



Facultad de Ciencias Humanas y Sociales
Grado en Relaciones Internacionales

Trabajo Fin de Grado

Europe's digital sovereignty Regulatory power and effective application

Estudiante: Álvaro Múgica Querejeta

Director: Miguel Benedicto Solsona

Madrid, May 2021

Abstract

This project aims to study the current situation, challenges and steps needed to be taken towards a 'European digital sovereignty'. For that, an analysis will be made on the need to boost such autonomy if the European Union aims to maintain its extraterritorial regulatory power -framed in the 'Brussels Effect'- and build strong practical capabilities.

In the digital arena, there are three pillars of paramount importance the EU ought to urgently address. The first is R&D in Artificial Intelligence, a field in which it has lagged particularly far behind its two main competitors: the U.S. and China. The second is the need to ensure critical parts of supply chains: core parts of 5G, raw materials and rare earths. The third is the need to establish the frame for a *digital future* to protect European citizens from disinformation and attacks by foreign agents and create a sustainable economic growth thanks to the advances in the field.

As “strategic sovereignty implies the consecution of the European digital sovereignty” (Shapiro J., 2020), this paper considers that the economic strategic autonomy can only be effectively enforced and sustained through a real European digital sovereignty. Thus, there will be an analysis and a theoretical study of the concepts of strategic autonomy, economic strategic autonomy and European digital sovereignty. It will be done in parallel to the concept of the Brussels Effect, understood as “the EU ability to externalize its laws and regulations outside its borders through market mechanisms, resulting in globalization of standards” (Bradford, 2012). Nonetheless, a critique will be made of it, since its scope and capacity may be compromised if it is not accompanied and sustained by tangible and effective economic firepower, which will be defined in the years to come by “investments in digital infrastructure, capabilities and industry” (Hobbs C., and Torreblanca J.I., 2020). In this sense, there should be a combination of soft and hard power.

Key words

Digital sovereignty, strategic autonomy, European Union, Brussels effect, hard power.

Resumen

El presente proyecto pretende estudiar la situación de Europa y los avances hacia una "soberanía digital europea". Para ello, se analizará la necesidad de impulsar efectivamente dicha soberanía para mantener el poder regulador extraterritorial de la Unión -enmarcado en el "efecto Bruselas"- y dotarle de capacidades prácticas.

En el ámbito tecnológico, hay tres pilares de especial importancia que la UE debe abordar con urgencia. El primero es la I+D en IA, un campo en el que se ha quedado especialmente rezagada respecto a sus dos principales competidores: Estados Unidos y China. El segundo es la necesidad de asegurar partes críticas de las cadenas de suministro: partes fundamentales del 5G, materias primas y tierras raras. El tercero es la creación de un futuro digital para proteger a los ciudadanos europeos de la desinformación y los ataques de agentes extranjeros, y conseguir un crecimiento económico sostenible gracias a los avances en el campo.

Dado que "la soberanía estratégica implica la consecución de la soberanía digital europea" (Shapiro J., 2020), este documento considera que la autonomía estratégica económica sólo puede aplicarse y sostenerse eficazmente a través de una soberanía digital europea. Así, se realizará un análisis y estudio teórico de los conceptos de autonomía estratégica, autonomía estratégica económica y soberanía digital europea. Además, este estudio se hará en paralelo a la idea del Efecto Bruselas, entendido como "la capacidad de la UE de externalizar sus leyes y regulaciones fuera de sus fronteras a través de mecanismos de mercado, lo que resulta en la globalización de las normas" (Bradford A., 2012). No obstante, se hará una crítica a la misma, ya que su alcance y capacidad pueden verse reducidos si no va acompañada de un poder económico tangible y efectivo, que se definirá en los próximos años por "las inversiones en infraestructura, capacidades e industria digital" (Hobbs C., y Torreblanca J.I., 2020). En este sentido, debe haber una combinación de poder blando y duro.

Palabras clave

Soberanía digital, autonomía estratégica, Unión Europea, efecto Bruselas, poder duro.

Index

| | |
|---|----|
| 1. Introduction | 6 |
| 2. Purpose and motives | 8 |
| 3. State of the question | 10 |
| 4. Theoretical framework | 12 |
| 5. Objective and question | 18 |
| 6. Methodology | 19 |
| 7. Analysis and discussion | 20 |
| 7.1. Artificial Intelligence | 20 |
| 7.2. The need to secure critical parts of supply chains | 28 |
| 7.2.1. The failure of 5G in Europe: lack of anticipation, dependence and risks | 29 |
| 7.2.2. The dangers of falling behind in the acquisition and control of core assets and materials such as rare earths, batteries or hydrogen | 34 |
| 7.3. Digital future: data, intellectual property and disinformation | 37 |
| 8. Conclusion and recommendations | 41 |
| 9. References | 45 |

INDEX OF TABLES

| | |
|--|----|
| TABLE 1 - ARTIFICIAL INTELLIGENCE: VENTURE CAPITAL AND PRIVATE EQUITY FUNDING. | 24 |
| TABLE 2 - NUMBER OF ACTIVE AI FIRMS THAT HAD RECEIVED MORE THAN \$ 1 MILLION IN FUNDING (2020). | 25 |
| TABLE 3 - NUMBER OF FIRMS IN THE TOP 100 SOFTWARE AND COMPUTER SERVICES FIRMS FOR R&D SPENDING (2020). | 25 |
| TABLE 4 - NUMBER OF SUPERCOMPUTERS RANKED IN TOP 500 (2020). | 26 |
| TABLE 5 - NUMBER OF GRANTED 5G PATENT FAMILIES* BY COMPANY. | 31 |

INDEX OF CHARTS

| | |
|--|----|
| CHART 1 - LOCATION OF LARGEST TECH COMPANIES WORLDWIDE (AS OF 2020). | 34 |
|--|----|

1. Introduction

A thorough critical analysis of the current European situation towards a real 'European digital sovereignty' is of utter importance for the Union as the digital economy will define the international political, economic and social dynamics in the years to come. Thus, it must be understood as a revolution with deeply entrenched political, geopolitical and civilizational implications.

First, if progress is made from Europe and with a European perspective in accordance with European rules and principles, it will serve as a tool to uphold and export the European democratic values of the Union. Similarly, if technological progress is made equitably, fairly, inclusively and consensually, it could serve to effectively restore trust in international institutions and global multilateralism. That is, it is an opportunity for the EU to get back to the forefront of the vanguard and enable it to lead by the power of its example.

Regarding the first and second ideas, only an autonomous and sovereign European Union can serve as the guarantor of peace, stability, multilateralism and human rights leading by the power of its example and defying power politics (Hobbs. C., 2020). If the EU becomes a technological superpower and a determinant player in the U.S.-China rivalry, it will develop and define the future 'excellent' and 'reliable and ethical' Artificial Intelligence revolution, it will effectively ensure consumer rights and privacy both internally and extraterritorially, it will be able to control disinformation and the threat of 'infodemia', it will occupy a prominent role in semiconductor value chains, it will secure the possession of European citizens' data (through a European Cloud, edge computing or other means) and it will lead advances in 6G; to name but a few. In short, it will enable it to be the leading role of the digital future, with all its implications (Torreblanca J.I., 2020).

Related with this, many of its partners and allies (mainly the U.S., but also Japan and Australia) depend on and need a strong EU to forge a global alliance of democracies so as to encounter an increasing global authoritarian model -currently led by China and incarnated in the Beijing Consensus (Bennhold K., 2011)-. If the digital future serves the Orwellian

dystopia of the Chinese Communist Party, Western democracies will see their very existence threatened. There is a need to create a long-term strategic approach based on the European economic and regulatory might as the means to promote our values. Only a sovereign and autonomous EU can carry out an independent doctrine to assert its power and advance its own interests as “it is the credo that brings us together to define our destiny, and to have a positive impact on the world” (Michel C., 2020).

The Union ought to occupy its natural dominant place in the global arena and achieve its strategic autonomy, which can be understood as "Europe's autonomous operating capabilities" (Macron, E. in Franke U., Varma T., 2020), so as to “avoid being sucked into a superpower struggle between America and its geopolitical rival” (The Economist, 2020).

2. Purpose and motives

Europe's American dependence has proven excessive, especially a time of increasing geopolitical rivalry and a less reliable U.S. Its position as the global hegemon and guarantor of democratic values is fading -especially after the last Administration, which has bullied and showed disdain for its allies-. That confidence has plummeted to record lows among its traditional European allies such as Germany, France and the UK (Wike R., Fetterolf J., Mordecai M., 2020). Hence, it is now an opportunity and more than ever of utter importance for the Union to act autonomously and assert its power on the global stage. Otherwise, the transatlantic alliance will continue ceding ground.

Despite the fact that the Trump Administration has highlighted the fault line opened in the EU-U.S. bond -and accelerated the exposure of the European shortcomings and weaknesses-, these strained relations go back to the beginning of the Obama era. In that respect, the EU has its share of responsibility as it has been reticent to develop its own capabilities due to an excessive self-assurance caused by a mistakenly believed indefinite protection of the U.S., which was perceived as inherent to our transatlantic relationship.

“Many in the EU describe digital sovereignty as the technological version of strategic autonomy” (Burwell. F.G., 2020), and it is made up of two pillars. The first is the effective building of capabilities. The second is the exploitation of the Union's regulatory power, “which is more durable, more deployable, and less easily undermined” (Bradford A., 2012) than economic sanctions or raw military might. Despite these two factors are interdependent, there is a lack of big companies (‘European champions’) that could serve as first movers and set international standards based on our interests, having a leverage on the sectors they compete in. Proof of that is that the U.S. could model the post-WWII international order thanks to its incomparable economic might over a devastated European continent (apart from humongous military capabilities). During these 75 years, American companies have championed every sector and market: the oil, arms, automotive, aerial, aerospace, technological, electronical, transportation or communications. They have enacted laws and have set standards thanks to their incomparably privileged position.

In the case of China, during these last 40 years of unprecedented economic growth, the country has pushed its interests throughout Southeast and Central Asia, Africa and Latin America thanks to its cheap workforce and non-existent labor standards, which serve as an opportunity to countries (many autocratic) that prioritize economic growth over other considerations. Indeed, the country's Belt and Road Initiative is a humongous and attractive project to many autocracies and would-be autocrats due to its non-existent rules, standards of transparency and respect for human rights. The Chinese government subjects underdeveloped countries by making them indebted to them ('debt trap problem') and hence have an indefinite political and economic leverage on them.

