Connected Continent for a Future-Proof Europe

Ensuring Affordable, Fast and Reliable Internet Access for a Thriving Digital Ecosystem

European **Political Strategy** Centre

Had Europe already completed a fully-functioning telecom single market, pan-European operators could compete across different countries. European-wide wireless networks would coexist with highly efficient, locally run, fixed broadband networks. New technologies would be profitable and rapidly deployed. High-speed access to the Internet would be available to all. This is not the case today, even though the European telecom infrastructure is better than often depicted: access prices are low and coverage of standard speed Internet is high. Europe is struggling, however, with regard to fast wireless and fast fixed broadband connections – which is precisely where the future will be.

The long-term success of a digital economy based on the Internet of Things, Machine to Machine technologies, cloud computing and Big Data, will crucially depend on access to the highest quality telecom infrastructure. With no prospect of enjoying fast and ultra-fast reliable Internet access, few industries will invest in Europe and citizens will struggle to benefit from the digital revolution. That is why Europe must urgently raise its digital game.

Towards Maximum Connectivity

To properly shape its digital future, the European Union should maintain focus on the ultimate goal: ensure the maximum level of connectivity to end-users – consumers and business customers – in terms of low prices, coverage, speed, quality and reliability of Internet connection – for everyone everywhere in Europe.

Prioritising Wireless Spectrum Management

The EU should promote the highest possible level of coordination of national wireless telecommunication policies. Improving spectrum management to maximise the likelihood of success of 5G should be a top priority.

Stimulating Demand for Cross-Border Digital Services

'Pull-policies' are needed to boost the development of demand, in particular across borders. They should consist of enhancing a pro-data flow regulatory environment, enabling and stimulating the adoption of high data-demanding applications, supporting the creation and portability of EU-wide content as well as stimulating uptake of digital by public and private entities.

Learning From the Best

'Supply-push' strategies should take inspiration from European success stories and scale them up at EU level. Such policies often hinge on the involvement of local and regional authorities to address issues of financing for broadband deployment financing issues. Public-private partnerships can foster investments with a high prospect of long-term profitability and social returns. Other models – such as co-investment or wholesale-only models – can also prove successful in lowering risks and increasing sustainable service competition.

1. Connecting Europe: Users are the Goal

Connectivity is increasingly at the heart of economic development. Cisco[1] estimates that global Internet traffic in 2019 will be equivalent to 64 times the volume of the entire global Internet in 2005. Worldwide, Internet traffic will reach 18 gigabytes (GB) per capita by 2019, up from 6 GB per capita in 2014. Global Internet Protocol (IP) traffic has increased more than fivefold in the past 5 years, and will increase nearly threefold over the next 5 years. **Trade will no longer be about the physical transfer of goods or services. Digital trade of data is rapidly increasing**: between 2008 and 2012 worldwide, cross-border data trade increased by 49% while trade in goods or services rose by just 2.4%.[2] Demand for digital technologies will continue, as 61% of the world's population has yet to go online.[3][4]

Figure 1: Mobile Data Traffic by 2020

Exabytes per month
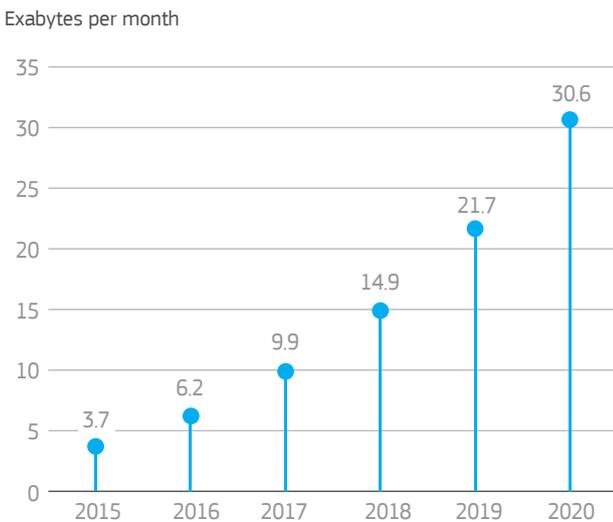
Source: Cisco VNI Mobile, 2016

Connectivity is Key for Investment

The spread of telecommunication technologies is known to have strong and significant impact on economic performance. Increasing broadband penetration by 10 percentage points has been shown to stimulate GDP per capita by 0.9-1.5%.[6] The European Commission has recently carried out a public consultation on connectivity needs: 90% of respondents indicated connectivity as the primary means by which their business is conducted or an important part of their business activity.[7] Most importantly, **it is the prospect of long-term connectivity which drives major investment today as well as industries' long-term investment strategies**. Therefore, sectors like video game development may move their new generation products to geographic areas that are better connected than Europe (as currently some parts of Asia

are, for example). Europe should not only be concerned with the actual development of infrastructure but also with conveying a strong signal to current market players that in 10 years down the road, its digital ecosystem will flourish, the infrastructure will be there, competition will thrive in the market, access will be affordable and, as a result, that digital services will prosper.

