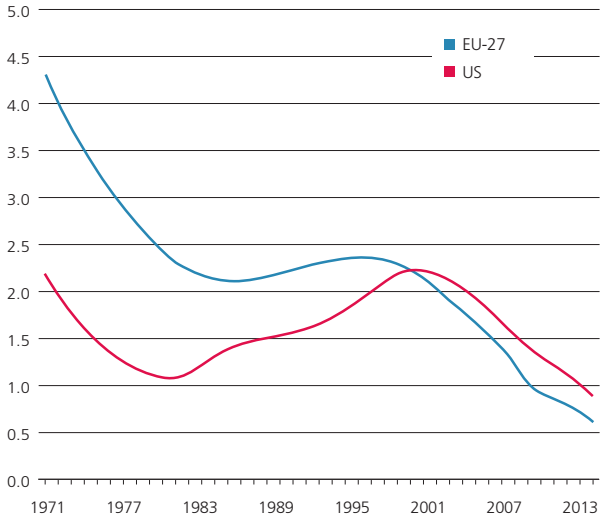
To be sure, productivity gains can sometimes destroy jobs – sweeping away the old as they make way for the new, and allowing many industries to do more with less. But the point is that policymakers must aim for a virtuous circle in which productivity gains are combined with job creation through new businesses and innovation, engendering a balanced path between jobs, investment and productivity gains. This virtuous circle is what creates long-term prosperity. Job growth and increased labour income generate the purchasing power which consumers need to buy the products and services companies produce every day. Productivity is the only sustainable way to produce the new products and services on a continuous basis at affordable prices. This then drives the demand which helps the economy to grow and ultimately creates more jobs than it destroys.

Productivity turns out to be one of the best ways to measure how we deploy our resources – be they labour, capital, natural resources or various types of what we call intangible capital – to generate long-term economic growth and increases in living standards. Unfortunately, Europe’s productivity performance is in bad shape. Labour productivity growth has been on the decline in Europe for nearly three decades (See Chart 4a below for more). Some of the decline in the 1970s and 1980s was due to the fact that the historical “catch up” effect from higher productivity in the US began to peter out. Despite some stabilisation in the 1990s, productivity growth slowed further in the 2000s. While the most recent recessions brought labour productivity growth down further, from a longer-term perspective it just shows up as a continuation of the trend. There is also evidence emerging that the crisis, so far, has not helped to accelerate the reallocation of resources between sectors and firms – which has been typical of previous post-recession periods. This time around, the slowdown seems to be across the board in all sectors.[7]

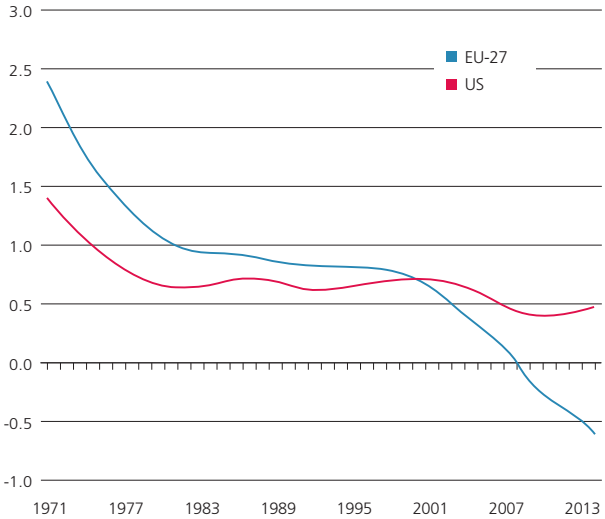
Charts 4a and 4b: Smoothed trends in labour productivity and total factor productivity growth in the EU-27 and the US (1970-2013)

The trend is based on a Hodrick Prescott filter. EU-27 refers to the European Union excluding Croatia

4a: Trend growth of Labor Productivity (GDP/Hour) using HP filter



4b: Trend growth of Total Factor Productivity using HP filter



Source: The Conference Board Total Economy Database (http://www.conference-board.org/data/economydatabase/)

7 See, for example, Rebecca Riley, Chiara Rosazza Bondibene and Garry Young, *Productivity Dynamics in the Great Stagnation: New Evidence from UK Business*, paper presented at the Royal Economic Society 2014 Annual Conference, 27 April 2014. A summary of this paper is available on Royal Economic Society website at www.res.org.uk.

‘Productivity is the Achilles’ heel in Europe’s growth picture – and not lack of investment, as is sometimes argued.’

The growth of total factor productivity, which is a more precise measure of the efficiency by which all growth resources are being utilised, has been slowing across most sectors in the economy in Europe (see Chart 4b for more).[8] And this trend reflects the failure to effectively adopt new technologies and innovation. Digital technology is showing its impact on the economy, not only through investment but also through total factor productivity growth, which can be traced to the positive effects of spill overs from digital technologies. But in Europe these effects are mute compared to, for example, the US which is (still) the world’s leader in securing the relationship between technology, and especially ICT, and productivity.

Why digitalisation matters for productivity

One of the biggest opportunities to accelerate productivity growth is through the on-going digitalisation of the European economy. The digitalisation of advanced economies in Europe and elsewhere has a long history, but the effects on economic growth have only become visible in the past two decades. From the mid-1990s to the mid-2000s, most of an economy’s digitalisation was reflected in rising labour productivity resulting from larger investment in ICT hardware and software.[9] In the past decade, however, the contribution of ICT has become more widespread as well as more complex when it comes to its impact on productivity. Especially the combined rise of broadband and the production of ever-more powerful mobile devices are among the biggest enablers of productivity gains from the economy’s digitalisation. In particular, the returns-to-scale effect – also known as Metcalfe’s Law, which states that the value of a network increases with the square of the number of users of the network – means that digitalisation carries a disproportionally large benefit to growth and particularly to productivity.[10]

Like the rise of other general purpose technologies which affected the long-term growth performance of entire economies, such as the steam engine or the electric grid, ICT’s impact on growth typically comes in three phases over a prolonged period of time:

1. a productivity effect through the ICT-producing sector,
2. an investment effect from ICT-using industries through capital deepening, and
3. a productivity effect from an efficiency rise through the use of ICT which goes beyond the direct capital deepening effect.

We will look at each in turn.

1) Productivity effects from ICT producers

In early stages of implementing new technologies, the productivity effects are foremost realised by the producers of those new technologies. Firms in the tech-producing sector often experience very strong productivity gains. Before the onset of the crisis, from 2001 to 2007, total factor productivity in ICT and other information services was on average 1.5% per year for a sample of eight major EU economies in Western Europe, and 4.5% in telecommunication services, and 4.8% for the producers of electrical and optical equipment (see Chart 5 on page 11). Even though these industries only represent a small part of

8 See Bart van Ark, Vivian Chen, Bert Colijn, Kirsten Jäger, Wim Overmeer, and Marcel Timmer, *Recent Changes in Europe’s Competitive Landscape and Medium-Term Perspectives: How the Sources of Demand and Supply Are Shaping Up*, European Economy Economic Papers 485, The Conference Board Report for DG ECFIN (Brussels: European Commission, 2013).

