

Pursuing Success for 5G in the EU: Balancing Policy Options

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I. Introduction

The fifth generation (5G) is the new global standard for the mobile network that is capable to connect not only people but also machines, devices and objects. It cannot be considered simply as an advancement with respect to the previous mobile technologies (Suryanegara, 2016). This is because in addition to features that are expected to introduce incremental changes (i.e. increased speed and lower latency in data transmission), 5G has also other features which will enable the introduction of radical changes that will improve the interactions between machines (even without the direct human agency) and will increase the relevance of edge computing (Ren et al., 2019). Due to all its new features, 5G technology is expected to enable digitalization in many areas, and thus will influence a broad spectrum of sectors (Cave, 2018, Campbell et al., 2017; Rao et al., 2018). In fact, the success of the Internet of Things (IoT), often called the next Industrial Revolution, strongly relies on the development and implementation of 5G technology.

The economic impact of 5G is expected to be enormous. According to one recent estimate, by 2026 there will be up to 26 billion connected devices (Ericsson, 2021). The roll-out of 5G is projected to produce up to €2.0 trillion in sales growth and add up to 20 million jobs across all sectors of the economy between 2021 and 2025 (Accenture, 2021). Given these estimates, and all the features of the new generation of mobile networks, it seems clear that the expected changes will spill over well beyond the telecommunications industry (Cave, 2018). While it is not yet clear in which sectors 5G will produce major impact, as with all the previous generations, the fields covered and the new applications will show up autonomously through the growing use of the technology and will surely cover more areas than expected (Campbell et al., 2017).

Considering the wide range of fields of applications, the expected worldwide diffusion, and the large-scale adoption, 5G may present the potential to become the first mobile technology to emerge as a General-Purpose-Technology (GPT), acquiring a standing, maybe not comparable, but in the category of momentum innovations similar to personal computers or the Internet.¹ A technology can be defined as a GPT when it shows three main features: it must be so diffused that it is present across most sectors of the economy, it should be an enabler of new processes of innovations, and it should be characterised by a fast evolution (Bresnahan and Trajtenberg, 1995; Knieps and Bauer, 2021). The emergence of 5G as a GPT is crucially connected to its diffusion which in turn depends on its adoption as a new universal standard. In this respect, the standard setting institutions will play a pivotal role in favouring and fostering 5G worldwide diffusion.

¹ The innovation process, as explained by Etzkowitz and Ranga (2013), is very complex and it involves the interactions of a set of interdependent actors - universities, industry and government - which the authors call a 'triple helix'. Under the neoclassical laissez faire approach, market forces determine whether and where to make investment. However, such an approach entails the risk of losing technological leadership in areas of strategic importance. For instance, McIvor *et al* (xxx) discuss how the US global influence in telecommunications has shrunk once the US governments stopped funding certain areas of science and innovation.

The overall success of 5G, however, depends on and will be defined by the balancing of different policy instruments: not only pro-competitive sectoral regulation and competition policy which have been traditionally associated with shaping the market dynamics in the telecommunications sector, but also industrial and security policy. Considering that many suggest that 5G could become a GPT, it is important to examine the impact that this could have on the industrial assets of the telecommunication sector at the European level and, viceversa, how well this industry is ready to invest in the new technology. This reflection is extremely timely as huge investments in infrastructures will be required in the telecommunication industry and in other sectors that will be mostly affected by this new technology. Accordingly, the remaining part of this note will focus on the relevance of industrial and competition policies (including pro-competitive telecom regulation) and the interaction between them. While concerns about the impact of industrial policy on competition policy and vice versa is not new, the current economic and geopolitical situation calls for its re-examination.

This contribution, in section II, analyses the current state of deployment of 5G in the EU in an effort to identify some of the obstacles that explain slow progress made so far. Next, section III focuses on consolidation in the telecom sector that could help European telecom operators gain scale and the issues this raises under the competition policy. Section IV confronts the competition concerns of section III with industrial policy, while the brief conclusion suggests a strategic rethinking of the policies promoting 5G deployment in Europe and the interaction between them.

II. The slow deployment of 5G in the EU

The 5G Action Plan, launched by the Commission to boost the deployment of 5G in the European Union, has undoubtedly set ambitious plans.² These have become even more ambitious with the 2030 Digital Compass (COM 2021 118, final) which has set the 2030 as a deadline for 5G coverage in all populated areas. However, according to several analysis (GSMA X, Court of Auditors, 2022), Member States (MS) are lagging behind with 5G implementation and are at risk of failing both 2025 and 2030 targets.