Connectivity requires infrastructure, such as fast and ultra-fast fixed broadband and wireless communication networks. Europe's current outlook with respect to connectivity is generally solid. But it suffers from a number of important gaps. Due to *ex ante* access regulation and competition between telecom operators, prices tend to be among the lowest in the world for both fixed and wireless connections (Figure 2 reports price data on broadband wireless connection) and standard broadband coverage is almost 100%. Actual download speed in most Member States is higher than in the US. Conversely, US users suffer from a lack of choice. As recently mentioned by the Federal Communication Commission's Chairman, only 15% of US citizens can choose between more than two fixed broadband providers. As regards fast and ultra-fast networks (or NGAs i.e. next generation access networks), 75% of users can pick only one operator at most. The US is also one of the OECD countries with the highest access prices for fixed broadband, although their bundles tend to offer more data and voice consumption and Americans, who use their bundles more intensely, consequently pay less per unit.

However, Europe is weak on future-proof telecom infrastructure. If taken as whole, **Europe has two Achilles' heels: the late adoption of wireless 4G technology and access to fixed NGA for fast and ultra-fast Internet**. The US has full 4G coverage while, at the end of 2014, 4G Long-Term Evolution (LTE) mobile broadband was available only to 86% of EU households. Likewise, fast/ultrafast broadband coverage in the US is almost 90% while in the EU is 71% on average.

It is widely believed that **the roots of the current poor performance in wireless lie in the lack of coordination of spectrum assignment and allocation between Member States**. On the other hand, Europe's poorer performance on average on fast/ultra-fast Internet fixed broadband penetration can be largely explained by the limited role played by cable TV, an inherent advantage that helped the US with the deployment of its fast and ultra-fast NGA infrastructure. Connectivity in Europe is also far from uniform across the Member States. For example, the Scandinavian and Baltic countries tend to be world leading on connectivity across all dimensions: coverage of urban and rural areas, access pricing, and actual speed of mobile and fixed connection. Figure 3 illustrates EU inter-regional differences in terms of fast and ultrafast Internet NGAs coverage (2015 figures).
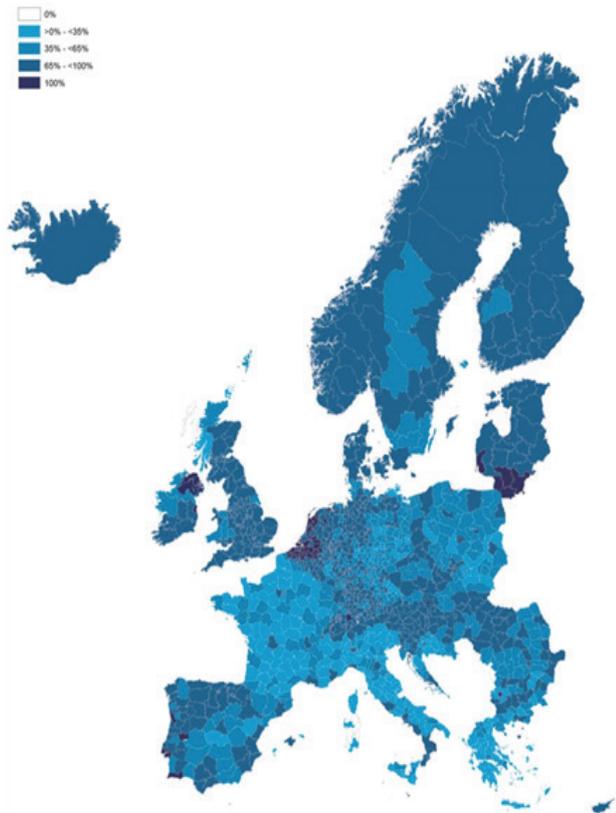
Figure 2: Wireless Broadband Prices 2012
US dollars PPP
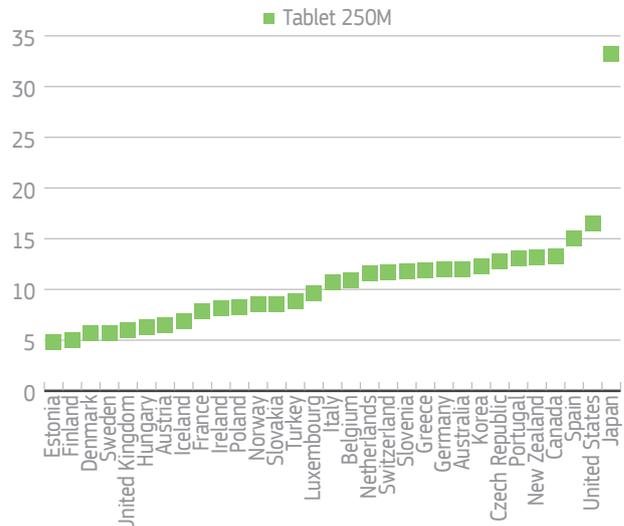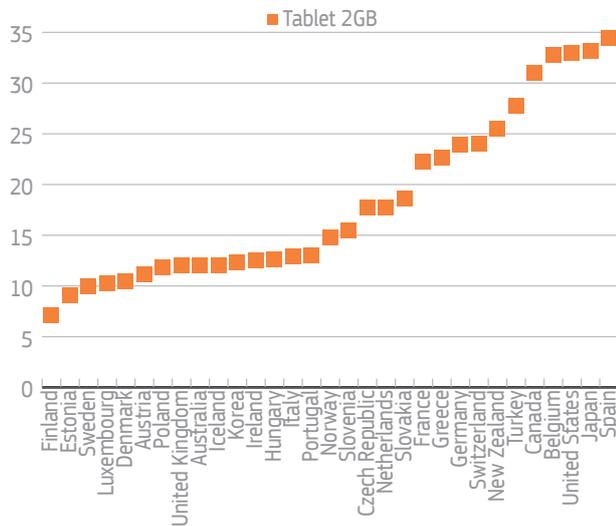
Source: OECD Communications Outlook 2013

