# THE CONNECTIVITY DIVIDEND:

How next-generation connectivity can define the EU's ability to compete, innovate, and preserve its way of life

## 1. SUMMARY

Europe is falling behind in the race for digital leadership. Across most metrics, it now trails the world's leading nations, including in adoption of cloud, AI, IoT and 5G standalone (5G SA). While the US and China surge ahead with next-generation networks, just 2% of Europeans currently enjoy continuous access to 5G SA, the most powerful mobile technology.[1] Such digital technologies and services – enabled by modern connectivity infrastructure – are the foundation of the future economy, enabling businesses to compete, public services to modernise and rural regions to thrive. Its digital shortfall undermines the EU's growth, sovereignty and way of life. Decisive action is now required to avoid the risk that our continent falls further behind – not only economically, but socially and geopolitically.

Europe's laggard position in digital services and infrastructure has coincided with the fading of its competitive edge. Across most of our continent, productivity growth is stagnating and innovation is underperforming. Between 2019 and 2024, eurozone productivity grew just 0.9%, compared to 6.7% in the US.[2] And while Europe's universities and researchers often excel, too few of their innovations reach the market. In 2023, the European Patent Office submitted 199,429 applications to the World Intellectual Property Office; the US sent almost three times this figure and China applied for over eight times more.[3]

Digital is one of the most powerful levers for change. By unleashing the power of the industrial internet, it enables smarter factories, more efficient public services and stronger small businesses. Firms that embrace digital tools grow faster, pay better and export more. Advanced technologies – from AI to biotech – rely on robust digital infrastructure to scale.

But they cannot do so without high-speed, reliable networks. No modern economy can thrive on yesterday's networks. Yet today, most member states have no 5G SA at all and though intangible, connectivity must be treated as strategic infrastructure no less vital than energy or transport. The costs of inaction are already clear. In one example between 2005 and 2022, Europe's ICT investment trailed the US by €1.16 trillion.[6] It is no wonder that Europe has become a net importer of digital innovations and, with that, of strategic dependency.

But Europe still has a choice. By prioritising digital infrastructure and unlocking the emerging technologies and industrial applications that depend on it, we can recover technological leadership – just as we did with GSM three decades ago. Unlike older networks, 5G SA is purpose-built for the next wave of innovation: powering smart manufacturing, enabling AI and automation, transforming healthcare, transport and education. Crucially, it is a platform for small businesses – the backbone of Europe's economy that provide two thirds of employment – to digitalise and grow.[4]

The returns for the EU are compelling: a full rollout of 5G would add €164 billion to GDP by 2030 – a 5-to-1 return on investment for the wider economy and greater than the European steel industry's gross value-addition; digitalised SMEs see 26% higher revenues and, if all of Europe's were digitised, it could provide an annual boost of €628 billion; and fully realising the Digital Decade could add €1 trillion to the economy.[5]

The digital highways we build today will shape Europe's competitiveness, resilience and cohesion for decades to come. To regain our leadership role in digital technologies and connectivity, we have three priorities.

## First, invest for innovation

Waiting until demand is 'proven' means waiting too long. Korea, the US and China are unlocking innovation through early deployment of 5G SA and already reaping the returns. Europe must match that ambition, shake off complacency and regain its passion for innovation. It's about the future, not the present.

## Second, treat connectivity as strategic infrastructure

Roads, railways and bridges remain priorities, but digital infrastructure is just as vital and just as economically transformative. Recent events, such as Storm Éowyn, have underscored the importance of resilient telecommunications infrastructure to individuals, businesses and government. The functioning of our economy and society relies on fast and secure communication networks.

Governments must put digital networks at the heart of national investment and treat connectivity as a core pillar of economic, societal and regional growth. Where market failures happen, governments step in.

## Third, fix the rules

Europe's telecoms framework is 20 years old. It was designed for voice calls, not AI-powered supply chains and applications. Policies and regulation need to prioritise investment, scale and high quality networks, in both the medium and long terms. The Digital Networks Act is a critical opportunity for modernisation.

# 2. INTRODUCTION

Europe has a long tradition of building transformative infrastructure. From the railways of the 19th century to the GSM standard in the 1990s, the continent has shown what is possible when political vision aligns with technological ambition. That tradition must be revived.

Digital connectivity is now the defining infrastructure of the modern era. It drives economic growth, underpins critical services, and helps societies adapt to major transitions – from decarbonisation to demographic change. It also enables the tools that will shape the next industrial revolution: AI, data analytics, smart logistics and cloud platforms.