In sum, the U.S. has consolidated its position as the world hegemon thanks to its post-WWII power. China has proven to be an autocratic but tremendously efficient model, challenging the Western commonly held belief that a democratic regime is a *sine qua non* condition for economic growth. For that reason, Europe must break the dichotomy and stop being a pawn in the superpower struggle battlefield. Europe should develop an open strategic autonomy, protecting itself whilst fostering critical sectors, as "autonomy is not protectionism; it is the opposite." (Michel C., 2020).

3. State of the question

As stated, Europe is sandwiched among the two superpowers. Within the continent and among EU member States, there are substantial divergences regarding the field. Eastern European countries (the Baltics and Poland) fear that any moves towards a hypothetical strategic autonomy would lead to a loss of the American umbrella. Within Western Europe, for instance, Germany has traditionally had an economic approach in its Foreign Policy whilst France has calculated its interests through a geopolitical lens. Regarding the digital sovereignty, divergences can be found among those States that do not perceive Chinese companies (operators and suppliers) as a threat, and those which prefer to side with the US in fear of economic or political retaliation. There is a lack of coordination and a strategic ambiguity.

Europe has so far proven to be a referee with global relevance, but at no time has it been a relevant player. In the field of data protection, the landmark General Data Protection Regulation (henceforth GDPR) has started a race to the top by forcing global companies to conform to its principles and by making other regions enact their European-style laws, such as the pseudo-RGPD California Consumer Privacy Act (CCPA) (Uttamchandani R., 2019). However, it has failed to create European champions in the field due to an excessive bureaucracy, lack of incentives and an unfriendly environment for innovation, investment and risk-taking; accounting for less than 10% of the world's largest tech companies (Ortega Klein A., 2020). As aforementioned, the EU has failed in every sector, from AI to the securing of raw materials.

However, there is still reason for hope as the Union, from an economic, political and legal point of view, is one of the most attractive regions in the world. The EU accounts for approximately 16% of global GDP, not much less than the U.S. or China. In this sense, it is the largest trading bloc and the world's largest exporter of manufactured goods and services, being the biggest export market for around 80 countries, four times more than the U.S. (European Commission, 2019). In the same line, the Union can take a huge advantage of its relations with the developing world as, "fuels excluded, the EU imports more from

developing countries than the U.S., Canada, Japan and China put together” (European Commission, 2019), and it is, along with its member States, the biggest donor globally, accounting for more than 55% of global Official Development Assistance. Finally, apart from having a privileged position, its inhabitants look for quality goods and value stringent rules and regulations, creating an ecosystem of 500 million inhabitants living in 27 high-income countries (with a GDP per head of >25,000 euros).

Apart from that, the EU is one of the best environments to invest in the world, being the most open and transparent investment regime worldwide. It is one of the most open economies and it is the guarantor of free trade, as more than 70% of imports enter the Union at zero or reduced tariffs (Eurostat, 2020). In fact, despite the 2008 financial crisis and the 2020 COVID-19 pandemic, the Union has not reacted by closing markets or hampering Foreign Direct Investment (FDI). The EU exports other countries its values and regulation regarding labor and human rights, business freedom and commercial and financial fair play, which can be perceived by the vast majority of the global population in day-to-day economic activities.

4. Theoretical framework

There are several theories, principles and concepts that ought to be analyzed. First, there will be a thorough study of the principles and limitations of the Brussels effect, as it is a necessary (but not sufficient) condition to achieve a full European digital sovereignty. This sovereignty is at the same time embedded in the European strategic autonomy. The definition of the latter is not clear, it is subject to debate and it is interpreted in different and even opposed ways by scholars and policymakers. Finally, realist and liberal scholars will be included to explain the European doctrine and its situation *vis-à-vis* the rest of the world.

The Brussels effect refers to the 'unilateral regulatory capacity' the EU possesses to make companies in other jurisdictions abide by its regulatory standards. It was first put forward by Columbia Law School professor Anu Bradford in *The Brussels effect* article published in 2012 and later developed in *The Brussels Effect: How the European Union Rules the World* book published in early 2020. What Ms. Bradford's calls the European 'unilateral regulatory capacity' relies on the following five factors -which are interrelated and act accordingly-:

The first pillar for an effective extraterritorial regulatory capacity concerns the market power of the actor exercising that capacity. Here, we refer to the relative power of the actor in comparison with those States or supranational organizations it wishes to influence. "The larger the market of the (strict) importing country relative to the (lenient) market of the exporter country, the more likely the Brussels Effect will occur" (Bradford A., 2012). In the same line, authority is required to exercise regulatory power in other jurisdictions, as only those "with the capacity to impose significant costs on others by excluding noncomplying firms from their markets can force regulatory adjustment" (Bradford A., 2012). Here, the Union has an overwhelming superiority over other smaller and more lenient jurisdictions. The second factor concerns the regulatory capacity of the actor, which refers to the strength of its institutions, their ability to reach consensus -and act coordinately- and the political stability of the jurisdiction. In this sense, "being a regulatory power is a conscious choice pursued by a state rather than something that is inherent in its market size. Not all States with large markets become sources of global standards" (Bradford A., 2012). The third factor is

the preference for strict rules rather than lenient ones, which is the case for the European high-income countries' inhabitants and their national and supranational lawmakers and institutions. The fourth factor is the predisposition to regulate inelastic targets, which is the predisposition of regulating consumer markets such as product or food safety; rather than other activities with low barriers for mobility and jurisdiction change (e.g., capital markets). The fifth factor is the non-divisibility of standards, which makes corporations comply in all the jurisdictions they operate in with the standards of the most stringent regulator.

Nonetheless, these five factors count with significant shortfalls and limitations which could possibly exacerbate due to the following reasons. First, the EU's decreasing market power puts in peril its superior relative size over other lenient exporter countries. This size decreases year by year due to the emergence of other powers (China, India) and the exit of the UK from the EU -which accounted for 15% of its GDP-, diminishing the pressure the Union can put on other jurisdictions. Brexit and the threat of national-populist parties also put at risk the stability and institutional architecture of the EU (Bradford A., 2020), constraining its ability to act jointly and to pass and enforce laws. Moreover, and related with that, the European willingness to promulgate stringent rules could be endangered "if the populists' anti-EU agenda leads to attempts to repatriate powers back to the member states" (Bradford A., 2020), putting in peril the third factor aforementioned. Finally, of particular concern is the threat to the fourth and fifth pillars of the Brussels Effect, which refer to the willingness to regulate inelastic targets and to the non-divisibility of standards, as mentioned. Product divisibility, additive manufacturing and geo-blocking -all enabled by technological advances- can vanish the Brussels' Effect, as exporters could significantly modify production processes depending on how stringent/lenient the importer jurisdiction is. For all these reasons, there is no evidence that in the near future many actors will consider "the benefits of adhering to a single global standard [EU standard] greater than the benefits of taking advantage of laxer standards in lenient jurisdictions" (Bradford A., 2012).

Hence, the Brussels Effect is the necessary but not sufficient condition to achieve an effective digital sovereignty. If digital sovereignty is the capacity of the countries "to control the new digital technologies and their effects on society" (Shapiro J., 2020), this control can

only be exerted through tangible power by striking “the right balance [...] that fosters innovation, competitiveness and leadership” (Ulmann L., 2020). That is, there is a pressing need to repatriate production to European soil (‘industrial renaissance’) whilst creating the right environment for the establishment of global companies (e.g., Big Tech). Despite being broad consensus in EU institutions and capitals regarding that, there are divergences on how to do it: should it depend solely on European efforts or should it count on American approval? And should Europe move towards a decoupling with China or is not there an alternative to collaborating with the Asian giant due to its immense economic power?

Some proponents (e.g., President Emmanuel Macron) believe the EU should use its soft and hard powers to advance its interests in spite of the American reticence to Europe advancing autonomously: “the Biden-Harris administration would welcome early consultations with our European partners on our common concerns”, as asseverated by NSA Jake Sullivan regarding the latest Comprehensive Agreement on Investment (CAI) with China (Sullivan J., 2020). Some of them regard China as an inevitable partner and believe that only will they abide by international rules through a rapprochement and increase in trade agreements. Despite having been proved wrong, this has been the traditional German ‘Wandel durch Handel’ (‘change through trade’) doctrine. That policy sustained the commonly held belief that accepting China into the WTO would make them open their markets, converge with the West in respect for human rights and accept the Conventions of the International Labor Organization. In the same line, they hold a consequentialist and utilitarian point of view which defends that, despite China’s systematic violations of human rights and aggressive Foreign Policy, Europe cannot ignore such a global superpower. Nonetheless, other proponents of the European own way or ‘Sinatra doctrine’ (The Economist, 2020) regard any agreement or détente with China as a “geopolitical naiveté instead of geostrategic autonomy” and consider it as a whitewashing of China’s record on violations of human rights (Verhofstadt G., 2020). They oppose to cutting deals with the Asian country and even defend a decoupling.

On the other hand, there are defenders of a more dovish and less confrontational stance who believe that any international agreement, in order to be enforced, must count with

the approval and participation of the US (Kramp-Karrenbauer A., 2020). They do not believe that the European autonomy is an imperative need to defend European values and support global multilateralism.

As we see, there is not a definition of (economic) strategic autonomy, its reach is ambiguous, and it is defended by policymakers who present opposing points of view. This paper believes there is a need to define the meaning and extent of it and make it a common base from which to create a shared strategic orientation for the long term. Although strategic autonomy is not the issue that concerns us, it is important to acknowledge there is a wide range of standpoints. This paper considers it is imperative to develop a European autonomous roadmap to strengthen and give credibility to the transatlantic link and to build a common ground on respect for fundamental rights and liberties to encounter China. "Europe must quickly learn to speak the language of power, and not rely only on 'soft power', as we have done so far", whilst it should be at the same time convinced that multilateralism and reciprocity must be the basis on which to build relations and move on the geopolitical chessboard (Borrell J., 2020). Hence, liberalism and liberal institutionalism are a fundamental pillar for the European construction, whilst it should also play the realist game.