9 Marcel P. Timmer, Robert Inklaar, Mary O’Mahony and Bart van Ark, *Economic Growth in Europe: A Comparative Industry Perspective* (Cambridge: Cambridge University Press, 2010).

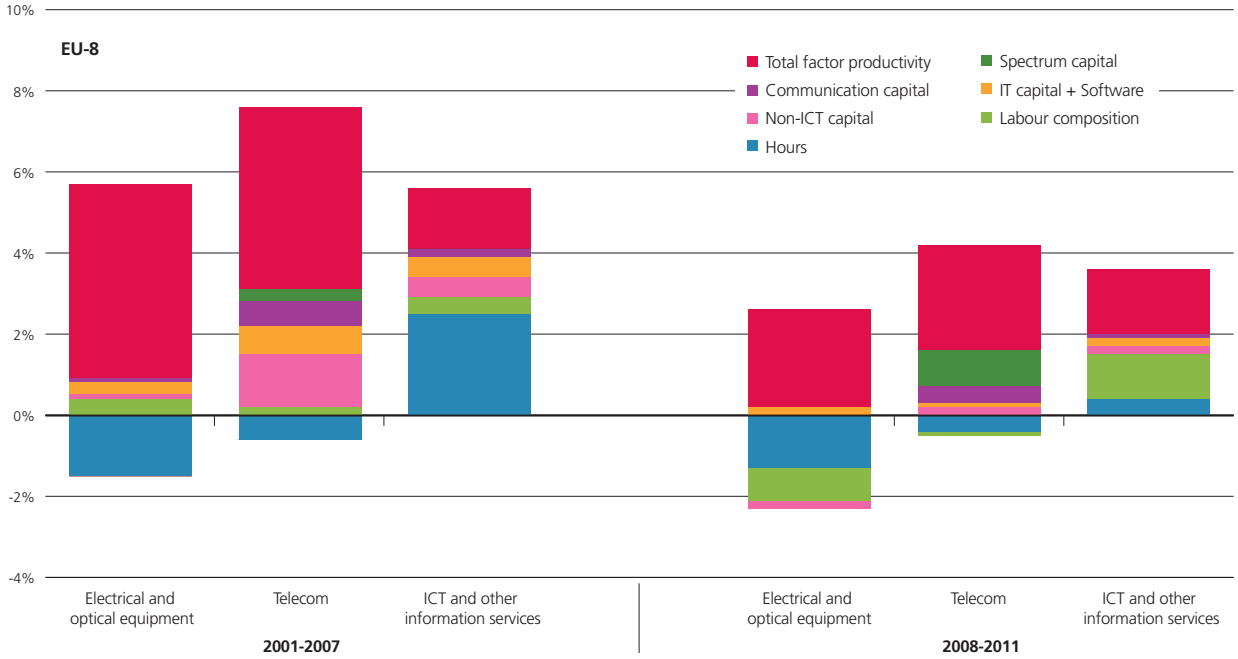
10 The law is named for the electrical engineer Robert Metcalfe, who first formulated it in reference to Ethernet technologies, which he co-invented.

‘Improved economic conditions as represented by a rise in GDP can only be sustained through growth in labour productivity.’

the economy, at about 8% of total GDP in Europe, they accounted for more than 40% (0.3%) of aggregate total factor productivity growth (0.7%) in the market sector of these eight economies.[11] While precisely comparable numbers for the US are not available, “best guess” estimates suggest that the total factor productivity effect from ICT producers in the US was slightly higher at 0.5% from 2001 to 2005 compared to 0.3% in the EU-27.[12] Importantly, while market-sector total factor productivity growth for the eight countries turned negative at -0.5% during the 2008-2009 recession and its immediate aftermath, the total factor productivity contribution of the three ICT sectors remained positive at a modest 0.16% from 2008 to 2011. Unfortunately, while they may be cool places to work, ICT producers are still not net job creators in Europe. Policymakers have still not found the balance where enough new companies are being created to offset the job shedding in the old ones. Only in ICT and other information services-based companies has hours worked increased, and only very little at that since 2008. The growth in labour force skills, as measured by the labour composition factor, increased strongly after 2008 making it a key sector for absorbing high-skilled employees.

Chart 5: Contributions to average annual growth in value added in three major ICT-producing sectors for eight major EU economies (2001-2011)

EU-8 refers to the weighted average of contributions for eight EU economies: Austria, Finland, France, Germany, Italy, Netherlands, Spain, and United Kingdom



Source: Corrado and Jäger (2014), The Conference Board

11 The analysis in this section is based on a recent new study by The Conference Board. See Carol Corrado and Kirsten Jäger, *Communications Networks, ICT and Productivity Growth in Europe*, The Conference Board Report for Telefónica (New York: The Conference Board, 2014). The study looks in detail at the contributions of ICT industries, capital and productivity to growth in the market sector (which excludes health care, education and government from the total economy estimates) for eight EU member states: Austria, Finland, France, Germany, Italy, Netherlands, Spain, and United Kingdom. The EU-8 averages are weighted by the value added shares of the individual countries. The estimates are based on “rolling updates” of EUKLEMS industry-level productivity accounts (www.euklems.net), which are extrapolated to 2011 through estimations by the authors.

12 See Desirée van Welsum, Willem Overmeer, and Bart van Ark, *Unlocking the ICT Growth Potential in Europe: Enabling People and Businesses. Using Scenarios to Build a New Narrative for the Role of ICT in Growth in Europe: Main Report*, The Conference Board Report for DG Connect (Brussels: European Commission, 2013).

‘The crisis has not helped to accelerate the reallocation of resources between sectors and firms, which has been typical of previous post-recession periods.’

2) Growth effects from investment in ICT

Investment in digital technology takes place through the spending on ICT and telecom hardware, software, networks, databases, and user platforms across the economy. As shown earlier, the investment effects from ICT positively affected value added growth before the 2008-2009 crisis, and these effects have remained positive throughout the crisis period since 2008. In particular, since 2011 when non-ICT investment in Europe had begun to severely slow, ICT capital remained strong and contributed as much to growth as in the early 2000s, and showed growth contributions which are comparable to the US.[13]

While positive for output and labour productivity growth, ICT investment does not necessarily lead to greater efficiency in the economy, as measured by total factor productivity growth. Investment booms in new technology can, temporarily, cause a slowdown or even a decline in efficiency. For example, at the end of the 1990s when the investment in ICT hardware boomed, creating the dot-com crisis of 2000-2001, total factor productivity growth significantly slowed in both the EU and the US (see Charts 2a and 2b on page 7 for more on this effect). A detailed analysis of the telecom sector, for example, shows that a very large increase in spectrum purchases in Germany, Italy and the United Kingdom in 2000 caused a huge rise in investment offset by a big decline in multifactor productivity growth. Changing degrees of utilisation of the new capital installed, especially after the creation of new networks, can impact significantly on productivity.[14]

Overall, the long-term trend, ignoring the recession effect, suggests that in the past decade the level of ICT investment as a percentage of GDP has remained more or less constant. This implies that the shift to “high quality” investments in ICT is now more or less over, almost as if we are in a steady state mode — with constant growth in ICT capital (see Chart 6 on page 13). This indicates that the potential of ICT and digitalisation to accelerate growth will have to come primarily from the third factor, which is the use of these technologies by other industries in the non-ICT sector of the economy.