Yet for over a decade, Europe has steadily fallen behind. Its firms account for only 7% of global R&D spending in software and internet technologies, compared to 71% by their US counterparts and 15% in China.7 This is not simply a lag in spending. It reflects a deeper failure to treat digital – and the connectivity infrastructure hat underpins it – as a strategic priority, with real consequences for jobs, prosperity and sovereignty.

The rollout of 5G standalone (5G SA) is Europe's opportunity to reverse this decline. Unlike earlier iterations of mobile technology, 5G SA does not rely on legacy 4G networks. It is purpose-built to deliver the speed, reliability and low latency required by today's most advanced applications – from smart manufacturing and telemedicine to AI-enabled transport systems.

Yet deployment remains patchy. Only 2% of Europeans currently enjoy continuous access to 5G SA, compared to 24% in the US and 80% in China.8 That gap is growing, and its impact is compounding.

The challenge now is clear: Europe must modernise the foundations of its digital economy or risk being left behind. Productivity and innovation – the twin engines of sustainable growth – depend on it.

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# 3. THE COMPETITIVENESS GAP: PRODUCTIVITY, INNOVATION AND THE ROLE OF DIGITALISATION

**Europe has much to be proud of. It is home to world-class universities, skilled workforces and leading researchers.** It offers strong public services, high environmental standards and a quality of life that attracts families, entrepreneurs and investors alike. But none of this is guaranteed.

At the heart of Europe's model lies a basic equation: a strong social contract depends on a strong economic base. Today, that base is eroding. Productivity growth is stagnating, innovation is losing ground, and the foundations of Europe's future prosperity are under threat.

## Productivity: the missing multiplier

Struggling since at least the mid-1990s, productivity growth in the eurozone has slowed dramatically in recent years. Between 2010 and 2023, US productivity rose 22%, but 5% in the eurozone.[9] And the most recent data show eurozone productivity grew 0.9% between 2019 and 2024, versus 6.7% in the US.[10]

This is not a new trend, but it is accelerating, and the consequences are growing more severe. As Mario Draghi warned in 2024, Europe's ageing populations and shrinking workforces mean productivity growth is no longer optional. It is the only viable path to sustaining public services and economic resilience.

Digitalisation is the most powerful lever available. Yet the EU trails the US by about ten percentage points in companies' basic digital uptake. According to the European Investment Bank, digitally advanced firms are more productive, more innovative and more likely to grow into exporters.[11] They also pay higher wages and generate stronger tax bases.

But digitalisation depends on infrastructure. Without gigabit connectivity and 5G SA, key productivity tools – from automation and real-time data to cloud platforms – remain out of reach for many firms, particularly Europe's 23 million SMEs. While Ireland's level of SME digitalisation is above the EU average, growth has been stagnating since 2022. These are not optional extras. They are the basic tools of a modern economy.

The demographic imperative makes this even more urgent. With fewer working-age citizens, Europe must get more output from each worker. Without a significant uplift in productivity, governments face an impossible trilemma: cut public services, raise taxes or increase debt. Better digital infrastructure is the only option that avoids all three. Ultimately, fixing productivity growth is essential to maintaining the social contract that citizens have enjoyed since the end of the Second World War.

## Innovation: Europe's underpowered engine

Europe's innovation gap is just as concerning. The EU produces high-quality research but struggles to translate ideas into commercial value. It lags in patent filings, venture capital and high-growth scale-ups. It has become a net importer of digital innovation. Indeed, large US companies devoted about €700 billion

more to capital and R&D spending than their European peers in 2022.[12] And whereas Europe accounts for about 5 % of global patent filings, the US share is roughly 15 % and China's is around 80 %.[13] Worse still, Europe's venture capital assets under management are equivalent to only 25% of those in the US.[14]

This matters. Without homegrown technological capacity, Europe becomes reliant on others for critical platforms – from cloud services to defence systems. Sovereignty starts with innovation.

Again, connectivity is key. AI, high-performance computing, digital twins and cloud-based collaboration all depend on robust digital networks. Without them, Europe's innovators are held back, unable to scale or compete globally. Advanced AI increasingly relies on high-speed, low-latency networks like 5G SA to operate in real time.

The issue is not sectoral. From biotech to precision agriculture, smart logistics to manufacturing automation, the same pattern holds: infrastructure either enables innovation or constrains it. The next big breakthrough might emerge in an unlikely place, but it will not come from one that's offline. Governments cannot design innovation, but they can build the foundations on which it depends.

Connectivity alone is not sufficient, but it is essential. Europe must recognise digital infrastructure as the enabling layer beneath both productivity and innovation. It is the multiplier. Without it, none of the EU's other ambitions are achievable.