With reference to the realist theory, it should be urgently and widely accepted that the States that want to occupy the position of world hegemon (China) will not accept international laws because these are the antithesis of their model, the biggest obstacle to their progress and a bulwark against their limitless greed for power. Following Mearsheimer, the most powerful state is the one that prevails in a dispute (Mearsheimer J.J. in Dixon W.J, Senese P.D., 2002). In fact, their model of global governance aims to change the status quo to make the normative order of the WWII obsolete and inoperative. This change in power relations and hegemonic aspirations is especially pressing in the technological field, which has become a cause of the rapid geopolitical transformation and the channel for doing so; and has for a long time contributed to the uneven growth among nations and the rise and decline of hegemonic powers (Galpin R. in Saull R., 2012). In the current global correlation of powers, the new aspirants to hegemon have adopted an offensive realist approach, considering the geopolitical chessboard as a zero-sum game. Nonetheless, this game may

make the Union bind together since external pressure seems to produce internal unity (Waltz, K., 1993).

These principles, put into practice, should be transformed into Europe deploying fully its economic and technological firepower as the economic and geopolitical implications of the digital race will leave no room for cooperation between models as opposed as the European and Chinese (and the American, in part).

However, the EU is not fully capable of fighting on this battlefield, as “it will not survive in a world of Beijing’s design, where cherished rules are replaced by the will of the mighty” (Stephens P, 2020). It should continue advancing in standard setting, enhancing its soft power and building an alliance of like-minded democracies (USA, Japan, South Korea, Australia or even India). This conjunction of like-minded countries will boost the global push for the respect for human rights and individual freedoms. Similarly, it is urgent for the Union to strengthen its intra-European ties since, "the more Europeans agree on how they see the world and its problems, the more they will agree on what to do about them" (Borrell J., 2020). The EU was founded on the Kantian approach that a federation of republics (understood as States based on popular consent) would advance in their interests, being in control of IIRR and enacting and enforcing international law. That principle is behind the creation of the European Coal and Steel Community, which was founded on the commercial liberal assumptions that international trade and economic interests would reduce the risk of conflict among States. And it has proven right. Therefore, the institutional liberal European reality - which is in turn based on rationalist institutionalism and Wilsonian idealism- is inherent to its character and construction.

It is inaccurate to define the current impasse as a second Cold War because global economic interdependence is too strong for decoupling. Global supply chains, transnational agreements and supranational organizations prevent the world from creating a new iron curtain. As the theory of complex interdependence puts it, military strength and the balance of power may have diminished -apart from being a wider variety of actors that cannot be controlled by States- (Nye J., Keohane R. in Rana W., 2015) but the EU must compete on an

equal footing with its two major competitors and advance by itself without leaving room for complacency or reminiscence of past eras of American protection.

5. Objective and question

This paper aims to study what steps are being taken towards an effective European digital sovereignty and whether its achievement is plausible solely through the Brussels effect. Is it possible for the European Union to achieve a leading position on the global chessboard thanks to its unilateral regulatory capacity, or should it boost its technological capabilities to have a say in the global dispute and prevent its regulatory power from becoming obsolete? Or, even more, is a digital sovereignty plausible through a race to the bottom regulatory approach, as the Chinese model has demonstrated? My hypothesis is that the EU has naively over-relied in its incomparable hegemonic regulatory power, being in the urgent need to boost its practical capabilities.

When drawing the conclusions, there will be a reflection on whether this hypothesis have proven right, whether it has limitations and whether it should be complemented by other aspects.

6. Methodology

The method to be used is both qualitative and analytical, whilst descriptive. To this end, primary sources will be used and included to carry out the analysis, such as European legislation (Official Journal of the European Union), communiqués from the European Commission and statements from member State governments. In addition, studies and analyses from think tanks and organizations will be included to quantitatively reflect how the European Union is positioned in terms of R&D, number of researchers, funding, investment in 5G and 6G, dependence on foreign actors and exploitation and commercialization agreements for raw materials and rare earths.

Besides, the quantitative analysis and the advances of the EU *vis-à-vis* the world will be accompanied by theoretical precepts, specifically the Union's unilateral regulatory capacity. As stated, we mainly use the theoretical principles of Anu Bradford's Brussels Effect, analyzing publications by think tanks and institutes to critically expose her precepts and explain their limitations.

After doing a thorough analysis of where the Union really stands at towards a full digital sovereignty, conclusions will be drawn to realize the gap between its approach and its position in the global arena.

7. Analysis and discussion

Given the impossibility of covering all the fields, this section will analyze the three pillars needed to sustain Europe's digital sovereignty. The first will be the development and investment in Artificial Intelligence, the second will be the need to boost domestic production of critical parts of the supply chains (chips, batteries etc.) and the third will analyze the paramount importance of building an exportable digital future in line with European values, putting technology at the service of people through increased investment in the cloud, better protection of user data and online protection or the development of ultrafast broadband.

7.1. Artificial Intelligence

First, we ought to understand that the “rapid progress of AI makes it a powerful tool from the economic, political and military standpoints” (Miaillhe N., 2018). AI is already one of the priorities of the governments’ policies and is at the heart of national security strategies of EU member and non-member States, being deeply entrenched in the dynamics of global geopolitics. It is contributing to a possible global decoupling and is leading to a growing struggle for technological supremacy, evolving towards a hypothetical fragmented network or 'splinternet' in the near future in which States worldwide must align themselves either with the U.S. 'surveillance capitalism' or with China's 'authoritarian surveillance' (Renda A., 2020). In the first case, citizens and companies would be victims of the interests of the leading companies in the sector, in the second case they would be prisoners of a 1984 Big Brother-style surveillance. In order to prevent such a dystopian scenario, the EU seeks to break that duopoly and open up ways to ensure independence of the two superpowers for citizens in Europe and worldwide. In this sense, in the first 100 days of Ms. von der Leyen as the European Commission president, an initiative was announced on the human and ethical consequences of AI at the same time the Commission was stepping up its efforts regarding data strategy (Renda A., 2020).

That attempted paradigm shift by the EU is reflected in the Union ramping up its efforts and exploiting its regulatory and normative capacity, fully deploying the Brussels effect. Its comprehensive strategy is based on three assumptions. The first refers to an

increasing investment in order to give Europe the weight it deserves in the field. The second refers to creating an inclusive and affordable AI; and the third refers to the need of AI reflecting European values: individual freedom, free competition, pluralism, tolerance and non-discrimination, among others (European Commission, 2021).

All that is comprised in the landmark 'European Commission's approach on Artificial Intelligence', sustained and formed by the following four pillars:

The first pillar is the (COM(2018)237) or Communication on "Artificial Intelligence for Europe". It sets the principles for a European long-term strategy regarding AI and it aims "to lead the development and use of AI for good and for everyone, based on its values and strengths" (Renda A., 2020). In this framework, the highly regarded High-Level Expert Group on AI (henceforth AI HLEG) was created. AI HLEG worked on and delivered guidelines on AI ethics. Despite having closed its mandate in July 2020, it launched 4 milestone deliverables. The first one concerned a "human-centric approach on AI", enlisted in the (COM(2019)168) and "intended to put forward ethics guidelines for a trustworthy AI" ((COM(2019),168), European Commission, 2019)). The concept of Trustworthy AI was based on seven key requirements, such as "privacy and data governance", "transparency", "diversity, non-discrimination and fairness" (AI HLEG, 2019), among others. The second deliverable, published on 26 June 2019, promoted the "use of trustworthy AI to build a positive impact in Europe" and "leverage Europe's enablers for trustworthy AI" (AI HLEG, 2019). This sought to "empower humans by increasing knowledge and awareness of AI" and build a vibrant private sector investing environment in cooperation with the public sector and its capacity of policymaking (AI HLEG, 2019). The third and fourth deliverables reinforce the ideas presented in the first and second ones regarding transparency, social awareness and private-public cooperation on AI investment. The AI HLEG also raised awareness regarding "massive vigilance and the use of lethal autonomous arms" derived from the development of AI, such as "personal identification [...] or the elaboration of psychographic profiles" (AI HLEG, 2019). In sum, the AI HLEG specified the ethical principles put forward in Ms. von der Leyen's initiative.

Apart from the landmark (COM(2018)237) and the AI HLEG, the EC also launched the mentioned "White Paper on Artificial Intelligence: a European approach to excellence and trust" (European Commission, 2020). It was launched on 19 of February 2020 and revolved on the idea of a 'human-centric AI'. It is focused on the future of AI and of data and presents a future scenario in which data is stored in local devices rather than in the cloud, switching the current 80/20 proportion (80% of data stored in the cloud and 20% in local devices) to a 20/80 one. This situation could be exploited by Europe and could enable it to have a say on the 80% of data stored locally (e.g. edge computing). In that framework, a 'federate cloud' is proposed to ensure and protect European citizens' data, such as the Franco-German GAIA-X initiative which will be discussed later. This White Paper establishes two main objectives: the creation of an "ecosystem of excellence" and an "ecosystem of trust" (European Commission, 2021), reinforcing the guidelines established by the EC and the AI HLEG.

On the one hand, regarding the idea of an "ecosystem of excellence" (European Commission, 2021), the Commission announced the creation of test centers as a means to attract international investment, new measures to support small and medium-sized enterprises (SMEs), an initial budget of €100 million for equity financing, and a new strategy for public-private cooperation on AI, data and robotics. The Commission aims to create synergies and centralize the research as "Europe needs a lighthouse center of research, innovation and expertise that would coordinate these efforts and be a world reference of excellence in AI and that can attract investments and the best talents in the field" (European Commission, 2020). In the same line, these initiatives are framed in the Enhanced European Innovation Council Pilot, which aims to "boost fast company growth and market-creation innovation" (EIC Accelerator Pilot, 2020). On the other, regarding the principle of "ecosystem of trust", the White Book pledges for the adoption of a flexible regulatory framework in sensitive areas such as health assistance, police and the judiciary. For those 'high risk applications', the White Book proposes regulation regarding data privacy and robustness and accuracy of the AI system (Renda A., 2020). This regulatory framework is accompanied by the 'Liability for AI and other emerging digital technologies' report prepared by the 'Expert Group on Liability and New Technologies – New Technologies

Formation’ and released in the COM/2020/64 final, which develops “on how liability regimes should be designed – and, where necessary, changed – in order to rise to the challenges emerging digital technologies bring with them” (European Commission, 2019).