3) Network effects on productivity from ICT use in non-ICT sectors

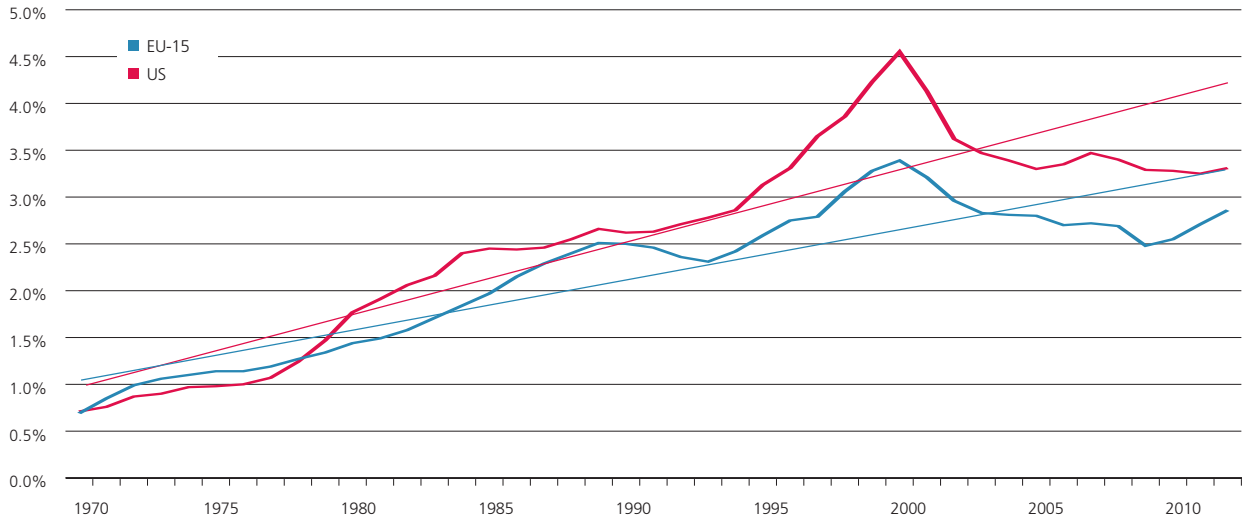
It is the long-lasting productivity effects of using ICT and digital content that are the hardest to come by and take the longest to emerge. The use of ICT hardware and digital content, improved access to open platforms, and the shift to mobile devices causes a continuous transformation of business processes and the production of new goods and services.[15] Despite the impressive rise in supply and utilisation of social media, cloud computing and big data analytics, the impact is still small from an economic point of view. Indeed, this recent phase of new applications is part of a long-term wave of implementing ICT, which is the most important general purpose technology of the late 20th and early 21st centuries. Its impact on growth is akin to the rise of steam, electricity or the combustion engine in previous eras – all of which came about more through a process of on-going “evolution” than overnight “revolution.”[16]

13 Carol Corrado and Kirsten Jäger. *Communication Networks, ICT and Productivity Growth in Europe*, The Conference Board Report for Telefónica S.A. (New York: The Conference Board, 2014).
14 Ibid.
15 See Ann Mettler and Anthony D. Williams, *Wired for Growth and Innovation: How Digital Technologies are Reshaping Small- and Medium-Sized Businesses* (Brussels: The Lisbon Council, 2012).
16 Nicholas Craft, *The Contribution of New Technology to Economic Growth: Lessons from Economic History*, Revista de Historia Economica (Cambridge: Cambridge University Press, 2010).

‘The potential of digitalisation to accelerate growth will come primarily from the use of these technologies by industries in the non-ICT sector.’

Chart 6: Investment in ICT as a percentage of GDP in the EU-15 (1970-2012)

EU-15 refers to the member countries before 2004; 1970-1975 excludes Austria, Greece, Ireland, Luxembourg, Portugal and Sweden; 1976-1979 excludes Greece, Ireland, Luxembourg, Portugal and Sweden; 1980-2012 excludes Luxembourg



Source: Corrado and Jäger (2014), The Conference Board

This is not to say that the new capabilities that come along with a general purpose technology cannot be very disruptive for parts of the economy. At first, productivity gains arrive for selected industries only, and spring up like mushrooms across the economy, putting old models out of business and creating room for new activities. The publishing industry, the retail sector and even health care are cases in point of large disruptions.[17]

Over time, as more and more companies adopt the technology and innovations spread across the economy, the impact on productivity at macro levels becomes more visible.

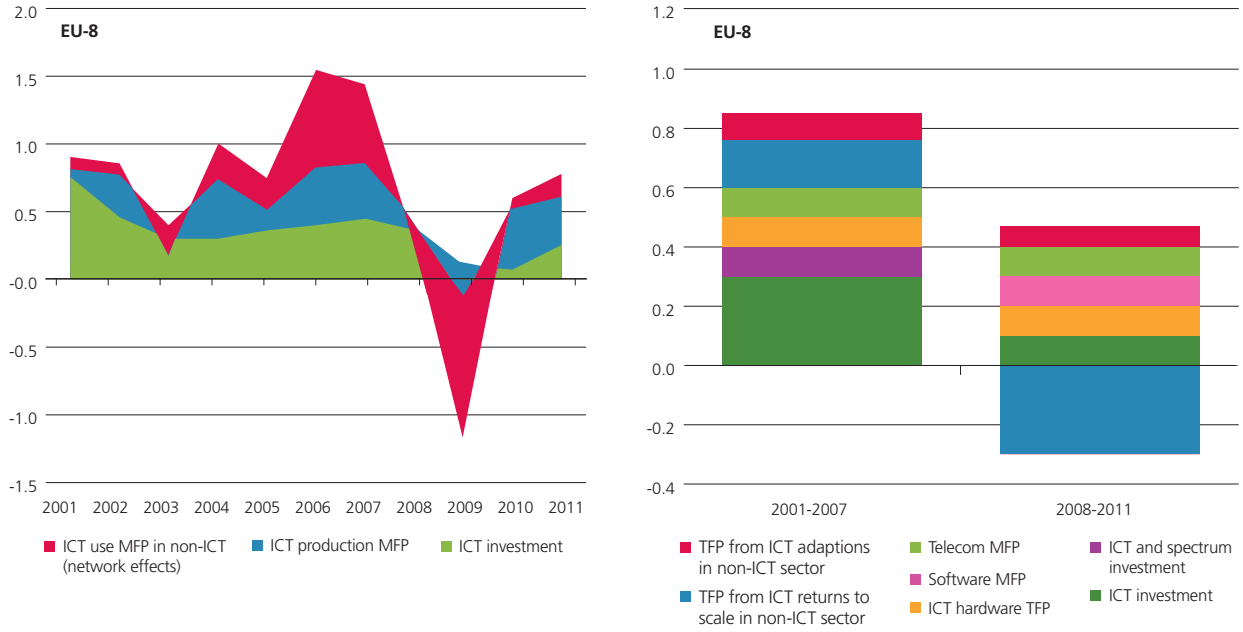
The productivity effects of using new technology is not easy to identify or quantify, and the traditional standard growth accounts employed so far in this report do not suffice to disentangle which part of productivity growth can be linked to so-called network externalities. The network externalities come in two parts: 1) a return-to-scale effect, which directly relates to Metcalfe’s law; and 2) the productivity effects from innovative adaptations from the use of, for example, the Internet and wireless technologies.[18]

17 Bart van Ark (ed.), *The Linked World: How ICT is Transforming Societies, Cultures and Economies*, The Conference Board Report for Fundación Telefónica (New York: The Conference Board, 2014).
18 Carol Corrado, *Communication Capital, Metcalfe’s Law, and U.S. Productivity Growth*, Economics Program Working Paper EPWP-2011-1 (New York: The Conference Board, 2011).