According to the last Quarterly Report produced by the 5G Observatory (#14 that covers developments up to January 2022), with the first commercial 5G service launched in Lithuania in January 2022, the target of having fully commercial 5G services in at least one major city by the end of 2020 is now completed for all EU-27.³ However, this data might be misleading as the lack of clarity on the expected quality of services (in terms of

² Launch of early 5G networks by the end of 2018, fully commercial 5G services in at least one major city by end of 2020 and uninterrupted coverage in urban cities and along main transport routes by 2030.

³ https://5gobservatory.eu/wp-content/uploads/2022/02/5G-Obs-PhaseIII_Quarterly-report-14_FINAL-Clean-for-publication_16022022.pdf

minimum speed and maximum capacity) creates the risk of different interpretations among MS which in turn could lead to inequalities in 5G services in the EU (see Special Report of the European Courts of Auditors, 2022). So far, only Germany and Greece out of the 27 MS have created specific definitions for the quality of 5G services.

The two main levers aimed at accelerating deployment are spectrum and infrastructure-related policies. With respect to spectrum assignment, due to the pandemic that blocked 5G auctions, progress has been quite slow: the objectives set for the three pioneer bands in the 5G Action Plan have not yet been achieved in all Member States (5G Observatory). Moreover, many observers have commented that average spectrum prices have trended upwards in Europe, and a recent survey of EU auctions (Kus and Massaro, 2021) has shown significant differences in reserve prices. High reserve prices might make it more difficult for new players to enter the market and, above all, as stated by MNOs globally, could mean less resources to invest in 5G deployment and therefore delays for 5G network roll-out.

With respect to infrastructures, 5G networks are expensive to deploy and face a sort of chicken-or-egg problem: the demand that would be sufficient to justify the large investments required cannot be taken for granted because in many cases cutting-edge 5G services and applications are not yet widely available (US National Strategy 2021).

The architecture of 5G, if compared with previous mobile generations, requires a significant network “densification”, that is many more cellular base stations, each of which will provide connectivity over a much smaller coverage area, or “small cells”. In this respect, the more subscribers can use a base station, the easier it is to repay its cost of deployment: countries with different sizes of population and different distributions on the territory face very different challenges in the deployment. More specifically, according to the evaluation of the European 5G Observatory, the largest countries (e.g., Finland, Germany, Spain, Romania), those with a dispersed urban population (e.g., Belgium) or with a small population (e.g., Slovakia, Hungary, Slovenia, Estonia, Luxembourg) will face more difficulties. As a result, 5G coverage (as % of populated areas) is quite diverse among the MS: while it is almost 50% for EU27, there are significant differences among MS, with countries where the indicator is still 0% (EU Observatory).

In comparison to the U.S and Asian counterparts, European telecommunications operators face challenges with respect to a timely and effective deployment because of specific market dynamics that reduce investments. Besides what has been decried by the operators in the region as excessive EU regulation (ETNO 2022), European operators come from years of a steady decline of their revenues in fixed and mobile services,⁴ which

4 Prices and spends in digital communications services in Europe remain extremely low in comparison with other regions of the world, as reflected in the long term trend of low ARPU (ETNO 2022).

in turn puts under pressure their investment capacity. Even if with respect to the revenues European operators are still heavy investors, given the intense price competition, their capital expenditure is low compared to the competitors.

It needs to be considered that worldwide in the countries where the situation is more advanced, rollouts have been driven less by consumer demand, which remains limited, and more by government ambitions. For example, the South Korean government played an essential role in the development of 5G, setting up a detailed time plan on 5G deployment and commercialization and guaranteeing consistent public investments. In particular, the government prepared a deployment model that helped the three major Korean telcos to achieve faster deployment and split the deployment costs. As for China, in the last decade it has adopted an explicit policy aimed at supporting the country's telecommunications operators in moving quickly to stand alone 5G in order to enable widespread use of IoT applications and upgrades to advanced manufacturing. Thanks to a strong government's guidance and control, with focused government investment into technology research and development, Chinese industry has been able to benefit from the economies of scale in its home market, which is also effectively protected from foreign competitors. In the US, in January 2021, the National Telecommunications and Information Administration (NTIA) released the long-awaited National Strategy to Secure 5G Implementation Plan, a government-wide plan to promote the development and deployment of secure and resilient fifth generation (5G) wireless communications infrastructure. The Plan builds on the "Secure 5G and Beyond Act", signed into law by President Trump in March 2020 and differs from earlier strategies because it lists specific actions the federal government will take in four identified "lines of effort", the first of which is "Facilitate Domestic 5G Rollout". This plan results from the growing and bipartisan support for the promotion of an industrial policy regarding the planning of 5G which is based on the widespread conviction that a successful deployment of 5G, as well as sustained wireless innovation beyond 5G, are opportunities of national importance.