Figure 3: Fixed Next Generation Access Networks (>30 Mbps) Coverage 2015

Source: Broadband Coverage in Europe 2015, a study by HIS & VVA for the European Commission

Cost of Fragmentation

Europe and the US indeed differ in a very important dimension. The former **lacks a seamless unified single telecom market** (see Box 1 for a discussion of what that means in the context of EU merger control). This leads to a situation in which European telecom companies operate their networks on a country-by-country basis. As networks are national, customers do not consider subscribing to telecom services offered in other countries since the price would normally be prohibitive. Operators, on the other hand, find it difficult to supply services cross-border because this entails overcoming significant barriers to entry, such as the need to acquire relevant spectrum licences for wireless communication, or incur the cost of complying with the specificity of a national regulatory framework. This ultimately means that **end-users experience very different connectivity conditions across the continent while European telecom services are overall less efficient** than what they could be if the full potential of the single market were untapped. If just a few operators would operate pan-European services, they could enjoy significant economies of scale.

The European Commission plans to address the lack of future-proof connectivity infrastructure in Europe. It has already adopted measures to mitigate cross-country differences, most recently through the regulation on roaming charges and net neutrality. The forthcoming review of the regulatory framework for telecoms aims to address questions of access regulation, wireless spectrum management, the design of a level playing field for competition from asset-light services e.g. over-the-top operators (OTT), and the institutional set-up of national and EU regulators.

In general, incumbent operators have called for a new regulatory approach which is more lenient towards market power and market concentration, arguing that this would favour infrastructure deployment (see Box 1). Conversely, emerging operators have called for continuing a strong enforcement of access rules to prompt competition as the primary source of investment incentives in telecom markets.

Box 1: Competition and Investment in Telecom Markets

European competition policy has come under great pressure by incumbent telecom operators in recent years. They argue that competition policy enforcement and, in particular merger control, hampers the prospect of investment. The argument states that in-country consolidation is necessary to make investment desirable, provide companies with the necessary financial resources to follow it up, and nurture European industry faced with the challenges of globalisation. However, competition rules are not against the creation of European champions. EU rules simply impose a framework in which such champions can emerge on the basis of their merits.

Conversely, there is no case for a reduction of competition to stimulate investment: there is no convincing evidence that higher levels of concentration in telecom markets are associated with more or better infrastructure. If users pay higher charges and companies make more profit, there is no guarantee that these profits will be reinvested in new infrastructure. For more than a decade, US telecom companies have been allowed to enjoy a significant degree of market power according to a forbearance policy. In the 2003 OECD country ranking for fixed broadband penetration, the US ranked tenth. In 2014 they were placed sixteenth. Countries that implemented a pro-competition policy ended up with higher average population coverage for standard broadband (see Figure 4).

Figure 4: Broadband Subscriptions

Per 100 inhabitants
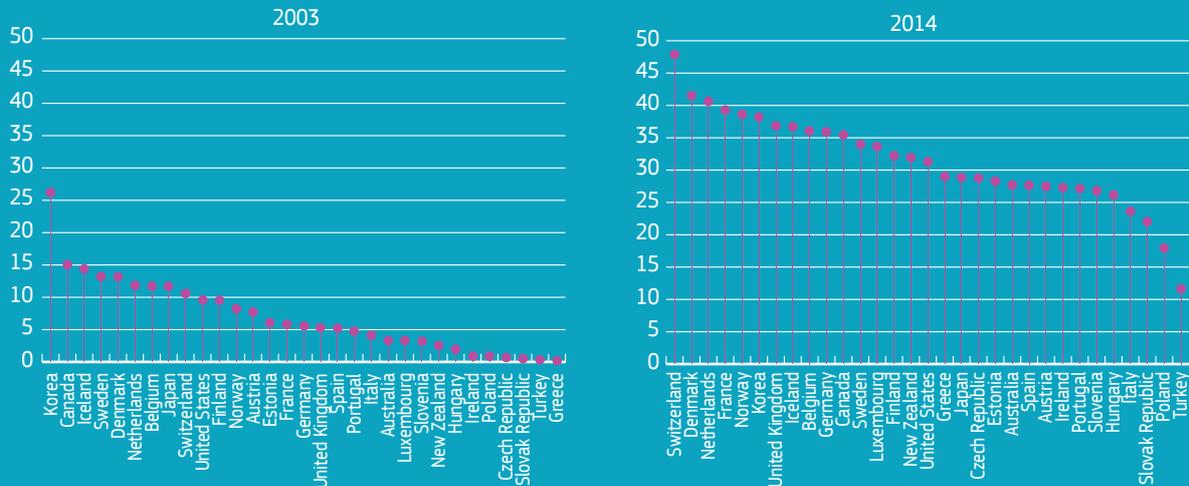
Source: OECD Broadband Statistics.