# 4. 5G SA – WHAT'S THE DIFFERENCE?

**4G networks, launched in the late 2000s, were built to meet the needs of smartphone users and deliver high-speed mobile internet.** But in today's world of cloud computing and AI, machines increasingly need secure, fast, reliable connectivity. This is where 5G SA comes in.

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5G SA connects all parts of the digital chain – from subsea cables to streetlights, satellites to bus stops. If 4G was built for smartphones, 5G SA is built for everything else. Consider the possibilities 5G SA offers across three sectors:

## A. Medicine.

5G SA supports real-time surgery, remote diagnostics, ambulance-to-hospital data transfer and virtual consultations. Network slicing ensures bandwidth and low latency for life-saving services while keeping sensitive data secure.

## B. Manufacturing.

5G SA enables real-time links between robots, sensors and machines. It supports drones for maintenance and slicing for ultra-reliable remote control, even offshore. In Australia's Cadia mine, 5G replaced Wi-Fi to enable remote vehicle operations, improving safety and boosting productivity.15 McKinsey estimates connected factories using 5G and edge computing can reduce machine downtime by up to 50% and extend equipment life by 40%.[16]

## C. Transport.

5G SA is the backbone for autonomous vehicles, smart traffic and remote port operations. The EU could roll out 5G SA across key transport corridors for under 5% of its annual transport infrastructure budget. In Saudi Arabia, 5G SA powers smart port maintenance and container management; China's Zhangjiagang Port saw a 12.8% productivity boost and 10% cut in energy costs after its adoption.[17]

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**Early 5G – non-standalone (NSA) – was built on top of 4G. In contrast, 5G SA runs on purpose-built infrastructure. The outcome is lower latency, vital for medicine and mobility, and greater reliability for energy grids and logistics**

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# 5. THE SCALE OF THE OPPORTUNITY

**It's no secret that Europe's economic security is under growing pressure.** Annual growth, once near 4%, is now a trickle at 1%. In 2008, the European economy was 10% larger than that of the US but by 2022, it was 23% smaller.[18] Creating the right conditions for large investments in 5G SA is critical to reversing this trend of relative decline, and it lies in our hands.

But it cannot be done without business growth. Europe's economic backbone is SMEs, representing 99% of businesses and two-thirds of employment.[19] SMEs have fantastic growth potential but are especially vulnerable to the consequences of inadequate digital infrastructure. Their productivity trails larger companies by around 26%, mainly due to insufficient digitalisation.[20] Unlike multinationals that can afford private networks, SMEs depend on public connectivity as part of their need to digitalise and innovate.

In the UK, 5G SA has the potential to bring up to €10 billion a year in productivity for SMEs alone.[21] Again, this productivity lag is a number that can be reduced by a widespread rollout. As Mario Draghi, in his landmark 2024 report about EU competitiveness, said, 'connectivity, and particularly digital infrastructure, is the foundational layer for Europe's productivity renaissance'.

Beyond this, Europe has specific imbalances that 5G SA can address. It can help rebalance the urban-rural divide and address the rural depopulation that is particularly pronounced in southern and eastern Europe. Rural Europe is home to 20% of citizens but only 14% of GDP, but innovations such as precision agriculture or smart energy management can reverse decades of relative decline and underinvestment.[22] Remote monitoring makes the farmer's job easier, increasing yields, reducing crop losses, decreasing fertiliser and water use, and improving livestock management. Urban Europeans enjoy GDP per capita 1.6 times greater than their rural counterparts.[23] Without better connectivity, this gap will only widen, undermining Europe's cohesion and potential.

Beyond the agricultural sector, 5G SA can make remote work and training viable in rural regions, creating new employment opportunities and reversing decline. In fact, transforming the agriculture sector via digital technologies and 5G connectivity could mean a €45 billion increase in EU GDP.[24]

5G SA can also deliver a much-needed boost to public services. Alongside enabling telemedicine that was previously unthinkable, full digitalisation – only achievable through 5G SA – could deliver €120 billion in annual healthcare savings across the EU, equivalent to Spain's entire healthcare budget.[25]

Finally, 5G SA is integral to delivering smart cities. Many European cities – based on foundations that stretch back centuries, if not millennia – have found balancing heritage and modernity particularly challenging. 5G SA enables real-time traffic management, improving air quality by 8-15%, and smart waste management that reduces a household's water use by 25-80 litres each day.[26]

The consequences of inaction are just as significant as the benefits of investment. Europe is already woefully behind its competitors in the rollout and protection of critical connectivity infrastructure. Without a rapid change of direction, the gulf will continue to widen with large scale investment, innovative new industries and quality jobs drawn to the US and China rather than Europe.