Finally, the “European AI Alliance” and the “Coordinated plan on AI” are the third and fourth pillars of the mentioned comprehensive “European Commission’s approach on AI”. The first is a “forum engaged in a broad and open discussion of all aspects of Artificial Intelligence development and its impacts”, created to give feedback to the HLEG AI. The second is comprised in the COM(2018) 795, which follows and develops the same guidelines established in the White Book and in the mentioned (COM(2018)237). It is related with the April 2018 Declaration of cooperation on Artificial Intelligence, joined by all EU members and established as a forum of cooperation for future joint research and investment projects (European Commission, 2018).

Despite all these initiatives, deliverables and regulatory firepower, the European AI is not whatsoever at the forefront of the global stage. “At the moment, AI is a race between two horses: China and the U.S.” (Mullen A. in Ortega Klein A., 2020). Thus, there is no European technology to be regulated, remaining (again) as intentions and a dead letter. It is therefore necessary to momentarily abandon the analysis of the regulatory and bureaucratic swamp in order to critically examine where the EU really stands at and where it is going in comparison with the two great superpowers.

In this sense, it is worth noting that the EU approach is unique worldwide, being diametrically opposed to the Chinese or American one. Firstly, in the U.S., “the AI strategy is led by corporations who are focusing on self-regulation and rapid technological development” (Think Nexus, 2019), whereas the European strategy is led by national governments and the EC’s initiative, principles and guidelines. Moreover, the U.S. emphasizes on ‘light-tough’ policy environments to foster innovation and competition, whereas the European approach is based on heavy and cumbersome regulation. That free-market approach has led to the American AI developments outrunning the scarce regulation on the area, whereas the European governments and institutions play an active role when protecting consumers (Think Nexus, 2019). That approach, coupled with an unparalleled

investment in the U.S., has made the country “hold a substantial overall lead in AI, while China has continued to reduce the gap in some important areas and the EU continues to fall behind” (Castro D., McLaughlin M., 2021). The US-based think tank Center for Data Innovation publishes every year a leading report analyzing the advances of the U.S., China and the EU in the field. In this report, 31 metrics are studied across six categories, which are talent, research, enterprise development, hardware, adoption and data. Each category has several metrics, being, for instance, in the case of the hardware category: number of firms in Top 15 for semiconductor sales, number of firms in Top 10 for semiconductor R&D spending, number of firms designing AI chips, number of supercomputers ranked in Top 500 and aggregate system performance of supercomputers ranked in Top 500. Later, a score is calculated for every category. If we look at the general picture, out of 100 total available points, at the beginning of 2021 the “United States still leads, with 44.6 points, followed by China with 32.0 and the European Union with 23.3” (Castro D., McLaughlin M., 2021). China has made huge progress, reducing the gap or extending its lead over the U.S. in more than half of the metrics, whereas the U.S. has expanded its lead over the EU in ¾ of the metrics studied. If we take a close look, the results are also staggering and not promising for the EU.

Table 1 - Artificial Intelligence: venture capital and private equity funding.

| Latest data on AI VC & private equity funding | | | |
|---|-----------|----------|----------|
| | US | China | EU |
| Absolute | \$14,345M | \$5,641M | \$3,207M |
| Per worker | 86.5 | 12.8 | 7.2 |

Source: Prepared by the author on the basis of data supplied by the Center for Data Innovation (2021).

Data shows that at the beginning of 2020 the U.S. had spent 4.5 times more than the EU in VC/private equity funding in the previous year. This investment gives special advantage when it comes to establishing start-ups and investing in ambitious projects. That is why, according to the leading CB Insights tech market intelligence platform, the U.S. had 65 of the top 100 start-ups worldwide in 2020; based on criteria such as patent activity, market potential, and talent (CB insights, 2020). In this sense, the U.S. had at the end of 2020

2.3 times more AI firms that had received >\$1 million in funding than the EU, as we see in the following table.

Table 2 - Number of active AI firms that had received more than \$ 1 million in funding (2020).

| N° of AI firms that had received >\$1M in funding | | | |
|---|------|-------|-----|
| | US | China | EU |
| Absolute | 2130 | 398 | 890 |
| Per 1M workers | 12.8 | 0.5 | 3.5 |

Source: Prepared by the author on the basis of data supplied by the Center for Data Innovation (2021).

Again, the figures in investment in the U.S. outnumbered by far the ones found in the EU and China, giving it an extraordinary potential in the short and medium term. That data show why so many European start-ups are launched at home before moving to the U.S. when scaling up as the country “offers a large market with one legal system, a large supply of talent, and a single language” (Castro D., McLaughlin M., 2021). That is, it is of paramount importance for the EU to launch a practical and real unified strategy to help the firms on the field, rather than setting regulatory principles with no real application.

Similar data is projected if we look at the “number of firms in the top 100 software and computer services firms for R&D spending” (Castro D., McLaughlin M., 2021). In this sense, the EU ranks third and has ¼ of those found in the U.S. Nonetheless, China has recently caught up, accounting to 50% more firms in the top 100 in the period 2016-2019, while the American ones decreased from 65 to 58 in the same period of time.

Table 3 - Number of firms in the top 100 software and computer services firms for R&D spending (2020).

| N° firms in top 100 software & computer services for R&D spending | | | |
|---|-----|-------|-----|
| | US | China | EU |
| Absolute | 58 | 15 | 12 |
| Per 10M workers | 3.5 | 0.5 | 0.2 |

Source: Prepared by the author on the basis of data supplied by the Center for Data Innovation (2021).

The spending found in 2019 in the U.S. in software and computer firms in global top 2,500 was the largest, being 8.5 times more there than in the EU and 5.2 times more when comparing it with China's.

Apart from that, the EU is also lagging behind in the production and distribution of semiconductors. This issue has been at the center of the trade war between the U.S. and China, as “they are foundational to nearly all modern products, from cars and kitchen appliances, to telecommunications networks and schools” (Gelsinger P., 2021). Europe has dramatically lost market share, accounting for 10% of the global semiconductor market, “down from a heady 44 per cent in 1990” (Gelsinger P., 2021). Moreover, according to the Semiconductor Industry Association, 80% of all semiconductors are currently made in Asia (Varas A., Varadarajan R., 2020). “It is good news that the EU has committed to doubling its manufacturing capacity to 20 per cent of global production by 2030” (Gelsinger P., 2021); however, it lacks the incentives other governments provide and does not consider it a national priority, as the U.S. or China do.

Finally, one of the most reliable metrics is the number of supercomputers per country, as they are critical for the development of AI systems, they set the conditions for future development and it predicts what the scenario will be like in the coming years. It is in this metric where China's catching up is most evident, having 3 times more supercomputers ranked in top 500 in 2019 than in 2012, while the U.S. has decreased its share from 50,4% to 22,6% in the same period of time.

Table 4 - Number of supercomputers ranked in top 500 (2020).

| Number of supercomputers ranked in top 500 | | | |
|--|-----|-------|-----|
| | US | China | EU |
| Absolute | 113 | 214 | 91 |
| Per 10M workers | 6.8 | 2.7 | 3.6 |

Source: Prepared by the author on the basis of data supplied by the Center for Data Innovation (2021).

Despite the divergences exposed between the transatlantic allies, there is common ground regarding respect for individual freedoms and rights when examining the potential

applications of AI. However, it is in China that we find insurmountable obstacles for mutual understanding and a model incompatible with Western values. In this sense, “the U.S. and Europe need to stand together as China seeks to write the global playbook” (Rep. Robin Kelly (D-Ill.) in Overly S., Heikkila M., 2021). China is heavily investing in AI R&D and has an advantageous situation due to the unrestricted use the CCP can make of the large quantities of data needed to train algorithms it has. For instance, at the end of 2019 China had 449 million fixed broadband subscriptions against the 184 and 114 million found in the EU and in the U.S., respectively. Likewise, if we look at the number of individuals using mobile payments, China again ranked first with 557 million citizens, 5 times more than the European and American users combined (Castro D., McLaughlin M., 2021). That amount of data has an extraordinary value for developing machine learning models, understanding human language or analyzing biometric data, among many other applications.

In conclusion, when looking at the data, it is clear that the Chinese government has made AI a top priority. Hence, it is of paramount importance that the EU takes urgent steps, such as increasing R&D tax incentives to increase spending by firms in the continent, expanding public research institutes or augmenting the number of high-performance computing centers. In the same line, both the US and the EU should augment the quantity of researchers and the quality of it (inextricably bounded up to the amount invested), since “the fuel behind AI development is money – and talent, that is attracted amongst others by money” (Caversaccio P.M. in Leprince-Ringuet Daphne, 2021), as China has demonstrated. In that sense, they should create more scholarships and fellowships for AI students and actively support research in academia. Moreover, and most importantly, cooperation should be fostered among like-minded countries. That is, the Global Partnership on AI (GPAI) -which was launched by the EU, the US, Japan, South Korea and others- was created to “guide responsible development and use of AI in a spirit of respect for human rights, inclusion, diversity, innovation and economic growth among democratic countries” (Gouvernement de la République, 2020). However, it should be more ambitious and should launch initiatives in the practical field, such as developing shared data depositories or fund and invest in international concrete projects. There should be a common strategic orientation in the field as even inside Europe there are divergencies regarding the sectors on which to focus the advances of AI. For example, France views developments in AI from a geopolitical

standpoint, while Germany views it from an economic lens. Since the German strategy was drafted by the ministries of education and research, economy and energy, and labor and social affairs, its focus is primarily economic, educational and social (Renda A., 2020). In contrast, France designates security and defense as two of the four main pillars of AI development. It has the goal of moving France and the EU out of the "second circle" of AI development in order to compete with the two superpowers in the "first circle", with the profound consequences they state that competition has on security and geopolitical elements.