Market definition in merger control has also been criticised. The European Commission considers national markets as markets per se, while merging operators often argue that markets are no longer national but global in scope. Market definition is a recognised tool used by competition authorities around the world. In its simpler form it consists of addressing one key question: 'if the price of telecom services in country A increases by a little, will users be able to buy services from country B or will operators from country B enter country's A market with better offers?'. Unfortunately, because Europe still lacks a unified single telecom market, the answer to both questions is typically 'no'. It is indeed too expensive for users to subscribe to services from a neighbouring country's operator if they want to use their phone for domestic calls or Internet connection. And it is costly for foreign operators to enter markets that require significant investment upfront, such as access to wireless spectrum. It turns out that until Europe becomes a single telecom market, the correct approach to market definition in merger control should hinge on the identification of national markets.

Stakeholders play an important role and their involvement is essential when setting up an effective policy strategy. However, **the European Commission should avoid a choice it has made in the past** when it primarily looked at the solutions suggested by market players, attempting to pick the right one and ending up balancing the interests of opposing sides.[8]

The debate on the virtues of *competition versus investment* currently seems fatigued. Evidence suggests that competition has played an important role in the past in making the telecom market flourish. Hence, there does not seem to be ground for reversing that approach.[9] On the other hand, new policies have to be promoted if competition itself is no longer sufficient in achieving Europe's investment goals. In moving beyond the *competition versus investment* debate, a new agenda should be proposed, presenting market players with solutions that have not yet been fully explored in the public domain, such as promoting public-private partnerships with local and regional authorities to drive broadband investment. In addition, private-private partnerships i.e. co-investment or network sharing, can help to de-risk infrastructure investments and lead to more sustainable market competition which is not so dependent on regulation – a sort of infrastructure-based competition on a single network.

Maximising Connectivity Opportunities

One key goal should guide the EU's overall approach, namely **maximising end-users' future connectivity opportunities.** The health of the European telecom industry should only be a means to reach the maximum benefits for users and not a goal in itself. Worryingly, about 41% of European companies have not yet adopted any of the new advanced digital technologies[10] while 80% of German SMEs still use fax machines.[11] In that sense, the question of how to stimulate telecom infrastructure investment should never be prioritised over the promotion of digital uptake downstream by businesses and consumers. This implies that preserving quality and reliability, and maintaining accessibility to services at low access prices, should always be a top EU priority – provided adequate returns on investment can be maintained to reward business technology and competition risks, arguably higher here than in other infrastructure sectors.

In this context, three types of policy actions should be considered. In order to meet the medium to long-term connectivity goals, (1) the new regulatory framework for telecoms should envisage a strong coordination regime for wireless spectrum policies across the EU; (2) a set of 'supply pull' policies should be deployed to stimulate the development of digital downstream markets; (3) a set of 'supply push' policies inspired by Europe's most successful examples should be adopted.

2. A Telecom Single Market Prioritising Wireless Spectrum Management

The review of the telecom regulatory framework is, on many counts, a welcome initiative. Significant structural changes in telecom markets have taken place since the last review of the framework in 2009:

- progressive transition from copper to fibre in view of the increasing demand for fast connections;
- emergence of the pressing need to facilitate cross-border supply of telecom services to promote the creation of a digital single market;
- erosion of the rents of traditional telecom operators due to the emergence of new asset-light 'over-the-top' (OTT) players such as Skype or WhatsApp.

The regulatory framework is an important piece of the puzzle when it comes to business investment decisions. Investment is lower when investors find it more difficult to anticipate future government policy.[12] [13] Currently, the degree of uncertainty with regards to the future regulatory framework is seen as high. Member States, national regulators, competition authorities, incumbent and emerging telecom operators, business users and consumers, online applications etc. tend to have vastly diverging positions. One way to promote harmonisation of regulation and enforcement could be by means of a central European regulator. However, national authorities strongly oppose this on the grounds that they are best suited to design regulatory solutions given their superior knowledge of national markets' structural features. The debates around access regulation and competition as well as the creation of a level-playing field for OTTs are likewise very lively and polarised (see Box 1 and Box 2).

Realistically, it is advisable in these circumstances to limit intervention to what is strictly necessary, without proposing an overall re-engineering of the framework which would be unlikely to be achieved and may further increase instability. At the same time, particular efforts should be exerted in the most promising area of intervention, namely: **wireless spectrum management**.

Spectrum Management

A key dimension of the discussion around wireless spectrum concerns the **integration of the process of allocation and assignment of radio frequencies used by operators for mobile communication from national to EU level.** There is a consensus in the academic debate and industry that delays, as well as the inefficient organisation of allocation of auctions and

Box 2: A Level Playing Field for Over-The-Top Applications?