‘The crisis has not helped to accelerate the reallocation of resources between sectors and firms, which has been typical of previous post-recession periods.’

Chart 7a and 7b: Contributions from digitalisation to average annual GDP growth for eight major EU economies (2001-2011)

EU-8 refers to the weighted average of contributions for eight EU economies: Austria, Finland, France, Germany, Italy, Netherlands, Spain and the United Kingdom



Source: Corrado and Jäger (2014), The Conference Board

The productivity impact of the two network effects, which was obtained from an econometric analysis for eight European countries, shows these effects to be quite low.[19] For example, between 2001 and 2007, the returns-to-scale (Metcalfe) effect accounted for as little as 0.16% of total factor productivity growth in the eight countries we surveyed. Only during the boom years of 2006 and 2007 did total factor productivity growth from higher returns-to-scale add as much as 0.4% to 0.6% to total factor productivity growth. While ICT capital continued to contribute to growth during the 2008-2011 period, the returns-to-scale even detracted 0.3% of total factor productivity growth because of the contraction in economic activity during that time. The effect of innovative adaptation on total factor productivity growth – at less than 0.1% throughout the 2001-2011 period – is even smaller than returns to scale but more sustainable (See Charts 7a and 7b above). Together, the returns-to-scale and innovative-adaptation equalled about one-third of overall total factor productivity growth in the market sector in the eight EU countries analysed. A direct comparison of the use effects from ICT on total factor productivity between Europe and the US is not straightforward, but cruder estimates suggest the network effects in the US to be at least double those in Europe, in the range of 0.5%, accounting for between 40% and 60% of total multi-factor productivity growth in the US between 2001 and 2011.

19 The eight countries are Austria, Finland, France, Germany, Italy, Netherlands, Spain and the United Kingdom.

‘The intensity of ICT capital is strongly related to the level of an economy’s development.’

Taken together, the impacts of ICT production, investment and use accounted for about one percentage point of output growth in the eight European economies from 2001 to 2007, which is substantial given the overall market sector output growth rate of just over 2%. Close to half of the ICT effect comes from investment and the other two-quarters from productivity of ICT producers and ICT users. While the productivity contribution from ICT producers and ICT capital was largely sustained since the onset of the crisis, especially the returns-of-scale part of total factor productivity by the non-ICT sector contracted sharply, bringing the overall contribution of ICT to output growth in the 2008-2011 period to 0.1%, down from 1% in the 2001-2007 period.

The upshot of this discussion is that the key challenge for accelerating productivity growth through digitalisation is not solely with the ICT producers but also with the impact of widespread use of scalable (digital) platforms as a business model in organisations more generally. It is likely that investment will start to grow again once economies begin to recover more broadly (but possibly only in proportion to overall economic activity). The sustainable effect on productivity growth will therefore need to come from stronger network effects through businesses and other organisations connecting to each other (and to the consumer) more effectively (the return-to-scale effect) and through picking up on the latest applications in digitalisation of their business models (the adaptation effect). It is on this point of network effects that Europe falls most behind the US.

Generating larger effects from digitalisation on productivity growth is a long haul and requires patience and commitment. As we will argue below, the biggest gains could be made through a larger single market, which would strengthen the returns-to-scale effects. And through more flexible product and labour markets, which allow newcomers to develop better applications and allow failing incumbents to exit. One shouldn’t expect miracles in seeing economic growth double or triple in the near term. Making the case for digitalisation as a growth driver through the proper types of investments in intangible assets (which require financial resources) and adequate reforms (which can use up political capital) doesn’t therefore always land on fertile ground. The fiscal constraints and lack of evidence on big-bang-for-your-buck effects in the short term make the focus on digitalisation as a growth driver an up-hill battle. But it would be a big mistake to ignore their pervasive effect on the longer-term growth trend.

‘As more companies adopt technology and innovations spread across the economy, the impact on productivity at macro levels becomes more visible.’

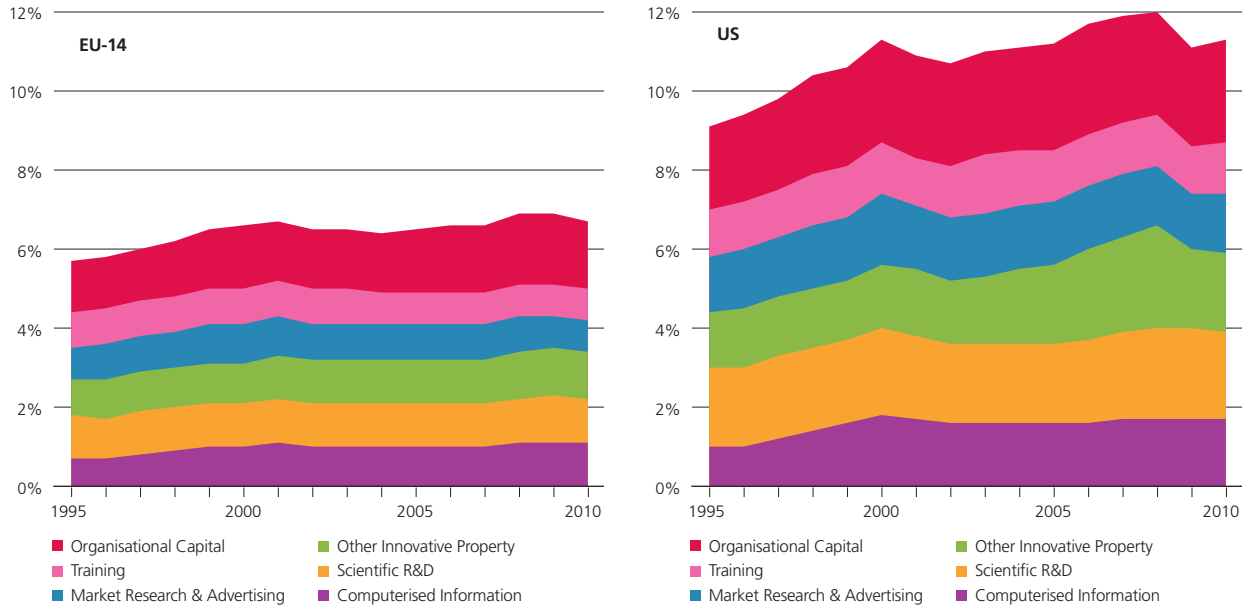
Intangible investments provide the foundation of the knowledge economy

It is important that the impact of technological progress on productivity should not be considered in isolation from a broader concept of investment, and not just labour and capital. Incorporating intangible assets such as investments in non-technological innovations (design, financial innovations), workforce training, improvements in organisational structures, marketing and branding, and – importantly – the creation of databases and other digital systems as part of an economy’s creation of capital shows that digitalisation does not happen on its own.