Strong state support for the development and deployment of 5G certainly sends an important signal to the market and to private investors. The investment challenge in 5G and in very high capacity networks (VHCNs) more in general is quite complex. New infrastructures that requires heavy investments will have to co-exist with legacy networks with which they may compete. Also, investment in the telecoms sector is a multi-round game as, in contrast to infrastructure building in sectors such as water or gas, telecom infrastructure is subject to a regular and rapid innovation cycle, which means that infrastructure which itself may have been deployed not so long ago may need to be replaced or upgraded. For investors this means that subsequent rounds of investment will be needed. However, a potential investor will evaluate the prospective returns on investing in telecom infrastructure in Europe versus other available options. Unfortunately, the past experience shows that returns generated by the European telecom market have underperformed in comparison to other sectors in the same region or to the

same sector globally (Williamson and Howard, 2022). Last but not least, as mentioned earlier, consumers' willingness to pay for higher speed, and hence demand for VHCN, including 5G, may be uncertain and weak, which further increases investment risk.⁵

III. Consolidation in the telecoms sector and the EU competition policy

Quite surprisingly, despite its enormous potential, 5G is still considered as an uncertain business case: the deployment of 5G and the launch of commercial offers require not only the availability of a suitable amount of spectrum, but also substantial investment. However, network operators will not invest or will invest below the optimal level if the business case for 5G is weak, demand insufficient and regulatory conditions unfavourable.

The case for investment needs to be considered in the context of the prevailing industry/market structure, which is still very fragmented as telecommunications markets in Europe remain national in scope. Most EU countries are dominated by a handful, mostly three to four mobile network operators (MNOs). This means that they tend to be highly concentrated, with HHI in excess of 2500 in most developed countries (Queder et al, 2020). Some of the factors that are most often cited as an explanation for the consolidation in the telecom sector include: (1) economies of scale and scope; (2) network effects; (3) sunk fixed costs; (4) economic or technical uncertainty; (5) first mover advantages; (6) scarcity of resources such as spectrum; and (7) regulations that might have distorted competition (such as measures concerning access to scarce resources).

The quest for scale is hence one of the factors that has driven consolidation in the sector. Geographically speaking, consolidation can take place within one country or across the borders. In-country consolidation, however, has been facing important hurdles as 4 to 3 mergers in the mobile industry have been seen with skepticism by the Commission. Since 2006, the Commission has reviewed ten in-country mergers. Eight of them have led to a 4 to 3 consolidation, and almost all of these followed a lengthy Phase II investigation. Most of the transactions have been cleared subject to remedies (see for example *H3G Austria/Orange AT* (2012), *H3G/Telefonica DE* (2014), *Telefonica DE/E-Plus* (2014)). However, *Three/O2* in the UK have been blocked while *Telia/Telenor* (2015) in Denmark has been abandoned. The last two transactions have arguably deterred telcos from pursuing further consolidation. This, however, may change as recently the General Court has annulled the Commission's decision blocking the *Three/O2* merger.⁶ Even if

⁵ In fact, declining ARPU could signal, among others, that consumers have reached their limit as to what they are willing to pay for ever-increasing speeds and capacity.

⁶ The Court was primarily concerned that the Commission had relied on arguments that would seem to apply to any 4 to 3 merger, effectively creating a structural presumption that would dispense with the need to identify any case-specific factors. Also, the Court's ruling makes it clear that, in contrast to the Commission's expectations, the standard of proof is higher for the Commission on prohibition cases than in cases permitting mergers.

European telcos were to start seeking again further in-country consolidation, it has to be noted that countries where 4 to 3 mergers have already taken place, are unlikely to see further consolidation. This means that mergers among the mobile operators in the 5G era could be expected only in around 10 countries that still have at least four operators.