Figure 5: Messages Sent Worldwide Via Mobile Handsets By Services

Trillion messages
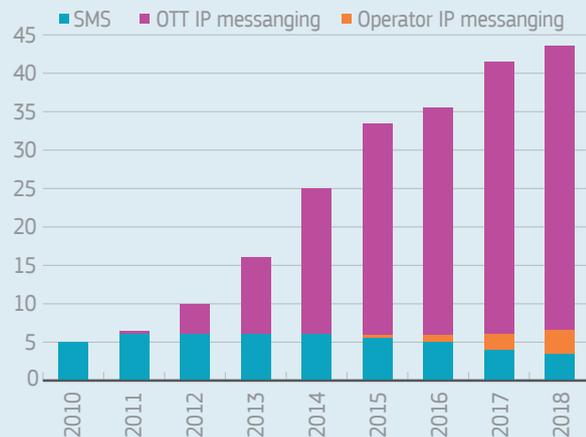
Source: Analysis Mason, 2014

Traditional telecom operators are increasingly confronted with the competitive pressure exerted by asset-light over-the-top services which are substitutes for traditional telecom services, but are not subject to the same regulatory regime. The review of the regulatory framework for telecoms aims to establish a level playing field by harmonising regulatory obligations across suppliers of similar services.

The discussion is also focused on lightening up regulation for traditional operators where certain rules might no longer be needed. While fair competition is necessary in order to achieve the best possible outcome from a societal point of view, any proposed new regulatory measure will hinge on the protection of end-users and not of traditional business models. It is particularly important that new obligations will not curb OTT's ability to compete and gain market shares at the expense of traditional telecom operators. This would not only ultimately harm end-users but could also damage the European telecom industry which would lose the incentive to adapt their business model to the incoming challenges posed by the uptake of digital services.

lack of coordination at the EU level, lie at the origin of Europe's failure with 4G. While spectrum is allocated through national auctions organised by each Member State, auctions in the US are held by the Federal Communication Commission.

This explains why the US was quick in deploying 4G with almost full coverage throughout its entire territory, while coverage of the European territory is still far from complete. The next mobile telecommunication 5G standard promises to bring a revolution in data transmission, with up to 1Gb/sec users' experienced data rate[14] and European countries should aim to be at the forefront (a leadership position that Europe held in the past, for example for 2G, also thanks to an efficient process for the adoption of the harmonised standard). The allocation of dedicated 5G spectrum bands through public auctions could start as early as 2020. The ground needs to be set now so as not to repeat the experience of 4G.[15] Resistance to supra-national allocation of spectrum comes mostly from Member States which rely on spectrum auctions as an important source of revenue. However, such a concern can be addressed if a functional system would be proposed to redistribute revenues across Member States in case of EU integrated auctions. Policies aimed at managing spectrum allocation at European level are worth pursuing. Two main reasons stand out.

a. Wireless Communication is Increasingly Relevant

Mobile data consumption is growing rapidly and, to a certain extent, it may become a potential alternative to fixed communication services, at minimum in low population density or rural areas, where building fixed infrastructures may not make business sense, even though wireless NGAs would still require a backhaul for offloading.[16] Especially in recent years, mobile communication has been increasingly perceived as a potential substitute to fixed lines in EU markets, albeit gaps in speed and especially affordability (cost per GB) still persist. One study estimates that without mobile telephony, fixed-line penetration would have been 14% higher in 2012[17]. Mobile is also the perfect ground where to sense Europe's frustration for the lack of a true single market. Moreover, most of the digital applications that will thrive in the future, and on which successful economies will increasingly rely, would require seamless cross-border connections. Driverless cars are an example, requiring continuous and inexpensive mobile connection across large geographical areas (see Box 3). At a minimum, efficient means must be found for providers of mobile Internet of Things systems (connected cars, logistics systems, services based on wearable connected technologies) to source connectivity without falling into the trap which afflicted roaming in Europe since the beginnings of mobile telephony.

b. European Union Plays Pivotal Role

A move towards a joint wireless spectrum management is essential to create a pan-European mobile market, even if full harmonisation cannot happen overnight, not least because countries have different frequency bands already allocated and different contract expiry dates. Joint management would help investment, because it would be cheaper for operators to deploy and operate EU-wide infrastructures, for example because of economies of scale or because of economically well-defined efficiency gains[18]. Instead, the timing of the current fragmented system of multiple national auctions increases the risk for operators willing to expand in multiple countries. It creates uncertainty as regards the viability of their long-term investment plans, concerning in particular the following issues: the timing at which telecom operators will be able to access spectrum in each of the targeted countries, the likelihood that they will win the different auctions, and the price they will have to pay for it.

It is reasonable to expect that Member States have an incentive to join well-conceived coordinated auction mechanisms, as this would serve their interest. Rents would not be lost while additional value would be created through efficiency gains. Importantly, the design and process of coordinated auctions would need to aim at maximising participation, avoiding spectrum hoarding (i.e. operators holding spectrum for strategic purposes), ensuring that spectrum rights are sufficiently stable over time to offer certainty to investors, and allowing for spectrum trading in secondary markets to maximise efficiency.
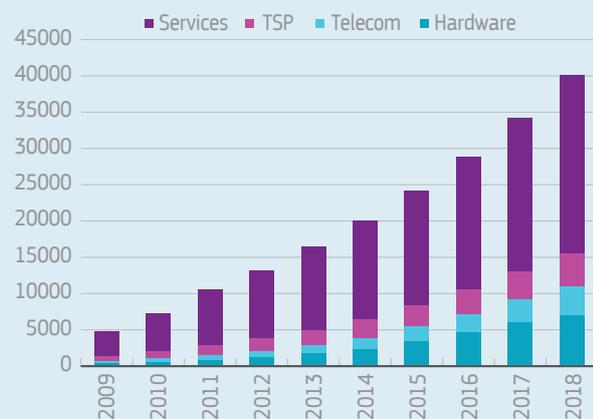
3. A Demand-Driven Telecom Single Market