Despite these internal debates, it is beyond dispute that the implications of AI will cut across all domains: from education to the military. In this sense, China has not only taken the initiative to be the hegemon in the field but seeks to have it serve its geopolitical and strategic interests. Its industrial policy on steroids Made in China 2025 and its latest five-year plan reveal the objective of dominating the technological revolution (with emphasis on AI) and molding it to its interests. The 2021-2025 plan "identifies seven frontier technologies that are deemed vital to development and national security" (The Economist, 2021), with strong focus on AI and supercomputing. In practice, China has already developed technology for mass surveillance and suppression of minorities, "building an all-seeing digital system of social control, patrolled by precog algorithms that identify potential dissenters in real time" (Andersen R., 2020). The tight control of the population in the Xinjiang police state is the epitome of it, but the tight grip that the CCP is exerting on the population with AI is perceptible in all spheres of public and private life. Moreover, and more worryingly, "China is already developing powerful new surveillance tools, and exporting them to dozens of the world's actual and would-be autocracies" (Andersen R., 2020), gaining a foothold in underdeveloped and developing countries to implement its autocratic 'Beijing Consensus' of iron-fisted state control, lack of individual freedoms and non-existent democratic guarantees.

7.2. The need to secure critical parts of supply chains

"Europe's strategic autonomy is about reducing dependence on others for things we need the most: critical materials and technologies, [...] infrastructure, security and other strategic areas" (European Commission, 2020). That is, it is of utter importance to foster the

production of strategic assets inside the Union and to protect their acquisition by foreign powers due to its economic but also national security implications. As provided for in Article 4(2) TEU and in accordance with Article 346 TFEU, member States have sole responsibility of “safeguarding national security” (EUR-lex, 2012), (EUR-Lex, 2016). Indeed, given the implications that technological advances have on critical infrastructures and national security of member States, in 2019 the EU published the Regulation (EU) 2019/452 “establishing a framework for the screening of foreign direct investments into the Union” (Official Journal of the European Union, 2019). Its main objective was to “assess risks to security or public order arising from significant changes to the ownership structure or key characteristics of a foreign investor” (Official Journal of the European Union, 2019), whether that foreign investor is under direct or indirect control of a foreign government. member States and the Commission may consider “critical technologies and dual use items [...] including artificial intelligence, robotics, semiconductors, [...] energy storage, quantum and nuclear technologies, [...] supply to critical inputs, [...] access to sensitive information, including personal data, or the ability to control such information” (Official Journal of the European Union, 2019). In other words, the EU has pushed States to act against the acquisition of strategic assets from non-member States. It has also been promoted that these assets and critical infrastructure be produced in Europe to reduce dependence on extra-community producers and suppliers. In this sense, several initiatives and steps have been taken, such as the 5G Communication, the Recommendation on Cybersecurity of 5G networks or the Intellectual Property Action Plan. Nonetheless, the EU has once again been left unprotected and devoid of its own supply chains and producers to face the Sino-American technology war and move forward autonomously in the launch of key present and future technologies such as 5G, chips and vital materials such as rare earths, batteries or hydrogen.

7.2.1. The failure of 5G in Europe: lack of anticipation, dependence and risks

Regarding 5G, the EU has acknowledged that “5G network security is an issue of strategic importance for the entire Single Market and the EU's technological sovereignty” (European Commission, 2020). Hence, the Union has taken innumerable steps. One of the most important ones is the *Cybersecurity of 5G networks: EU toolbox of risk mitigating measures* report, published in early 2020 (European Commission, 2020), which had the goal

of identifying “a possible common set of measures which are able to mitigate the main cybersecurity risks of 5G networks [...] and to provide guidance for the selection of measures which should be prioritized in mitigation plans” (European Commission, 2020). It identifies a number of categories of risks by scenarios related to insufficient security measures or risks associated to the 5G supply chain, among others. Other reports such as the *EU coordinated risk assessment of the cybersecurity of 5G networks* go in the same line. There is no doubt that the EU has deployed its regulatory power and has established strong and concrete regulatory frameworks in the field. Thanks to the EU telecommunications framework, member States can impose obligations on operators and are “required to ensure that the integrity and security of public communications networks are maintained” (European Commission, 2020). Concerning that, there is vast regulation on the matter, mainly framed in the ‘Telecoms Package’, which consists of four milestone Directives. In the same line, there are also plenty of tools to protect European companies, such as the mentioned FDI Screening Regulation and the utilization of defense instruments. Nevertheless, despite the reports, communications, working groups, measures, and a vast range of instruments; the EU has once again lost itself in the regulatory swamp, losing perspective of the real changes in the technological dispute. As the Spanish think-tank Real Instituto Elcano puts it, “the EU already has a 5G risk assessment (now action is needed)” (Arteaga F., 2019).

Despite the versatility, scalability and specialization that will enable a wide variety of innovative services to be offered with 5G, the exposure and effects of cyber-attacks are exponentially greater if software developers do not integrate security from the initial design. A less centralized architecture, smart computing power at the edge, the need for more antennas and increased dependency on software make 5G networks have more entry points for attackers (European Commission, 2020). The problem in Europe is that these developers are not located on the continent, being at the mercy of their interference and the agents (governments) that back them. As the aforementioned *Cybersecurity of 5G networks: EU toolbox of risk mitigating measures* report points out, the problem lies in the fact that the 5G supply chain lengthens and is made up of a large number of actors from different countries with different ethical and qualitative standards of cybersecurity and data protection. It is in the supply chain where Europe does not have a say whatsoever.

Table 5 - Number of granted 5G patent families* by company.

| Number of granted 5G patent families by company | | | |
|---|------------|-------------------------------|---------------------------------|
| Country | Company | N° granted 5G patent families | % of granted 5G patent families |
| China | Huawei | 2993 | 17.4% |
| USA | Qualcomm | 2323 | 13.5% |
| South Korea | Samsung | 2628 | 15.3% |
| Finland | Nokia | 1963 | 11.4% |
| South Korea | LG | 1663 | 9.7% |
| China | ZTE | 555 | 3.2% |
| Sweden | Ericsson | 948 | 5.5% |
| Japan | Sharp | 967 | 5.6% |
| China | Catt | 283 | 1.6% |
| Japan | NTT Docomo | 460 | 2.7% |

* A patent family is a collection of patent applications covering the same or similar technical content (European Patent Office, 2017).

Source: Prepared by the author on the basis of data supplied by Nakane T and Orita Y. (2020).

As can be seen in the graph, the EU has only 2 companies in the top 10 of firms with the greatest number of granted 5G patent families, and none of them are in the top 3. Europe accounts for 1/7 of the total 5G patent families worldwide. Moreover, Ericsson and Nokia cannot compete whatsoever with Huawei in costs. In other words, Europe is doomed to irrelevance in the field.

As President and CEO of Ericsson Börje Ekholm stated, there are structural reasons that make Europe lag behind. There is “a dangerous wait and see approach to 5G among some regulators and service providers” (Ekholm B., 2019). In the continent, operators “are trapped in a vicious circle, which leads them to continuously underinvest in their networks” (Nordström B., 2019). That underinvestment and foot-dragging approach is to blame to policymakers, since they ought to “adjust spectrum and infrastructure policies to alleviate the financial burdens on mobile operators”, apart from fostering transnational cooperation and reducing the regulatory burden which condemns Europe to lag behind. According to data gathered by the consulting firm Northstream, full EU4 (Germany, France, Italy, Spain) 5G population coverage will be available by 2023, as opposed to Japan and the US, which is

already covered and will be covered in the following months, respectively. Indeed, investment in mobile CAPEX per inhabitant is 40% lower than in the U.S. and 50% if we compare it with Japan's figures. Moreover, there has been a lack of political clarity and consensus regarding "whether they [mobile operators] must accede to U.S. demands to exclude leading equipment supplier Huawei and other Chinese vendors" (Mukherjee S., Binnie I., 2020). Nokia and Ericsson have won deals from telecom operators which are former Huawei customers and have upgraded their 4G infrastructure to 5G by switching to those companies. Nonetheless, this progress has been slow. Apart from that, the pandemic has slowed down the auctioning of 5G spectrum (which are the airwaves needed for operators to start offering commercial 5G), disappointing operators and hampering the already low rhythm. The result of all that is that at the end of 2020, global 5G mobile subscriptions surpassed 220 million, with China accounting for nearly 80% of them. "Unless Europe moves quickly, it risks lost growth and weakening industrial competitiveness in manufacturing and logistics that could cost billions of euros in new wealth" (Mukherjee S., Binnie I., 2020).

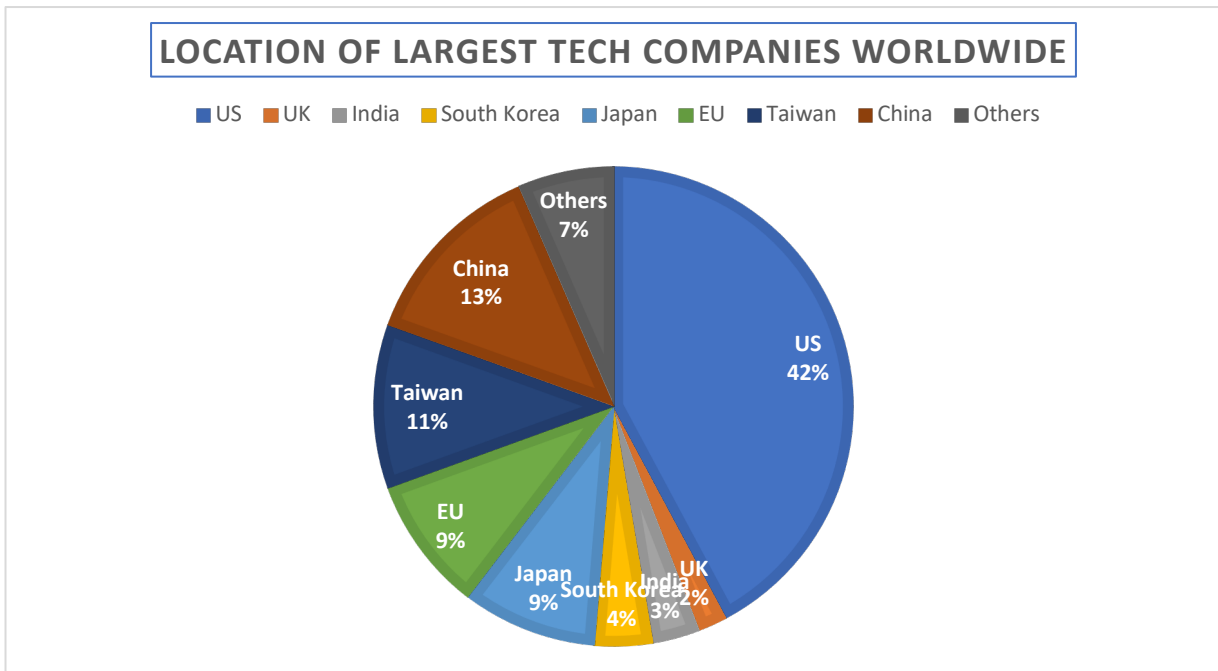
In conclusion, there are two main problems regarding the issue in Europe. The biggest one is that there are still disputes as to which what supplier (Ericsson, Nokia or Huawei) the implementation should depend on. Europe is still caught in the crossfire and in 2020 has been under American pressure not to use the Chinese supplier, at the same time that for commercial reasons it has needed to resort to it. Also, and as noted in the data, the EU does not have the capacity to ensure a fully European value chain.