In addition to in-country consolidation, telecom operators could also pursue consolidation across the borders. While such an option has been frequently discussed in the past, due to the comparative small scale of EU operators vis-à-vis American or Chinese ones, it wasn't actively pursued. Lack of attempts at cross-border consolidation may seem to be surprising considering that even Commission Vestager has urged companies to pursue more cross-border takeovers.⁷ However, while creating large European telcos would allow merging parties to reach higher scale, it would also entail a number of not insignificant hurdles. Certainly, creating pan-European telecom operators would involve a complex decision-making process that may be too slow for a very fast-moving sector. Also, there is a question whether incentives to merge on EU-scale are actually sufficient. Heterogenous consumers across the countries, present differences in infrastructure and spectrum allocations (particularly relevant in the context of mobile, and hence 5G markets), different tax and labour regulations may significantly diminish potential economies of scale and scope.

Whether we consider future in-country or cross-border consolidation, some recent cases seem to suggest that a merger's impact on the ability of MNOs to invest and innovate may gain a more prominent role. Two recent 4 to 3, albeit non EU, mergers (*T-Mobile/Sprint* in the US and *VHA/TPG* in Australia) have dealt precisely with the issue of 5G network investment. In both cases it was asserted that the merged entity would have increased ability to invest, which in turn would allow a faster deployment of 5G networks.⁸ Also, the EU General Court's in its judgment that annulled the Commission's decision blocking the *Three/O2* merger, accepted that higher concentration does positively correlate not only to higher prices, but possibly also to higher levels of investment".⁹

As an alternative to mergers, operators can pursue scale through network sharing, which, at least in theory, could face a less demanding review and clearance procedure.

⁷ Commissioner Vestager said: "We would not consider that to be controversial if European businesses consolidate", and "In some sectors, there is indeed room for consolidations cross-border, I think the telco sector in particular, because here we still have very national markets".

⁸ The *T-Mobile/Sprint* merger, was approved by the U.S Department of Justice and the FCC in 2019, as, among others, the transaction would "facilitate the expeditious deployment of multiple high-quality 5G networks for the benefit of American consumers and entrepreneurs". In Australia, the ACCC intended to oppose the *VHA/TPG* merger. However, VHA asked a court to declare that the proposed transaction would not substantially lessen competition, The court found in favour of VHA stating, among others: "MergeCo's ability to invest additional capex in its network will enable it to offer high-quality 5G services to customers far sooner than Vodafone or TPG would be able to do alone. In doing so, MergeCo will have the opportunity to become a more effective competitive constraint on Telstra and Optus".

⁹ Para. 281: "...it is apparent from the evidence submitted during the administrative procedure that, while a positive correlation may be established between concentrations which reduce the number of operators in the mobile telecommunications sector from four to three and result in price increases, a correlation may also be established between those concentrations and an increase in network investments by mobile network operators.

Network-sharing agreements are, in fact, the most common response to effective and cost-reduced deployment and to investment risks mitigation, with the amount of savings being dependent on factors such as the type of sharing (passive or active), the technology and the geographical coverage. As the ideal time to implement network sharing is just prior to the deployment of a new technology, we can expect to see an increase of such agreements as 5G technology is being rolled-out. Considering that such agreements are likely to anyway attract regulatory scrutiny from the European Commission as well as national competition and possibly also regulatory authorities, it would be of utmost importance to ensure that such scrutiny provides predictable guidance and is coherent with EU's policy aimed at deploying VHCNs. In that regard, it should be pointed out that most network sharing agreements have been approved, even if concerns about the potential anti-competitive effects of the cooperation among competitors have been raised (see, as an example, the merger investigation on the joint venture INWIT between Telecom Italia and Vodafone).¹⁰ However, the Commission's Statement of Objections (SO) issued in August 2019 against T-Mobile CETIN and O2's NSA in the Czech Republic involving 2G, 3G and 4G technologies seems to be troubling. As Geradin and Karanikioti (2020) point out that Commission's press release announcing the SO states that the Commission's analysis "is without prejudice to any future assessment of network agreements involving emerging technologies such as 5G, which may have very different characteristic". However, as the authors rightly point out, in the initial phase, in which network sharing agreements can be expected to be popular, 5G will be developed on top of 4G networks. Hence, the Commission analysis in that case might have a direct impact on 5G deployment, with the risk that mobile operators might implement sub-optimal sharing arrangements in order to avoid or limit antitrust scrutiny.