On average, Europe has much lower investment intensity in intangibles than the US. The share of all measured intangible investment has increased by just over one percentage point to 6.7% in 2010 for an average of 14 European countries, up from 5.6% of GDP in 1995, making it just over half of the share of intangibles in US GDP (see Charts 8a and 8b below).[20] The US saw sharper increases than Europe in computerised information itself, but also in organisational capital. Strikingly, however, while most European countries retained their intangibles during the recession, at least relative to GDP, the US lost almost a full percentage point in 2009 as a result of the recession.

Charts 8a and 8b: Investment intensity of intangible assets as a percentage of GDP for 14 EU economies and the US (1995-2010)

EU-14 refers to the EU-15 before 2004, excluding Sweden and Denmark, but including Slovenia



Source: Corrado, Haskel, Jonas-Lasinio and Iommi (2013)

20 Charts 8a, 8b and 9 are from Carol Corrado, Jonathan Haskel, Cecilia Jona-Lasinio and Massimiliano Iommi, “Innovation and Intangible Investment in Europe, Japan, and the United States” in *Oxford Review of Economic Policy* Vol. 29, Issue 2, pp. 261–286, 2013. The data is also available at www.intan-invest.net.

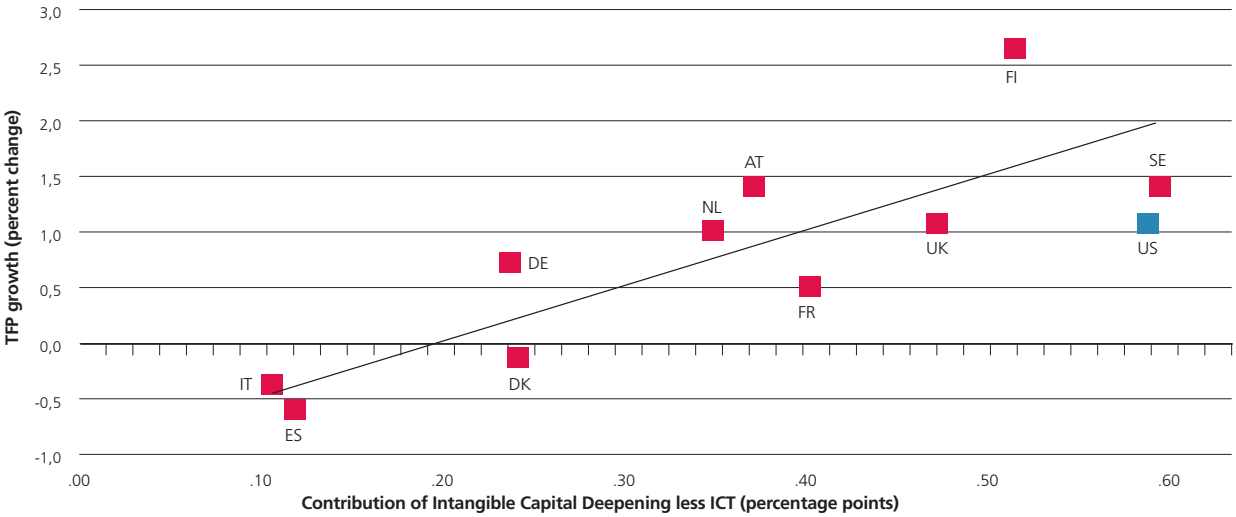
‘The biggest gains could be made through a larger single market, which would strengthen the returns-to-scale effects’

The intensity of ICT capital is strongly related to the level of an economy’s development, and therefore presents a large variation across countries ranging from an average of only 2% of GDP in Greece (in the 1995 to 2010 period) to 9% in the United Kingdom. The intensity of intangibles is in part related to the structure of the economy, which explains the relatively high intangible shares for the United Kingdom and the US, which have relatively large service sectors. These economies have correspondingly large shares of their intangibles concentrated in economic competencies, notably organisational investments, and in ICT. In Germany, which has a relatively large manufacturing sector, the role of innovative property, including research and development, is equally important.

ICT and intangible assets are connected in many ways. Some ICT assets, such as software and databases, are themselves classified as an intangible asset. ICT can facilitate the deployment of other intangible assets and enable innovation throughout the economy, such as the re-organisation and streamlining of existing business processes, for example through order tracking, inventory control, accounting services and the tracking of product delivery. At the same time, capital deepening in intangible assets provides the foundation for ICT to impact productivity. Without intangible investments, productivity improvements from technology progress and innovation will be minimal and a strategy towards digitalisation of the economy will quickly run into diminishing returns. For example, the internal organisation of a firm plays a role in its ability to use ICT more efficiently, in particular through the managerial and other organisational structures.[21] Indeed there is a strong relationship between intangible capital deepening (excluding ICT) and total factor productivity growth, which is consistent with the possibility of total factor productivity spill overs from intangible investments beyond GDP (see Chart 9 below).

Chart 9: Relationship between Intangible capital deepening and total factor productivity growth in EU economies (1995-2007)

Regression line is for the 10 EU countries only. Intangible capital excludes software



Source: Corrado, Haskel, Jonas-Lasinio and Iommi (2013)

21 Erik Brynjolfsson and Lorin Hitt, *Beyond Computation: Information Technology, Organisational Transformation and Business Performance,* Journal of Economic Perspectives, Vol. 14, No. 4, 2000; John Van Reenen, Nicholas Bloom, Mirko Draca, Tobias Kretschmer and Raffaella Sadun, *The Economic Impact of ICT*, SMART N. 2007/0020, Final Report, Centre for Economic Performance, Report for the European Commission (Brussels: European Commission, 2010).

‘Structural reforms which help to reallocate resources away from less productive activities to more productive sectors are the necessary starting point.’

Four European country-groups which differentiate in their sources of growth

The EU has a highly diverse economy – a characteristic which has been widely quoted as a cause for success as well as failure. In many previous studies, the traditional practice of ranking EU economies along a continuum characterized by differences in growth catch-up potential has lost much of its usefulness. In recent work at The Conference Board, we have developed a new grouping of European countries on the basis of important supply and demand characteristics in their growth models including 1) demographic characteristics (population growth and the age, skill and gender composition of the labour force); 2) the potential to create sustainable (total factor) productivity growth even when at or close to the innovation frontier; 3) the capabilities to invest in tangible and intangible assets, including innovation; and 4) the nature of intra-European and global interaction through trade and offshoring.[22]

How do the four country groups compare in terms of productivity and ICT effects?