Regarding the European timid position, it has not banned Huawei's deployment on the continent, but has warned of its potential dangers. This is doubly pernicious as it makes it appear as a weak and disunited actor, whilst creating friction in those European countries that perceive Huawei's deployment in other member States as a threat. Regarding the mentioned 5G Toolbox, "the executive outlined a series of non-binding recommendations that include improving security standards" (Stolton S, 2020). Similarly, "under the 2018 Electronic Communications Code, member States had been obliged to assign spectrum" for all 5G bands before 31 December 2020 and had to establish "risk profiles of suppliers based on an agreed set of criteria" (Stolton S., 2020). This has led to diverging, inconsistent and non-coherent policies in the European capitals. For example, "French authorities [The agency

nationale de la sécurité des systèmes d'information] will reportedly decline to renew the Chinese vendor's regional equipment licenses when they are due to expire" (Morris I., 2020), whilst "German incumbent Deutsche Telekom has urged authorities not to copy the UK with a ban" (Morris I., 2020), and "Belgium's center for cybersecurity has found no evidence that telecoms equipment supplied by Huawei Technology could be used for spying" (Reuters, 2019). There are other multiple and diverging approaches such as Spanish Telefónica's defense of a Huawei/ZTE-free "clean network" and Austria's Sebastian Kurz standing for a "close coordination with our European partners and also with the European Commission" (Reuters, 2020). Other countries such as the Czech Republic and Poland have warned about Huawei's threat to national critical infrastructure and have required operators to remove products sold by 'high-risk vendors'. As European Court of Auditors' Paolo Pesce stated in early 2021, "member States seem to be progressing at a different pace as we implement this measure [mitigation of risks]" (Stolton S., 2020). In sum, there is a *mêlée* of national legislation and diverging interests; whilst the EU has not yet worked on a consolidated approach to boost the deployment of the technology throughout the continent while mitigating risks and showing a united stance to China's menace.

However, this lack of initiative and of European companies with global projection is found in other fields of the digital arena, as there is only one digital company (Deutsche Telekom) in the top 20 of the global top 100. Furthermore, Europe accounts for only 4% of the market capitalization of the world's 70 largest platforms, while only Apple is worth more than the 30 largest German companies (Burwell F. G., 2020).

Chart 1 - Location of largest tech companies worldwide (as of 2020).



Source: Prepared by the author on the basis of data supplied by Ortega Klein A. (2020).

Nonetheless, there are signs that the EU has acknowledged its limitations and has tried to reverse course. It has already launched the Hexa-X project, whose vision “calls for an x-enabler fabric of connected intelligence, networks of networks, sustainability, global service coverage, extreme experience, and trustworthiness” (Hexa-X, 2020) and is inside the investigation and innovation Horizon program. It will be led by the Finnish Nokia whilst Ericsson, Siemens or Telefónica will take part.

7.2.2. *The dangers of falling behind in the acquisition and control of core assets and materials such as rare earths, batteries or hydrogen*

As Commissioner for Internal Market Thierry Breton said, “we cannot afford to rely entirely on third countries – for some rare earths even on just one country [China]” (Breton T. in Simon F., 2020). There is a pressing need for Europe to diversify its supply chains, regain control of critical raw materials and reduce its excessive dependence on foreign actors. Figures again show the EU is lagging behind and there have not been tangible results of the timid attempts it has carried out.

In the framework of the European Industrial Policy and with the goal of securing critical assets in key industrial sectors, the European Battery Alliance (EBA) was launched by the European Commission in 2017. “Supported by the Commission and the EIB, the EBA brings together EU national authorities, regions, industry research institutes and other stakeholders in the battery value chain” (European Commission, 2017). It aims to develop a global leading complete battery value chain in the continent, having gathered nearly 450 innovation and industrial actors and more than €100 billion in investment. It wants to prevent a “mostly foreign-supplier-dependent EU” (European Commission, 2017) and build a self-sufficient Union in the matter by 2025. As stated in the communication of the EC in May 2018, it aims to “secure access to raw materials from resource-rich countries outside the EU and facilitate access to European sources of raw materials” (European Commission, 2018). It aims for, for instance, having by 2025 “80% of Europe’s lithium demand supplied from European sources”. (EUR-Lex, 2019). In fact, it has proven to be successful as in 2019 investments in the EU topped €60 billion compared to the €17 billion spent in China (Šefčovič M. in Simon F., Euractiv, 2020).

Similarly, the Action Plan on Critical Raw Materials aims to “reduce dependency on primary critical raw materials through circular use of re-sources, sustainable products and innovation”. (European Commission, 2020). The EC will develop international partnerships to secure key raw materials with Canada, Australia, Norway and resource-rich countries in the MENA region. The Commission published in 2011 the first Critical Raw Materials List, enlisting those key assets on which the Union should reduce its dependency. The third and latest review in 2020 has screened 83 materials considered critical on the basis of their economic importance and supply risk. “Supply risk looks at the country-level concentration of global production of primary raw materials and sourcing to the EU, the governance of supplier countries [...] and EU importance reliance” (European Commission, 2020). Some of them are cobalt, lithium, titanium and heavy and light rare earth elements (of which the EU depends on China for 98% of them) (European Commission, 2020). Strategic technologies and sectors for the EU economy include renewables, photovoltaics, wind generators, robotics, construction, automotive, e-mobility, batteries, traction motors, fuel

cells, defense and space, drones or 3D printing, among others. Nonetheless, “in some cases is [the EU] highly exposed to vulnerabilities along the supply chain” (European Commission, 2020). In the same line, the European Raw Materials Alliance (henceforth ERMA) “aims to make Europe economically more resilient by diversifying its supply chains, creating jobs, attracting investments to the raw materials value chain and fostering innovation” (ERMA, 2021).

Other initiatives include the European Clean Hydrogen Alliance, which “is strongly anchored in the hydrogen value chain, covering renewable and low-carbon hydrogen from production via transmission to mobility, industry, energy, and heating applications” (European Commission, 2020). There are estimations of reaching €430 billion in investments by 2030. It is also included in the new industrial strategy for Europe and hydrogen is one of the key value chains identified by the Strategic Forum for Important Projects of Common European Interest (IPCEI). The Strategic Forum for IPCEI identified in 2020 six key strategic value chains: autonomous vehicles, smart health, low-CO₂ emission industry, hydrogen technologies and systems, Internet of Things (IoT) and cybersecurity. They are characterized by their technological innovativeness, economic and market potential and societal and political importance (European Commission, 2019). The need to promote the IPCEI is particularly important because of the wide range of perspectives in which they have an impact on. Politically, it improves Europe's position *vis-à-vis* the world and brings it closer to the necessary digital sovereignty. Economically, it generates increasing returns on investment in the economy of the future. Technologically, it puts Europe at the forefront of the world and environmentally contributes to achieving the goals of decarbonization and circular economy.

Nonetheless, despite these initiatives and alliances, the EU still lags behind in many aspects. In the case of rare earths -which are minerals and metals found in the ground and “are in everything from lithium-ion batteries to electric vehicles, wind turbines and missile guidance systems” (Deaux J., Vasquez J., 2021)- China mined 140,000 tons in 2020, 3.5 times more than the 38,000 tons mined in the U.S. and incomparably more than the nearly non-existent activity in Europe. Indeed, many companies send their rare earth production to be refined in China (Deaux J., Vasquez J., 2021), including European ones which extract

lithium and ship it to the Asian country to have it refined. In this sense, Europe has many materials such as reserves of cobalt, bauxite or borate but lacks the processing facilities, according to Thierry Breton (Breton T. in Simon F., 2020). Countries like “France, Germany, Portugal, Spain, Sweden, Greenland and Norway” have rare earth reserves but have not been “fully explored” (Šefčovič M. in Simon F., 2020). Aerospace, construction, automotive, low-carbon energy-intensive industries and other industrial ecosystems dependent on raw materials will account for €2 trillion of economic activity in 2030 (Šefčovič M. in Simon F., 2020), being in key parts of the supply chains and at the center of the geopolitical disputes. In sum, the EU must boost its processing facilities, reach agreements with resource-rich countries and make them respect ecological, labor and other standards; deploying its regulatory power and forcing other countries such as China to act accordingly.

7.3. **Digital future: data, intellectual property and disinformation**

The European Commission has launched the 2030 digital targets, which are the objectives to be met for achieving ‘Europe's digital decade’: the “vision of what a successful digital transformation will mean for Europeans by 2030” (European Commission, 2021). Among the many goals and guidelines it has established, this paper will focus on the most important factors for the democratization of technology and its position at the heart of the economy and society: the protection of personal data, the defense of intellectual property and halting the spread of disinformation.