In this regard, it is also important to note that the new European Electronic Communication Code has introduced an innovative Article 76 to foster co-investment with the explicit purpose to favor a quicker deployment of VHCNs in the EU.¹¹ Its concrete effects and the extent of any potential contrasts with competition law assessments of the co-investment agreements among competitors is still too early to evaluate.

IV. Ensuring a competitive European telecom sector through consolidation: is there a need for an EU industrial policy on 5G networks?

As mentioned in the introduction, the success of 5G depends on the right balancing and alignment of different EU policies. While competition rules are not the only instrument to deal with all 5G-related challenges, they should also be enforced in a manner that either supports, or at least does not weaken the effectiveness of other measures. Considering that 5G has the potential to become a GPT, that its deployment and take up in the EU lags

¹⁰ https://ec.europa.eu/commission/presscorner/detail/en/IP_20_414

¹¹ Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code, O.J. [2018], L 321/36.

quite behind the US and China, and that 5G also raises serious security concerns, it seems legitimate to ask if a more proactive and holistic policy at the EU level in this field could help overcome existing obstacles. In particular, the question is whether a more proactive EU industrial policy could act a right trigger, and if so whether and how it could be better aligned with the traditional EU competition policy.

Over the last decade, the economic and political context in which competition law has been applied and enforced has changed significantly. Due to the challenges posed by the financial crisis and ongoing COVID-19 pandemic, industrial policy has started regaining its relevance, raising questions about its impact on the application of competition policy and the need to make its enforcement more flexible. Prior to the financial crisis of 2007, there was a widely spread consensus that competition policy was the most apt instrument to ensure that competitive markets would deliver what consumers looked for. In parallel, there was a strong conviction that the protection of or attempts to create national champions through government intervention was not only undesirable but also seriously inefficient. However, as these views have evolved recently quite significantly, skepticism towards industrial policy has started diminishing, and the question has emerged “whether the EU’s longstanding approach of providing the right regulatory framework and maintaining the current stringent competition rules is a sufficient strategy for the 21st century”. As noted by the European Commission (2022), “against conventional wisdom, nearly all the countries have systematically engaged in some form of industrial policy, especially large economies like the USA and China, notwithstanding their very different economic models”. While a universally accepted definition of industrial policy is missing, at its core it can be defined as “any type of selective intervention or government policy that attempts to alter the structure of production towards sectors that are expected to offer better prospects for economic growth than would occur in the absence of such intervention” (Pack and Saggi 2006).

One of the key issues relevant for a coherent application of competition and industrial policy with respect to the 5G deployment is still an extremely fragmented structure of the telecoms sector in Europe, which counts more than 70 companies in the region in comparison to only a handful of international competitors in the US and China that benefit from much higher economies of scale. Consider, however, that when it comes to the telecom equipment for mobile access, the EU market, and the global market in general, is highly consolidated and dominated by Nokia, Ericsson and Huawei which altogether account for approximately 80 per cent of the global market. This means that while EU telecom operators still operate on a highly fragmented national scales, firms that provide telecom equipment on which mobile networks run benefit from much larger scale of operations.

While aggressive competition and fragmentation in the telecom markets has certainly delivered benefits in terms of low prices, retail service innovation and consumer welfare,

it has also contributed to a strong decline of revenues in the industry, which may make it hard for the EU telecom operators to sustain the growing investments costs associated with 5G. Despite a rather high level of harmonization of the EU telecom policy that supports the development of the EU internal market for telecommunications, EU operators still have to deal with divergent regulations across the borders and a multitude of application procedures and permits to install 5G equipment which further increase deployment costs and delay the rollout.

The traditional question of “how many big players are needed for healthy competition in telecoms markets?” – which has found in the past an empirical answer in pursuing (at least) four players in each market – might require some rethinking in the current 5G scenario, assuming that the necessary economies are no longer national but rather continental in scale. Considering the fatiguing in-country consolidation discussed earlier and the lack of serious attempts at cross-border consolidation, the question arises whether the EU actually needs to relax merger control to encourage consolidation in Europe with a specific reference to 5G deployment. As we have seen earlier, in-country consolidation, in particular when it leads to the reduction of operators from four to three, has always attracted harsh regulatory scrutiny, which has focused predominantly on the likely impact of the transaction on prices. In the telecoms sector, the Commission continues to define relevant markets and assess the impact of the transaction at a national level as some aspects of telecom regulation, in particular spectrum assignment, are still largely national. However, if the telecom market for 5G should tend to become genuinely pan-European, the question arises whether this should lead to a major change in the assessment of mergers also with respect to market definition. The question is extremely relevant given that market definition, in its product or geographical dimension, can actually determine the outcome of any merger assessment.