- The “Integrated Value Chain” group
  Germany-led supply chain group, including Austria and much of Central and Eastern Europe
  Since the middle of the 2000s, Germany has experienced a strong improvement in its structural performance compared to other major European economies. Germany has notably implemented significant reforms in the labour market to create more employment, as well as deliberate short-term policy action which was aimed at retaining employment during the 2008-2009 recession. Germany also successfully exploited its strength in producing for global manufacturing, through engaging with economies in Central and Eastern Europe (as well as Austria) to create an optimal supply chain, benefitting the economies’ strengths from a cost and innovation perspective. The “Integrated Value Chain” group has experienced by far the largest total factor productivity growth of the four country groupings discussed here, and maintained the strongest positive growth of ICT capital, even as total factor productivity growth weakened during the recession (See Chart 10a on page 19).

- The “Global Niche Players” group
  An arc of small economies in north-western Europe (Nordic/Baltic/Benelux/Ireland)
  Most economies in this group are relatively small and therefore have sizeable and competitive foreign sectors, including manufacturing or service-sector industries with specific competitive advantages, such as the ICT sectors in Estonia, Finland, Ireland and Sweden, and the transport and logistics sector in Belgium, Denmark and the Netherlands. By the mid-2000s, many countries in this group had proceeded relatively far with labour and product market reforms as reflected in their stronger labour market performance. Before the crisis, output growth in the “Global Niche” group was stronger than in the “Integrated Value Chain” group, but it was mostly driven by traditional inputs, such as labour and non-ICT capital, instead of ICT capital and total factor productivity. Also total factor productivity declined more sharply here than in the “Integrated Value Chain” group during the recession (see Chart 10b on page 19). The challenge for the “Global Niche” group is to generate larger competitive strengths through digital-driven growth performance, especially in the services industries in which it competes most strongly with the rest of the world.

22 Van Ark et al., *Recent Changes in Europe’s Competitive Landscape and Medium-Term Perspectives: How the Sources of Demand and Supply Are Shaping Up,* op. cit.

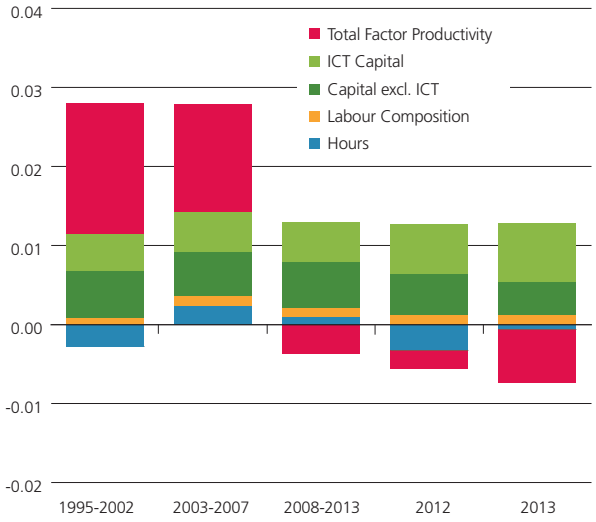
‘Policies that drive market integration are probably the most important prospect for a growth bonus beyond the individual economies’ performance.’

- The “Inward Looking” group Mediterranean countries (France, Greece, Italy, Spain, Portugal, Cyprus and Malta)
  At the other extreme from the “Integrated Value Chain” group, the structural issues from which many European economies suffer have come most clearly to the forefront in the Mediterranean economies, which includes France, Italy and Spain as the largest economies. Growth in these economies was largely accounted for in this group by growth in capital, with a relatively small share of ICT-related capital contributing to growth (35% in this group against 40% or more in the other groups). With the exception of France, the economies have experienced the weakest productivity growth rates (see Chart 10c on page 20).

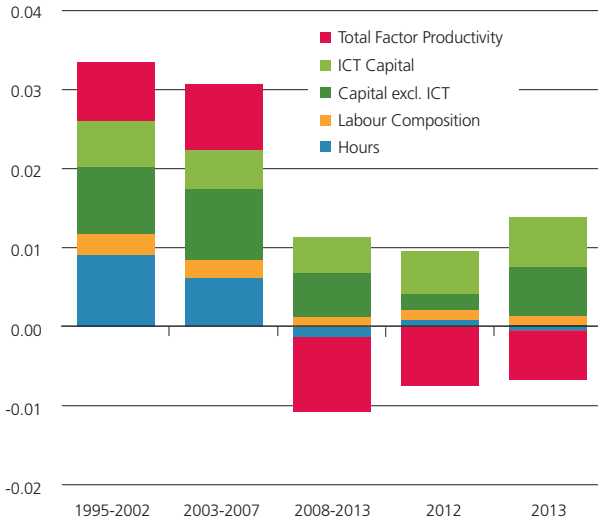
Hence the combination of low ICT investment and lack of reforms provide a difficult point of departure for recovery. This is aggravated by weak domestic demand through large labour losses during the recession and a lack of outward orientation. This, in turn, prevents those economies from benefiting from demand through the global value chain either through manufacturing or services (hence the term “Inward Looking”). As demand factors are unlikely to strengthen enough to change the growth path soon, structural reforms which help to reallocate resources away from less productive activities to more productive sectors are the necessary starting point before innovation and digitalisation can begin play their role as sustainable growth drivers.

Charts 10a, 10b, 10c and 10d: Contributions to average annual GDP growth in the EU by major country group (1995-2013)

10a: “Integrated value chain” includes Germany, Austria, Poland, Czech Republic, Hungary, Slovakia, Slovenia, Romania and Bulgaria

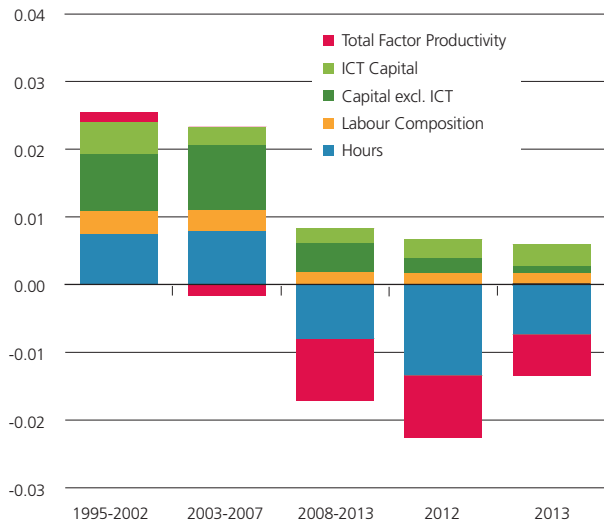


10b: “Global Niche Players” include Finland, Sweden, Denmark, Netherlands, Belgium, Luxembourg, Ireland, Estonia, Latvia and Lithuania

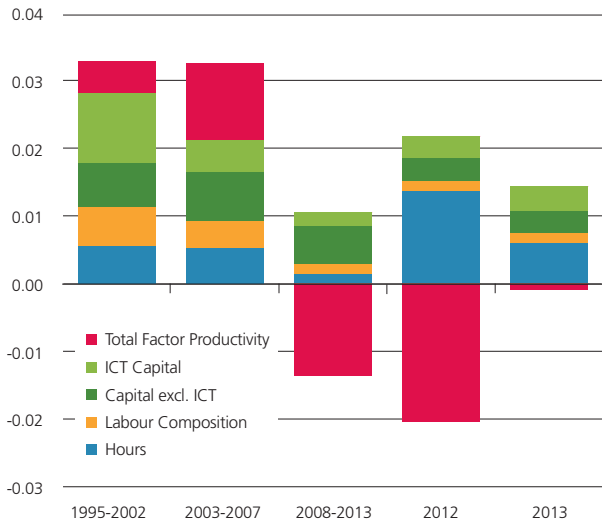


‘The rapid diffusion of high-speed networks and mobile devices has the potential to empower consumers and businesses to drive demand in new ways.’