It is in the field of data protection that the Union has deployed its regulatory firepower and has achieved the most comprehensive regulation worldwide. Its implications are both de jure and de facto “forcing companies around the world to comply with European privacy practices” (Shapiro J., 2020). The General Data Protection Regulation 2016/679 (henceforth GDPR) was enacted in 2016 and superseded the previous Data Protection Directive (Directive 95/46/EC) (Official Journal of the European Union, 2016), being finally implemented in May 2018 for the EEA. This ‘race to the top’ started by Europe has made other governments enact their own laws, such as the RGPD-style California Consumer Privacy Act (CCPA), which is the first comprehensive privacy law in the US. The GDPR is

applicable to any organization which has data of EU residents and it allows the EU to fine organizations up to 4% of their annual global turnover or €20 million, whichever is greater, for serious breaches, or up to 2% of their annual global turnover or €10 million for breaches of their data protection obligations. The Regulation breaks the dichotomy between the American model of data monetization by large companies (mainly FAANG) and the Chinese model, whereby the State exercises direct control over data (Puddephatt A., 2020). “My goal is to prepare ourselves so the data will be used for Europeans, by Europeans and with our values” (Breton T., in Espinoza J., Fleming S., 2020). Let us recall that companies are obliged to transmit personal data to the government at its request under China’s National Intelligence Law. Similar to it are the two initiative legislatives proposed by the EC: the Digital Services Act (DSA) and the Digital Markets Act (DMA). These two share the RGPD’s goals of “creating a safer digital space in which the fundamental rights of all users of digital services are protected” and “establishing a level playing field to foster innovation [...] and competitiveness, both in the European Single Market and globally” (European Commission, 2021). That is, the European strategy for data aims at creating a single market for data that will ensure Europe’s global competitiveness and data sovereignty. Similarly, the EC adopted on 2020 an Action Plan on Intellectual Property, “aimed at helping companies, especially SMEs, to make the most of their inventions and creations and ensure they can benefit our economy and society” (EARTO, 2020). Its main objective is to shield European companies from foreign interference and takeovers, especially Chinese ones, “as they benefit from huge state subsidies, [...] intellectual property theft, forced technology transfers and huge amounts of state-supported research and development” (Oertel J., 2020). Foreign acquisitions “enable Europe's digital competitors to access both European technology and digital infrastructure” (Ortega & Oertel in Shapiro J, 2020).

Related to that, the European Commission and the EU Cybersecurity Agency Cooperation Group published a report deeming threats from States or State-backed actors 'of greater relevance'. The group (which is inside the broader NIS Cooperation Group and included in the NIS Directive) signaled the weaknesses and threats the EU was being and will be exposed to if it did not launch a comprehensive plan regarding data, privacy and disinformation. With the same goal, the EP and the EUCO launched the Declaration

“concerning measures to ensure a high common level of network and information security across the Union” (European Commission, 2013). The goal of all that initiatives, communications and projects is to go “towards a common European data space” (European Commission, 2018).

Non-EU data cloud operators have already recognized that being admitted to the future European federated cloud infrastructure will involve adherence to a set of protocols and standards that incorporate European compliance (Renda A., 2020). However, despite all that regulatory display, the Brussels Effect ought to count with an underlying effective structure for the long run. Despite not being comprehensive nor EU-wide, efforts related to data and data holding have been started within the Union, such as the Franco-German GAIA-X initiative. It is a federated data infrastructure for Europe, “a secure, federated system that meets the highest standards of digital sovereignty while promoting innovation”; it is a combination of digital sovereignty of cloud services users with “the scalability of European cloud providers” (GAIA-X, 2020). Nonetheless, it was founded by 22 companies (11 from France and 11 Germany) and “formal admission beyond the existing 22 founding members is still pending” (GAIA-X, 2020).

It is noteworthy that, unlike the Multiannual Financial Framework for the 2014-2020 period -in which the digital transition was not a top priority whatsoever-, the European digital sovereignty is of paramount importance in the MFF approved for the 2021-2027 period (€1.1 trillion). Inside the MFF, it is of utmost transcendence the Digital Europe Program (henceforth DEP), “a program focused on building the strategic digital capacities of the EU and on facilitating the wide deployment of digital technologies” (European Commission, 2021). That €8.2 billion program aims to close the gap between research and deployment of digital technologies, mainly in the fields of supercomputing, AI and cybersecurity.

Similarly, the landmark Next Generation EU “is funneling a fifth of its 750-billion-euro recovery fund to improve countries’ digital capabilities”. (Mukherjee S., Binnie I., 2020).

Other initiatives include the Digital Single Market Strategy, which is framed in the Digital Agenda for Europe –“one of the seven flagship initiatives of the Europe 2020 strategy adopted by the Commission” (McGourty A., Maciejewski M., Ratcliff C., 2020)- and has the objective of "providing better access for consumers and businesses to digital goods and services [...], creating the right conditions for digital networks and services [...] and maximizing the growth potential of the digital economy" (McGourty A., Maciejewski M., Ratcliff C., 2020).

Finally, it should be noted that due to the fact that the EU is currently not sovereign regarding its data, it is one of the most coveted regions for extraterritorial attacks. According to Freedom House, these pose a big threat to the political system of the Union and point principally to disinformation coming from Russia, China, Iran, Saudi Arabia and North Korea (Freedom House, 2017). These regimes have been using tools to destabilize the Western democratic system for years. According to analyst José Ignacio Torreblanca, there are three problems intrinsic to digital platforms and specifically to social networks. The first is disintermediation, which refers to the lack of intermediaries (e.g., political parties) to channel citizens' demands. The second is that these social networks are based on the 'attention economy' model, and the third is the opacity of the algorithms that decide which content has priority. The EU has already experienced its consequences with, for instance, the Brexit referendum in 2016. In this respect, the Union has not worked on important regulation nor launched or fostered game-changing initiatives regarding social networks, and “the malicious actions of authoritarian States are possible in large part because democracies have failed to adequately regulate social networks” (Torreblanca J.I., 2020).

As explained, the European Union has made humongous efforts and comprehensive plans in the area of data, cybersecurity and disinformation, and in that of digital transition and sovereignty. However, neither of these have been fruitful enough to put the Union on a par with its two rivals, and at no time has it ceased to be a pawn on the battlefield. So far, it has excelled at being a referee given its regulatory power, but ‘referees do not win games’.

8. Conclusion and recommendations

As we have analyzed, the European Union has so far clearly lagged behind its competitors. Not only has it compromised its position and development in the digital arena, but it has also strained its relations with the U.S., its long-time ally. This impasse has raised tensions among EU member States whilst increasing its vulnerabilities vis-à-vis third parties (Russia or China). The supranational organization is currently facing both a humungous challenge and a historic opportunity, since "as the US struggles to rebuild its reputation and heal its own divides after the chaotic and disruptive Trump presidency, Japan and Europe must step in to shore up the global order and free trade agreements" (Harada R., 2020). Similarly, it ought not to forget that "Biden is closer to Europe than Trump, but closer to Trump than Europe" (Simon L., 2021). Europe cannot afford itself to continue sandwiched between the American surveillance capitalism and the Chinese authoritarian surveillance models. It is high time for it to ramp up its efforts.

The hypothesis set up has proven true. Based on the data presented, the EU has been naively over-dependent in its hegemonic regulatory power, losing sight of the changes on the ground and being poorly positioned in the global race. As exposed, funding in AI companies and projects is minimal in the EU (accounting to nearly 80% less than in the US), the number of global top firms for semiconductor sales is derisory, R&D spending is negligible, the number of supercomputers has increased substantially in the U.S. and China (the Asian giant has 3 times more supercomputers in the top 500 in 2019 than in 2012) whilst it has stalled in the EU, the number of European 5G patents clearly lags behind (1/7 of the total 5G patent families worldwide), the number of leading tech companies in Europe is insignificant (almost 80% less than in the US) and so. Apart from that, there have not been serious efforts regarding the securing of the supply of rare earths and critical materials -which serve as the basis for the assembly of mobiles, computers, electric vehicles or wind turbines-. In other words, Europe has substantial deficiencies in the securing and building of both hardware and software, being overexposed to foreign agents.

Apart from all that, the EU is at a disadvantage due to its structural characteristics. That is, it does not have neither competences nor the legislative power to compete on an equal footing with the U.S. and China, hindering its long-term strategic orientation due to political discrepancies in its institutions and in the European capitals. As we have seen, for instance, the risks faced by the Baltics are not the same as those issues considered as a threat by Germany. Moreover, it does not have neither the power to make limitless use of its citizens' data -like China-, nor can it adopt an American-style free-market approach.

Despite all its shortcomings and limitations, the organization has a historic opportunity to behave both as a geopolitical Europe and as a multilateral Europe. In other words, it ought to continue fostering its intra-European ties and its relations with like-minded democracies, whilst boldly asserting its power on the global stage. In this line, the prevention of foreign takeovers and other protectionist policies are the means to shield itself from third agents whilst advancing towards an 'open strategic autonomy'. It can lead by the power of its example as, for instance, “the European [Internet] model is emerging as a model that democratic governments, eager to preserve an open market for digital services while protecting citizens' interests, find increasingly attractive” (Puddephatt A., 2020). However, its liberal system is currently not sufficiently appealing for autocracies and would-be autocrats which see the Western political model as cumbersome in front of the boundless power the Chinese one confers, which is free of legal and administrative burdens.

Nonetheless, there are signs for optimism as the EU has numerous assets other jurisdictions do not count with. As mentioned, the EU's 500 million inhabitants live in high-income countries, are eager for high-value products and consider ethical and social implications in their purchasing decisions. In addition, European legal certainty and judicial independence are nowhere to be found; whilst it still has great leverage over its aid recipient countries (Africa, Latin America).

It is beyond dispute that Europe has lost the first generation of digital transformation, but it could -and should- catch up with the incoming one, that of decentralized computing and edge computing, which will give sovereignty over users' data, as previously explained.

Regarding this incipient ‘second wave’ of digital transformation, key priorities should be placed in transversal and interdependent domains: quantum technology, machine learning and data science (irretrievably related to AI), new energy technologies, smart grids, energy storage, energy efficiency, medicine and health.