On a more general level the question is whether merger policy, predominantly focused on the impact of transactions on prices, is excessively rigid and whether it may unduly restrain industrial policy, thereby hampering the pursuit of technological leadership that could lead to a higher economic growth. In that regard it is worth recalling that in the aftermath of the Commission’s veto of the proposed *Alstom-Siemens* merger in February 2019 that would have led to the creation of the ‘European champion’, which in turn would make it a global leader in the railway market, the French and German governments issued a quite controversial *Franco-German Manifesto for a European industrial policy fit for the 21st Century*.¹² One of its three pillars foresees changes to the European competition policy, and in particular a review of the merger guidelines that would allow further consolidation, in particular in sectors exposed to strong competition from foreign, especially state-owned firms. According to the manifesto, the Commission should have

¹²https://www.bmwi.de/Redaktion/DE/Downloads/F/franco-german-manifesto-for-a-european-industrial-policy.pdf?__blob=publicationFile&v=2

more flexibility when assessing the relevant markets so that it could “take greater account of competition at the global level, potential future competition and the time frame when it comes to looking ahead to the development of competition”. In this mode a more forward-looking assessment would, among others, allow the Commission to take into account broader strategic interests and the long-term implications of geopolitical threats. Last but not least, the proposal foresees that the EU’s Council of Ministers could exceptionally approve a merger that has been vetoed by the Commission on competition grounds.

However, before considering or endorsing such profound and disruptive changes to merger control, we should first understand whether there is anything in merger control that actually hinders the formation of European champions or whether the lack of cross-border consolidation is caused by other different factors, for example the lack of sufficient incentives for firms to engage in such complex transactions. If the Commission was to assess a merger on the basis of a pan-European market, as long as it would produce merger-specific efficiency gains in terms of international competition that would outweigh anticompetitive effects, and hence would not substantially alter national retail competition, there would seem to be no grounds to prevent the creation of a European champion. While these considerations may have some general relevance, their weight appears more significant in the presence of the potential gain of a rapid and strong 5G deployment contrasted with the objective difficulties the European telecom industry appears to be facing.

Finally, also certain important security issues that 5G technology raises need to be examined. Security policy in this context may reveal itself to be no less important or decisive than industrial and competition policies. 5G architecture reduces the separation between edge and core communications networks, meaning that it is no longer possible to limit vendor impact to the edge; therefore, a potential threat in any point of the network becomes a threat to the whole network. As pointed out by Kaska *et al.* (2019), 5G rollout needs to be recognized as a *strategic* rather than merely a *technological* choice and actually many countries, notably the US, the UK, France, have imposed restrictions on the use of Chinese 5G solutions over national security concerns. While on security issues the EU and MS have concurrent powers, the objective of achieving fast deployment of secure networks has become a priority within the EU and has been consistently reiterated by the Member States and the EU institutions (Robles-Carrillo 2021). In light of this, it is worth pointing out that fragmentation of national security policies concerning the US or Chinese equipment risks further disrupting the EU level playing field for telecom operators. In countries where operators would find themselves forced to migrate from such equipment to other, they would have to bear the costs of such migration while operators in countries where a similar ban had not been imposed would not have to face it. Therefore, an EU unifying view and strategy about the security issues could bring

significant gains not only in terms of the specific policy goal but to the all European telecom industry.

V. Conclusions

Regardless of one's view about the need to create European champions, it seems much easier to agree that the EU should focus its efforts on supporting investment in innovation and maybe carefully screening foreign investment in sensitive sectors. The complexity surrounding industrial policy is caused by the fact that it 'cuts through a variety of economic policy tools, ranging from trade to FDI [foreign direct investment], and innovation (European Commission, 2022).

Rapid and safe deployment of 5G appears one of the big challenges for EU industrial policy. If, like so many academic and industry experts are suggesting, 5G is so important to be considered as a next GPT then a serious discussion about the effective possibility of the European telecom industry, in its present status of fragmentation and low earnings, to raise to the challenge and sufficiently invest in it is urgently needed. This discussion unavoidably involves also competition policy, state aid and sectoral regulation in a much more radical way that we have seen in the past 20 years.

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