Measures that directly target supply can be effective in stimulating infrastructure deployment. Traditionally, EU and national policies have aimed to achieve 'pushing effects' by reducing the cost of broadband investment. However, as successful international experiences suggest, 'pulling' measures targeting the demand side are equally important. In Sweden, for example, demand for digital services was a key driver for investment. The government played a primary role by funding training for small companies, the unemployed and 75,000 teachers. It also deployed a public-private partnership initiative to create the biggest ICT cluster in Europe: Stockholm's Kista Science (more than 1,000 companies and 25,000 employees in the ICT sector are located there).[20] **Demand-side policies** tend to be less prominent in the European policy debate than supply-side initiatives, despite having a **higher impact on broadband penetration**.[21] It is useful to stress that the more urban and rural users are likely to become intensive consumers of data, the more commercially attractive these areas become for private investment. This in turn decreases the need for public funding to cover these areas.

The European Commission's digital single market strategy[22] aims to boost digital demand in Europe. Its full and correct implementation will incentivise broadband penetration by operators eager to match

Box 3: How Can Driverless Cars Help Connect Europe

Figure 6: Revenues Evolution

Million euro

Source: GSMA 2013

* http://www.techweekeurope.co.uk/e-innovation/vodafone-5g-m2m-smart-cars-172042)

According to GSMA (2013), by 2025 every new car sold will be connected through a number of ways (smartphone integration, tethering and/or embedded SIM cards). GSMA (2013) estimates that the overall market in 2018 will be worth 3 times as much as in 2012 – revenues will go up to EUR 40 billion, and mobile operators will have the possibility to appropriate a big chuck of these (see figure 6). Vodafone has already announced that its 5G network will be geared towards supporting Mobile-to-mobile technology, and in particular, connected autonomous vehicles*. Smart cars will require fast and reliable connectivity. Google's self-driving car generates 1 Gigabyte of data per minute (according to Handelsblatt/Vodafone). They will also require seamless connectivity and stable rates throughout the EU territory. Pan-European 5G networks will therefore be an essential input to the market. Enacting an efficient and uniform single market regulation that would make the market for autonomous vehicles flourish could have significant pull effects for wireless infrastructure deployment.

a booming demand. This applies in particular to data-hungry applications (e.g. applications based on Big Data analysis). **A strong 'pan-European' demand for digital content and services will generate a supply of pan-European connectivity infrastructure**. It is worth noting that initiatives geared towards demand are likely to have a stronger incremental effect in Europe. That is because Europe's untapped potential lies mostly on the demand side.

To be successful, however, the strategy will have to rely on a regulatory framework favourable to the development of a thriving digital ecosystem. This implies adopting a decisive pro-competitive stance, where cross-border trade from outside and within the EU is strongly incentivised. There are three areas where intervention is needed.

a. Unleash the Potential of the Data Economy

Initiatives aimed at tackling unnecessary restrictions on data flows and fighting 'digital protectionism' – data localisation requirements imposed on companies by Member States not for privacy protection or security concerns but to limit cross-border competition – can be very effective in stimulating data use across the continent. A 2015 McKinsey report estimates that Europe is by far the region with the highest interregional data flows in the world.[23] Traditional industries (retail, manufacturing, energy) increasingly rely on cross-border data flows.

Moreover, seamless data flows can support the creation of EU-wide cloud computing facilities with potentially very strong effects on productivity. A rich environment welcoming the Internet of Things and the Machine-to-Machine revolution can be a strong lever for connectivity supply. Smart cities require ultra-fast, reliable fixed and wireless connectivity. The expectation of a flourishing driverless car market will trigger pan-European mobile services (see box below), as will virtual reality, video streaming on demand, distance learning, live conferences, digital wearable technologies, telemedicine. These are all data-hungry applications. **If these markets are to thrive, so will the market for connectivity. By definition, this will extend to European telecom operators, provided they will be able to match a booming demand and adapt to new digital business models.**

b. Boost Measures to Facilitate EU-Wide Access to Digital Content

Telecom operators typically manage their networks in each country on a stand-alone basis, even where the same operator is present in multiple markets. With a truly seamless market for content and services across Europe, they could find it profitable to brand their supply

as 'a door to everything in Europe'. Easy clearance of copyright for cross-border distribution would help film distributors to partner with network operators and sell packages including video streaming on top of Internet data access, calls and SMS, on the same conditions, and across the countries covered. More generally, measures aimed to stimulate portability of digital content across Europe or cross-border access to digital services and goods may have a positive effect on the incentives to provide cross-border connectivity services. So would measures aimed to increase trust and harmonise digital contracts across Europe.

c. Promote Digital Uptake by Private and Public Entities

Promoting e-Government, e-Health and e-Procurement, particularly facilitating cross-border interoperability, can be effective in starting a virtuous circle in which public services are increasingly digital, and citizens find it increasingly natural to rely on them.[24] Against this backdrop, e-Government plans are important for broadband deployment.[25] The European Commission unfolded its new e-Government action plan for 2016-2020 on 19 April 2016. In this context, national and local public administrations could be prompted to design strategies on how they plan to address their connectivity needs in the future, both from the point of view of the local authorities as providers of digital public services and from that of the local community which will need to access these services online.