10c: “Inward looking” includes France, Greece, Italy, Spain, Portugal, Cyprus and Malta



10d: “Deindustrialisation” includes United Kingdom



Source: Van Ark et al. (2013), updated with The Conference Board Total Economy Database (http://www.conference-board.org/data/economydatabase/)

- The “Deindustrialisation Model” United Kingdom
  The most important characteristic of the British economy is that it has become one of the most deindustrialised economies in the world. Especially the financial services sector and other business services account for a relatively large share of the UK economy. Before the crisis, the UK was among the faster growing economies, with a relatively large contribution of ICT capital before 2003. Relatively early reforms in its labour market helped support total factor productivity growth between 2003 and 2007 (see Chart 10d above). There is evidence pointing to the fact that the financial services industry also contributed to rapid total factor productivity growth, but the experience of a huge productivity decline since the onset of the crisis suggests that a growth model based solely on the financial sector could not be sustained. Weak productivity growth is the Achilles’ heel of the UK. The country has very low shares of ICT capital, especially compared to a decade ago, which suggest that the innovation capabilities of the UK economy are significantly weakened.

While a “one-size fits all” approach doesn’t apply to the four country groupings, it’s hard not to conclude that the “Integrated Value Chain” and “Global Niche Players” groups are currently much better positioned to drive future growth through productivity gains and digitalisation than the “Deindustrialisation Model” and “Inward-Looking” groups. Apart from domestic reforms, policies that drive market integration of the various groups are probably the most important prospect for a growth bonus beyond the individual economies’ performance. Without a stronger single market in the EU, especially in services, scale advantages may be limited, and countries may rely more strongly on their own global supply chains or domestic growth dynamics rather than benefit from the larger scale that the European economic area offers.

‘The EU is well positioned to benefit from the potential of ICT investment and digitalisation.’

Why demand matters at least as much as supply

Europe’s moderate success in picking up on the productivity effects from digitalisation is not just a matter of imperfect supply factors, related to slow growth in intangible assets, lack of technological infrastructure and a failure to reform markets so that precious resources flow towards the sectors, industries and companies with the highest return. Slow growth can also result from weak demand for the new products and services that are being offered. Income constraints, high prices, the inability to adapt, or even cultural and generational factors can all cause weak demand. Governments have few policy options to directly stimulate consumer demand, even if short-term fiscal stimuli can help to avoid the erosion of productive resources during long crisis periods. But there are at least two policy areas that are fundamental in generating more demand for the new products and services that digitalisation generates.

Completing the digital single market

As the services sector makes up 70% of the EU’s GDP, the completion of the single market for services in the EU can hugely leverage the demand for services across the Union. When consumers and businesses can access services across the EU and benefit from the lower prices at which these services can be offered, companies will be better able to realise the returns to scale which Europe is generating so slowly and which are holding back productivity growth.

There is probably no area where the need for an emphasis on demand is more visible than in the digital market itself. The rapid diffusion of high-speed networks and mobile devices has the potential to empower consumers and businesses to drive demand in new ways.[23] Such ICT-enabled demand shifts can result, for example, from the shift to “everything mobile,” the increased analysis of “big data,” or from the diffusion of technologies such as 3D printing. Consumers have more options to obtain digital services from anywhere. Creating a larger single market facilitates the providing and accessing of digital services across the EU, which will not only better satisfy consumer needs, but also create the much needed scale that business requires to provide more variety, better quality and lower prices.

None of the measurements of returns-to-scale effects discussed above takes into account the utility effects which consumers can realise through accessing larger networks. The unmeasured consumer surplus, which results from switching from older more expensive technologies to newer and cheaper ones, has been documented to be substantial. For example, countries with large Internet economies are receiving more revenue growth and consumer surplus affiliated with broadband’s diffusion to households than smaller economies.[24]

In a digital single market with more vibrant demand, businesses have more room to grow and business failures can be rapidly replaced by success cases, making the reallocation of productive resources in the economy a proportionally important driver of growth relative to across-the-board productivity improvements.[25]

23 See Paul Hofheinz and Michael Mandel, *Bridging the Data Gap: How Digital Innovation Can Drive Growth and Create Jobs* (Brussels/Washington, DC: The Lisbon Council and Progressive Policy Institute, 2014).

24 Shane Greenstein and Ryan McDevitt, “The Global Broadband Bonus: Broadband Internet’s Impact on Seven Countries,” in The Conference Board, *The Linked World: How ICT is Transforming Societies, Culture and Economies*, The Conference Board Report for Fundación Telefónica (New York: The Conference Board, 2011). The consumer surplus part of the switch to broadband consists of the amount consumers would have been willing to pay for broadband in excess of what they actually are paying, and is measured using the observed increases in broadband diffusion in each country during the 2000s as its real price dropped during the decade.

25 Eric J. Bartelsman, *ICT, Reallocation and Productivity*, Free University Amsterdam, European Economy Economic Papers 486, Report for DG Ecfin (Brussels: European Commission, 2013).

‘Countries with large Internet economies are receiving more revenue growth and consumer surplus affiliated with broadband’s diffusion to households.’

The larger market also creates more room for start-ups and other small innovative companies, including those developed by digital entrepreneurs, which play an important role in energising the business environment, but often face many institutional barriers on their own home turf.[26] Access to finance for such companies is another major issue that needs to be tackled in this context as access to finance for smaller, more innovative and riskier ventures remains difficult, not only seed capital, but also the capital required to scale up.[27]

Hence a virtuous circle can be created in which a single market for digital services feeds consumer and business demand, which drives innovation through adoption of digital technologies, which supports productivity growth and GDP, which then creates the demand for jobs, which generate the income for consumers to obtain the products and services being produced.

Tapping the global value chain

None of the evidence presented here suggests that it will be easy for European consumers and business to create the virtuous circle of growth, productivity and technology, especially while the recovery in domestic demand remains weak. The second key source of demand will therefore rely more strongly on the external market. Europe is well-positioned to benefit from foreign demand for its products and services, because of its geographical proximity to (potential) fast-growth markets. Except for ICT investment, exports have been almost the only economic performance variable which has remained a positively contributing growth factor throughout the recession, and more so than in the US.