Sovereignty will remain a pipedream if the cutting-edge technologies central to the future of our economies and security are developed overseas and imported by Europe. If we fail to rapidly correct our connectivity infrastructure policy failures, then we are only embracing Europe's long-term decline.

# 6. WHAT'S HOLDING US BACK AND WHAT ARE THE SOLUTIONS?

**For those that see in Europe only managed decline, telecommunications is a powerful example.** From leading the pack in the early 1990s, Europe is, regrettably, far behind its competitors. Legacy EU policy fragmentation and lack of vision from individual governments have hindered the necessary investment.

A step change in energy is needed. At EU institutional level, the current regulatory environment was put in place over two decades ago and needs alignment with modern needs. A pro-investment approach to EU spectrum and competition policy is vital. The Digital Networks Act, set to be unveiled by the European Commission in December, provides an opportunity to correct course.

But decisive action taken by member states matters too, and this is where there is room for real leadership.

**First,** governments must support investment ahead of demand – they must worry more about the next generation, 5G SA, than catching up with legacy 5G NSA. That is what Europe's competitors do. Korea, China and the US are surging ahead with 5G SA infrastructure, giving their companies space and certainty in which to innovate and helping these economies build massive strategic advantage. The geopolitical element to this is hard to ignore, as noted by the European Commission's Competitiveness Compass that calls for 'building the infrastructure of the future to preserve the EU's global influence'.

**Second,** governments should pull out all the stops to remove barriers to deployment. An activist approach is good if it generates growth. In most instances this is not about money, but about dismantling the many unnecessary obstacles that still frustrate investment by the private sector, from artificial spectrum scarcity to imposing subscale operators, burdensome approvals or restrictive permitting. In a few cases, given the quantum of growth this stands to unlock, carefully designed fiscal stimuli would more than pay for themselves and lead to better partnerships with an industry that is ready to make significant investments.

**Third,** governments must take a coherent and aligned approach to the overriding objective of investment competition. Three policies should be modernised to fit this ambition: spectrum, scale and 'same services, same rules'. Spectrum policy should create investment certainty for a longer period and incentivise deployment. Operators also need scale to run much more efficient networks with a lower unitary cost, releasing capital constraints for network upgrades and improved coverage. And across Europe, 'same services, same rules' should apply, creating a digital single market that allows operators to monetise infrastructure with the same chances to innovate, diversify and compete as other companies that offer similar services.

**Finally,** governments should create the right ethos for digital investment. Very often, political leaders talk about infrastructure purely in the form of built infrastructure. Big, visible infrastructure projects tend to dominate public and government attention as a new road or upgraded rail network can be easily seen and understood. But it is the invisible infrastructure of digital connectivity that will be the key to unlocking economic growth and – more importantly – productivity in the coming decades.

# 7. CONCLUSION

Europe remains one of the best places in the world to live and work. For this to continue for generations to come, Europe needs to stop resting on its laurels.

Mobile connectivity is a case in point. Europe led the 2G and 3G revolution, and remains home to some of the world's best, most innovative mobile operators and equipment vendors. But the US seized the advantage with 4G, and Europe continues to trail far behind 5G pioneers like China or Korea. It's even worse for 5G SA.

Yet poor connections act as a drag on growth, lead to economic underperformance and prevent citizens and businesses from fulfilling their aspirations. It makes for a worse quality of life for patients who cannot access world-class healthcare, farmers who struggle to make their land profitable, or for entrepreneurs who find their competitors outside Europe can provide a much more efficient product. For without sustained economic success, governments will struggle to afford the European way of life that citizens expect. It will only grow harder as declining innovation and productivity growth take an ever greater toll on the EU's global competitiveness.

We cannot continue to sit by and let this happen. Very often, political leadership is about making difficult decisions. Paving the way for private investments in a sector that stands to deliver this quantum of growth should be a relatively straightforward policy decision. The returns for the EU are compelling: a full rollout of 5G would add €164 billion to GDP by 2030 – a 5-to-1 return on investment for the wider economy; digitalised SMEs see 26% higher revenues and could provide an annual boost of €628 billion; and fully realising the Digital Decade could add €1 trillion to the economy.

Falling behind in digital connectivity should be taken as seriously as falling behind in defence or energy. You might not be able to touch it, but connectivity is a pillar of Europe's economic resilience and geopolitical sovereignty. Our digital complacency must end.

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