Likewise, measures to promote the digitisation of business, particularly small and medium-sized enterprises which might be discouraged by high initial fixed costs, can be a key driver for connectivity. If well implemented, the European Commission's Strategy for Digitisation of the Industry (also published on 19 April 2016[26]) can bring significant benefits in that respect.

Tax incentive schemes should be rolled out and promoted everywhere in Europe to encourage companies to buy ICT equipment and invest in connectivity and applications, in addition to what is already done in the context of the European Structural and Investment Funds voucher schemes. A uniform taxation strategy across the EU could help to stimulate ICT adoption across the continent under the umbrella of the broadband deployment / connectivity plan. Other potentially fruitful measures could consist of **demand aggregation policies** to decrease the cost of broadband deployment and mitigate investment risk. The idea would be to coordinate potential demand by customers and increase their bargaining power while at the same time reducing uncertainty for service suppliers. In the UK, for example, potential private customers have been prompted to register online on British Telecom's website and sites

of government-run local agencies to flag their interest in subscribing to broadband services. As part of a demand stimulation strategy, buyers' aggregation could be encouraged by setting up a one-stop-shop portal where buyers would register in partnership with telecom companies. This could facilitate identifying business customers or citizens who need fast-speed connectivity (e.g. a Europe-wide shipping company needing constant connection with its fleet), while mitigating risks for telecom operators.

4. No Need to Invent. Just Learn From the Best

Most of the OECD countries that developed coherent national broadband strategies at an early stage are currently best performing in terms of broadband penetration.[27] The government of the Republic of Korea, for example, has played an active role both on the supply and demand sides with a number of programmes that allowed the market to expand much faster than in other economies. The government extensively supported the deployment of the country's backbone national network with significant amounts of public subsidies and provided incentives to operators to deploy fibre networks.

The government of the Republic of Korea also fully endorsed a pro-competition paradigm: barriers to entry for Internet service providers were lowered; small players entered segments of the markets and exerted fierce competitive pressure on the three major telecom players which responded with aggressive fibre deployment to preserve their market shares. By mid-2000, South Korean users were the first in the world to experience 100Mbps services. South Korea is now among the best performing countries on all parameters of connectivity: broadband penetration, coverage, reliability of connection etc.

Europe also has its success stories. Sweden, Denmark, the Netherlands, Norway and Finland are among the most notable. While every country has its own specificities in terms of market structure, demand and supply characteristics, an effective approach from the EU perspective would **prioritise understanding the reasons underlying success stories and design strategies that could replicate these at EU level**. This approach should combine policy and non-binding decisions with regulatory and more enforceable aspects in order to replicate the regulatory best practices across countries.

The Story of Sweden's Success

A good example is Sweden. On many counts, Sweden is a virtuous 'connectivity' country with high broadband penetration rates, despite adverse geographic conditions, with a relatively small population dispersed on a large territory. What can be learned from Sweden and transposed at EU level?

By the beginning of 2015, the entire territory of Sweden was covered by fixed and wireless broadband, with 76% penetration for Next Generation Access networks. 4G wireless technology reaches 99% of homes. Fibre connection represented 40% of all fixed broadband subscriptions, compared to an EU average of 8%. Sweden has the EU's highest ultrafast broadband (at least 100Mbps) penetration: subscriptions represent 11,2% of the population (with an EU average of only 2% in 2014). Demand for digital services in Sweden is also one of the highest in Europe. Figure 7 below shows that Swedish demand for mobile-to-mobile SIM cards is much higher than in the rest of the world. There are 67 mobile-to-mobile SIM cards per 100 inhabitants while the second in line, New Zealand, has 27 mobile-to-mobile SIM cards per 100 inhabitants and the United States stands at 14.

A peculiarity of the Swedish market is that **a vast number of networks of different sizes has been deployed and managed by municipalities** (approximately 160). Most of them sell access to dark fibre[28] to telecom operators while a significant minority (approximately 35%) of network municipalities supply telecom services themselves.

The involvement of the public sector (through state guarantees and the implementation of public-private partnerships) has been crucial in the Swedish broadband deployment strategy: municipalities tend to lease the provision of service, but with municipal investment ready to take over in case no private operator wants to 'light up' the fibre.[29] In the late 1990s, the city of Stockholm set up a holding company called Stokab that used public loans to buy duct networks and deploy dark fibre connections which it would later lease to private entities with profit. Today, all business and 95% of citizens in the city are connected with fibre optic.

Private companies such as telecom operators or real estate developers can lease dark fibre at low and stable rates from Stokab. Stockholm's far-sighted policy resulted in one of the most vibrant digital ecosystems in the world, a hub for leading ICT companies and a pole of attraction for jobs requiring advanced digital skills.[30] An important element of the Swedish strategy to broadband development (in addition to the heavy direct involvement of the Swedish government) was the **creation of the**

'Swedish Broadband Forum', a body entrusted with the task to involve national, regional and local public authorities and private players to develop consensus-based solutions to meet national connectivity targets. It is believed that Sweden's success in broadband deployment is due to (1) Sweden's very fertile technological environment with world-leading ICT knowledge and competence and (2) a highly decentralised, bottom-up approach, where local and regional authorities took the responsibility for deployment. It is this mix between centralised planning, use of frontier technologies and the primary role of local actors that lies at the root of the Swedish success. Inspired by the Swedish model, an 'EU broadband deployment strategy' could be launched, hinging on the involvement of local and regional authorities in deployment.