Given its industrial density, Europe also has the ability to leverage its diversity through managing different parts of the supply chain. Metrics derived from the World Input Output Database show that 23% of EU wide employment in 2009 can be linked to production for foreign demand, including demand from other countries within the EU.[28] This employment not only concerns workers who directly contribute to the production for exports, but also affects all workers indirectly through the supply chain. The distribution of workers is about 50-50 between manufacturing and services industries. The productivity impact of production for foreign demand is important. Between 2000 and 2008, the level of labour productivity of goods-producing workers in the EU-27 dedicated to foreign production was 13% higher than that of those producing for domestic demand. In services, the productivity level was 10% higher for workers producing for foreign demand.

From the perspective of productivity growth, 23% of the aggregate growth in labour productivity in the EU-27 was accounted for by workers producing for foreign demand, equally distributed between goods- and services-producing sectors. Returning to the four country groupings, we find confirmation that the “Integrated Value Chain” and the “Global Niche” groups were the most successful in obtaining positive productivity impacts from integration in the global value chain, at 28% and 34% of aggregate labour productivity growth, respectively. This shows there can be important technology and innovation spill overs from involvement in production for the global value chain, which reflect on the relevant economy’s ability to grow productivity through innovation.

26 Tony Clayton and Desirée van Welsum, *Closing the Digital Entrepreneurship Gap in Europe: Enabling Businesses to Spur Growth*, The Conference Board, Executive Action Report 425, 2014.
27 See Michel Barnier, Sören Stamer, Ann Mettler, Richard Pelly, Anthony D. Williams, Emma Vandore, Daria Tataj and Ton Wilthagen, *SMEs in the Single Market: A Growth Agenda for the 21st Century* (Brussels: Lisbon Council, 2012).
28 Van Ark et al., *Recent Changes in Europe’s Competitive Landscape and Medium-Term Perspectives: How the Sources of Demand and Supply Are Shaping Up*, op. cit., based on World Input Output Database (www.wiod.org).

‘Governments should play a key role in making the necessary investments and reforms to the educational system.’

Paving the road to faster growth through productivity and digitalisation

The EU is well placed to benefit from the potential of ICT investment and digitalisation. The huge size of its GDP, which has made it potentially the largest single market in the world, its relatively high levels of per capita income and productivity, the major and increasing contributions from European firms to producing for the global value chain of manufactured goods, and the above-average level of innovation infrastructure in which business, government and research interact, are putting Europe in a favourable position to book results in digitalising the economy and raising productivity.

But time is running short. Not only is the power of the sources of growth eroding under the influence of long episodes of slow growth, especially for intangibles such as workforce skills and new technology. Other countries and regions are racing ahead, and in the digital world many activities will flow to where they can flourish, with lags proving increasingly difficult to make up.

A number of actions can be laid out to pave the road for a technology infused growth path. We propose a seven-point action plan based on three principals:[29]

- Pre-conditions for reaping ICT-driven growth benefits need to be secured by a high-quality and affordable infrastructure in all sectors, capable of supporting the growing cloud, big data, and including high-speed fixed and mobile broadband. This should be matched by investments in the soft infrastructure to equip people with the skills to analyse and synthesise big data and use them to create new business opportunities.
- Government and business can work together to develop and foster the skills and willingness to use ICT within the context of a fully integrated single market. This market can be supported by providing effective platforms that increase readiness and by focusing on government investments where businesses leave them on the table because of the high externalities. Governments should play a key role in making the necessary investments and reforms to the educational system to ensure that people are taught the technical and user skills required for today’s and tomorrow’s world, putting an emphasis on the employability of graduates.
- Governments will need to focus increasingly on facilitating a regulatory environment in which businesses, both inside the ICT sector and outside it, can thrive (and fail). This increases the incentives to innovate by reducing the risks associated with innovating and introducing new technologies, helping the private sector to realise the spill overs that justified the original government investments.

The roles of governments and the European Commission are crucial in laying out a vision, reforming and investing where necessary, putting in place favourable framework conditions, using public procurement to further innovation, and leading by example.

Government agencies can:

29 Desirée van Welsum, Willem Overmeer, and Bart van Ark, *Unlocking the ICT Growth Potential in Europe: Enabling People and Businesses. Using Scenarios to Build a New Narrative for the Role of ICT in Growth in Europe: Summary Report*, The Conference Board Report for DG Connect (Brussels: European Commission, 2013).

‘Pre-conditions for reaping ICT-driven growth benefits need to be secured by a high-quality and affordable infrastructure in all sectors.’

1. **Articulate a broad and crosscutting vision that all departments and stakeholders can adopt.** This vision should be based on an understanding of where the region should be 10 years from now and what it will take to get there.

2. **Make sure regulation is enabling.** This may mean removing regulations that are unnecessarily hampering innovation and/or the transformation that ICT can bring about, or proposing new regulations that allow new businesses to form and individuals to develop to their full potential.

3. **Deal with funding and finance issues that include public funding for research**, which can often be biased against smaller, riskier, and more innovative players and projects. Obtaining European funding may be so complicated and costly in terms of time and administrative procedures that smaller players give up. The public sector can also fund “blue sky” research that might otherwise not find funding. Such funding should not be biased in favour of incumbents or exclude small players and newcomers. Instead, public funding should support technologies and applications (rather than companies and sectors) and bring ideas closer to market.

4. **Put in place the right investment conditions to stimulate entrepreneurship**, as well as the hard and soft infrastructure to fully enable and support it.

5. **Establish the right conditions for the creation of scale effects**, which can include:
   a. achieving the digital single market in practice;
   b. creating a single market for content and services;
   c. reducing barriers and harmonising regulations to reduce fragmentation in markets, which will create the scale needed to benefit from network effects;
   d. increasing the knowledge of English (which may contribute to creating scale in the market for talent, especially if combined with reducing barriers to cross-border recruitment and increasing the flexibility of labour markets);
   e. removing barriers to international growth; and
   f. reducing barriers to entry in markets to ensure healthy levels of competition.

6. **Using public procurement to drive innovation and encourage ICT uptake**. This can be accomplished by:
   a. making the adoption or delivery of certain technologies or applications part of the specifications of procurement contracts;
   b. reforming government procurement practices and considering purchasing more from small and innovative companies; and
   c. simplifying procurement practices and procedures significantly, making them more accessible to smaller companies.

7. **Lead by example.** The public sector could move more activities online, reorganise and streamline their administrations, adopt new technologies and solutions, equip workers with the right skills, and include more IT-savvy people in government, including in high positions.

‘The real challenge facing policymakers and citizens alike is the search for a path to sustainable growth in the medium and long terms.’

If Europe wants to build on its existing economic and social values, it must not wait longer before making meaningful, and sometime bold, changes to sustain the existing model. The long-term growth projections, following the base scenario, offer no chance of survival. The overarching objective of the Europe 2020 strategy is to achieve “smart, sustainable and inclusive growth.”
This report aims to show that a commitment to productivity growth through innovation and digitalisation is key to achieve those goals.

National governments and European Commission actions are likely to be more successful only if they happen in concert and, importantly, create more scale and scope for growth across Europe and provide the conditions that allow a greater role for consumers and businesses to drive the impact of new technologies through their effective use. European companies and citizens have a unique opportunity to leverage the region’s internal economies of scale to exploit the benefits offered by ICT and, at the same time, secure Europe’s role as a global spearhead for competitiveness and growth.

Additional Reading

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