Figure 7: Machine to Machine Subscriptions June 2015

Per 100 inhabitants
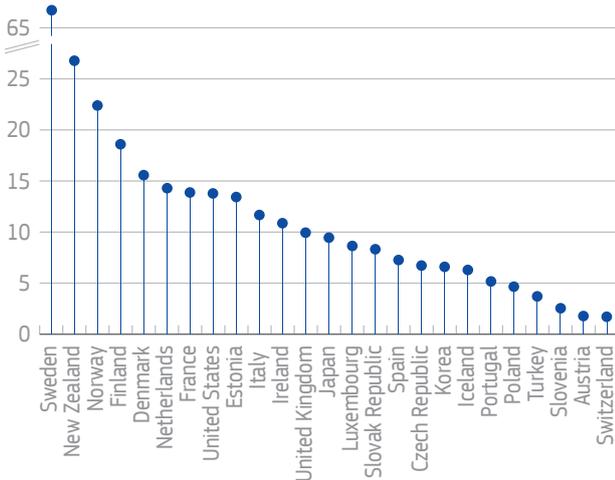
Source: OECD Broadband Statistics

No One-Size-Fits-All

The Swedish approach is not exempt from criticism – Sweden is not performing particularly well in fixed high-speed broadband coverage in rural areas, particularly due to low population density. In addition, the Swedish model entails dealing with complex regulatory issues that have to do with municipal fibre monopolies.

Therefore other models that prove effective should also be closely examined. **France has been a leading country in the launching of co-deployment and co-investment measures** for the roll-out of telecom networks with the help of the European Investment Bank (EIB).[32] In support of France's superfast broadband

plan (*France Très Haut Débit*), Axione Infrastructure and EIB issued for the very first time 'project bonds' with the aim to speed up the mobilisation of private capital for the roll-out of fibre optics in sparsely populated areas. Axione has established a digital infrastructure-sharing industrial platform to be used by all telecommunications operators optimising their investments to serve the country's less densely populated regions. In Italy, ENEL, a leading energy company, proposed to make available its infrastructure for the roll-out of fibre technology in areas 'at risk of a digital divide'.

The fundamental lesson is that the involvement of the public sector not only as a passive cash-lender, but also as an active participant, can be dramatically effective for telecom infrastructure deployment, as it has been in the past for road transport or other utilities.

5. Conclusions

In order to meet Europe's ambitious long-term connectivity goals, speed, reliability and cost of access for end-users should be prioritised to ensure that a thriving downstream digital market can be created. The forthcoming review of the regulatory framework for telecoms should allow Europe to leapfrog in **wireless spectrum management**. In parallel, digital single market policies should **stimulate online service demand** and 'pull' with it supply of fast broadband services. To achieve this objective, the **pro-competition paradigm** should be fully endorsed, pulling down barriers to cross-border data flow, facilitating deployment of new, data-hungry technologies and applications. The provision of **EU-wide content** through measures on copyright or digital contracts should be facilitated. An EU-wide **tax incentive scheme** should be set up to which Member States can adhere if they wish to stimulate digital uptake without infringing state aid rules. Finally, supply-push strategies should be deployed, taking inspiration from **the success stories in international connectivity.**

Notes

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5. Cisco VNI Mobile, Cisco Forecasts 30.6 Exabytes per Month of Mobile Data Traffic by 2020 2016.

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9. EU Guidelines for the application of State aid rules in relation to the rapid deployment of broadband networks, (2013/C 25/01), '*the highest broadband coverage and take-up is found in Member States with infrastructure competition, combined with effective ex ante regulation to promote service competition*', available at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2013:025:0001:0026:EN:PDF

10. http://ec.europa.eu/growth/images/features/8188b.jpg

11. http://m.welt.de/wirtschaft/webwelt/article153291879/Deutsche-Firmen-nutzen-eher-das-Fax-als-Social-Media.html

12. Julio, Brandon, and Youngsuk Yook, 'Policy uncertainty, irreversibility, and cross-border flows of capital', *Irreversibility, and Cross-Border Flows of Capital*, 2014.

13. Julio and Yook investigated the relationship between cross-border capital flows and political uncertainty in host economies. They found that the capital flow from US companies towards their foreign affiliates drops by 12 percent during election years in host economies.

14. http://www.netmanias.com/en/post/blog/7335/5g-kt/key-parameters-for-5g-mobile-communications-itu-r-wp-5d-standardization-status

15. On February 6th, the Commission presented a proposal to coordinate the use of the 700 MHz band for mobile services. This will improve Internet access for all Europeans and help develop cross-border applications. http://europa.eu/rapid/press-release_IP-16-207_en.htm

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17. Grzybowski, Lukasz, and Verboven, Frank, 'Substitution between fixed-line and mobile access: the role of complementarities', *Journal of Regulatory Economics*, 2014.

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