Regarding these last fields, there should be avenues for future research in electric vehicle (EV) charging stations, renewables and clean hydrogen. Concerning the needed investment in EVs throughout the continent, “Biden's energy platform calls for the construction of 500,000 new public charging stations by the end of 2030” (German B., 2021) whilst China aims to make electric vehicle sales account for one fifth of all total car sales by 2025. The European Court of Auditors’ report released in April 13 criticized the “lack of clear and coherent targets for charging point rollout” and the non-existent “minimum infrastructure requirements at EU level” (Carroll S.G., 2021). Charging points throughout the EU have increased by 36,000 a year to reach 250,000 in September 2020, far from the EC’s goal of having 1 million by 2025 (it will take another 21 years to reach the objective at current pace). The EC has also set a goal “of at least 30 million zero-emission vehicles by 2030 and a largely zero-emission vehicle fleet by 2050” (Carroll S.G., 2021), figures which are considerably higher than the two million which are currently registered in the EU. Campaigners have also asked for the deployment of hydrogen re-fuelling stations; a cheap, viable and central element in the decarbonization of sectors of the economy, as Dutch minister of economic affairs and climate policy, Bas van’t Wout, highlighted in early April 2021 (Pereira M. J., 2021). Energy ministers throughout the EU have warned about the sluggish pace in establishing a regulatory framework in hydrogen and the construction of the necessary infrastructure for the production and distribution of hydrogen, which entails reducing the cost of electrolyzers (machines that separate oxygen from hydrogen to produce pure hydrogen). This issue is of special concern as the EU has already missed the boat on solar and battery technology. Hydrogen-powered fuel cells could shorten the long recharge times battery electric vehicles need, but this needs huge investments in the “engineering challenge of producing emissions-free hydrogen”, whilst demand for it and the infrastructure to transport it are still scarce. The Union aims to make hydrogen account for 12-14% of its energy supply by mid-century. For this goal, the EU seeks to produce 10 million tonnes of it

by 2030. However, there has been a clear Asian domination, as “Asian industrial heavyweights China, Japan and South Korea are keen on the prospect of green hydrogen” (Euractiv, 2021). If the EU aims to halve its emissions by 2030 and become neutral by 2050, “it will need to roughly double the share of electricity in energy consumption” (Taylor K., 2021). This, again, apart from being decisive in the global digital race, will become a geopolitical issue as it could become a weapon for hydrogen-producer countries (like in the case of oil exporting and oil consuming nations) (Euractiv, 2021). Moreover, countries such as Poland rely on coal for more than 80% of its electricity. Hence, there must be an alternative to the current model that ensures the jobs of workers in sectors that will become obsolete. The alternative must be plausible in the short term, affordable and should have the ability to relocate blue-collar workers.

Also, a tangible, plausible and promising objective would be that before the end of the current EC mandate, “at least two European companies are among the top 10 in the technology field” (Ortega Klein A., 2020). It is not possible whatsoever to create in the short term a company the size of Alphabet or one with greater added value to displace it. Hence, the strategy must be comprehensive, transversal and for the long-term, participating in as many fields as possible and being equally ambitious. An example of it was Horizon 2020, a promising project that had the goal "to ensure that Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation". Its expiration date was 2021 but has served as the framework for the Horizon Europe research and innovation program, which has a budget of some 95 billion euros for the period 2021-2027. These multi-year plans set a clear strategic orientation to build capabilities among companies and governments but can only be translated into tangible results if they have defined time frames and allocate specific quantities to work jointly with the private sector. Only through that, will the Union move from being a regulatory superpower to a technological superpower.

9. References

AI HLEG (April 2019). *Ethics guidelines for trustworthy AI*. Retrieved from <https://ec.europa.eu/futurium/en/ai-alliance-consultation>

Andersen R. (September 2020). The Panopticon is already here. *The Atlantic*. Retrieved from <https://www.theatlantic.com/magazine/archive/2020/09/china-ai-surveillance/614197/>

Arteaga F. (12 November 2019). la UE ya tiene una evaluación de los riesgos 5G (ahora falta tomar medidas). *Real Instituto Elcano*. http://www.realinstitutoelcano.org/wps/portal/rielcano_es/contenido?WCM_GLOBAL_CONTEXT=/elcano/elcano_es/zonas_es/ciberseguridad/comentario-arteaga-ue-ya-tiene-evaluacion-de-riesgos-5g

Bennhold K. (2011). What is the Beijing Consensus? *The New York Times*. Retrieved from https://scholarship.law.columbia.edu/cgi/viewcontent.cgi?article=1275&context=faculty_scholarship

Borrell J. (2020). Borrell: “Europa debe aprender rápidamente a hablar el lenguaje del poder”. *Agenda Pública*. Retrieved from <https://agendapublica.es/borrell-europa-debe-aprender-rapidamente-a-hablar-el-lenguaje-del-poder/>

Bradford A. (2012). The Brussels Effect. *Columbia Law School*. Retrieved from https://scholarship.law.columbia.edu/cgi/viewcontent.cgi?article=1275&context=faculty_scholarship

Bradford A. (2020). *The Brussels Effect: How the European Union Rules the World*. Oxford University Press. Oxford.

Breton T., in Espinoza J., Fleming S. (2020). Europe urged to use industrial data trove to steal march on rivals. *Financial Times*. Retrieved from <https://www.ft.com/content/8187a268-3494-11ea-a6d3-9a26f8c3cba4>

Breton T. in Simon F. (5 October 2020). Europe faces up to China's supremacy on raw materials. *Euractiv*. Retrieved from <https://www.euractiv.com/section/circular-economy/news/europe-faces-up-to-chinas-supremacy-on-raw-materials/>

Burwell. F.G. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 93. Madrid. Catarata.

Carroll S.G. (14 April 2021). Deployment of EU electric vehicle charging stations too slow, auditors say. *EURACTIV*. Retrieved from <https://www.euractiv.com/section/road-charging/news/deployment-of-eu-electric-vehicle-charging-stations-too-slow-auditors-say/>

Castro D., McLaughlin M. (January 2021). Who is winning the AI race: China, the EU or the United States? *Center for data innovation*. Retrieved from <https://www2.datainnovation.org/2021-china-eu-us-ai.pdf>

Caversaccio P.M. in Leprince-Ringuet Daphne (2021). US, China or Europe? Here's who is really winning the global race for AI. *ZDNet*. Retrieved from <https://www.zdnet.com/article/us-china-or-europe-heres-who-is-really-winning-the-global-race-for-ai/>

Deaux J., Vasquez J. (16 February 2021). Why rare earths may leave Europe and U.S. vulnerable. *Bloomberg*. Retrieved from <https://www.bloomberg.com/news/articles/2021-02-16/why-rare-earths-are-achilles-heal-for-europe-u-s-quicktake>

EARTO (25 November 2020). *EC adopted Action Plan on Intellectual Property*. Retrieved from <https://www.earto.eu/ec-adopted-action-plan-on-intellectual-property/>

Ekhholm, B. (2 December 2019). It's time to face the facts on 5G in Europe. *Ericsson.com*. Retrieved from <https://www.ericsson.com/en/blog/2019/12/borje-ekholm-5g-europe-falling-behind>

ERMA (2021). *European raw materials Alliance*. Retrieved from <https://erma.eu>

EUR-Lex (2012). *Consolidated version on the treaty of European Union*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12012M004>

EUR-Lex (27 April 2016). *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance)*. Retrieved from <https://eur-lex.europa.eu/eli/reg/2016/679/oj>

EUR-Lex (7 June 2016). *Official journal of the European Union*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12016E346>

EUR-Lex (9 April 2019). *Implementation of the strategic action plan on batteries: building a strategic battery value chain in Europe*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1555336470408&uri=CELEX:52019DC0176>

Euractiv (31 March 2021). *World powers race to develop 'green' hydrogen*. Retrieved from <https://www.euractiv.com/section/energy/news/world-powers-race-to-develop-green-hydrogen/>

European Commission (7 February 2013). *Directive of the European Parliament and of the Council concerning measures to ensure a high common level of network and information security across the Union*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013PC0048&from=EN>

European Commission (2017). *European Battery Alliance*. Retrieved from https://ec.europa.eu/growth/industry/policy/european-battery-alliance_en

European Commission (24 April 2018). *Towards a common European data space*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018DC0232&from=ES>

European Commission (17 May 2018). *Europe on the move. sustainable mobility for Europe: safe, connected and clean*. Retrieved from https://eur-lex.europa.eu/resource.html?uri=cellar:0e8b694e-59b5-11e8-ab41-01aa75ed71a1.0003.02/DOC_3&format=PDF

European Commission (10 April 2018). *EU member States sign up to cooperate on Artificial Intelligence*. Retrieved from <https://digital-strategy.ec.europa.eu/en/news/eu-member-states-sign-cooperate-artificial-intelligence>

European Commission (2019). *Strategic forum for IPCEI*. Retrieved from <https://ec.europa.eu/docsroom/documents/37824>

European Commission (February 2019). *EU position in world trade*. Retrieved from <https://ec.europa.eu/trade/policy/eu-position-in-world-trade/>

European Commission (8 April 2019). *Ethics guidelines for trustworthy AI*. Retrieved from <https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai>

European Commission (2020). *EIC Accelerator Pilot*. Retrieved from <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/eic-accelerator-pilot>

European Commission (2020). *European Clean Hydrogen Alliance*. Retrieved from https://ec.europa.eu/growth/industry/policy/european-clean-hydrogen-alliance_en

European Commission (19 February 2020). *White Paper on Artificial Intelligence: a European approach to excellence and trust*. Retrieved from https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf

European Commission (23 January 2020). *A new industrial strategy for Europe*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0102&from=EN>

European Commission (23 January 2020). *Cybersecurity of 5G networks – EU toolbox of risk mitigating measures*. Retrieved from <https://digital-strategy.ec.europa.eu/en/library/cybersecurity-5g-networks-eu-toolbox-risk-mitigating-measures>

European Commission (29 January 2020). *Secure 5G networks: Commission endorses EU toolbox and sets out next steps*. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/ip_20_123

European Commission (3 September 2020). *Commission announces actions to make Europe's raw materials supply more secure and sustainable*. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1542

European Commission (2021). *Europe's digital decade – 2030 digital targets*. Retrieved from <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12900-Europe-s-digital-decade-2030-digital-targets>

European Commission (2021). *The digital services act package*. Retrieved from <https://ec.europa.eu/digital-single-market/en/digital-services-act-package>

European Commission (8 April 2021). *The Digital Europe Program*. Retrieved from <https://digital-strategy.ec.europa.eu/en/activities/digital-programme>

European Commission (21 April 2021). *Europe fit for the digital age: Commission proposes new rules and actions for excellence and trust in Artificial Intelligence*. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/IP_21_1682

European Commission (22 April 2021). *A European approach to Artificial Intelligence*. Retrieved from <https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence>

European Patent Office (2019). *Patent families*. Retrieved from <https://www.epo.org/searching-for-patents/helpful-resources/first-time-here/patent-families.html>

Eurostat. (2020). *International trade in goods – tariffs*. Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php/International_trade_in_goods_-_tariffs

Freedom House (13 November 2017). *New report – freedom on the net 2017: manipulating social media to undermine democracy*. Retrieved from <https://freedomhouse.org/article/new-report-freedom-net-2017-manipulating-social-media-undermine-democracy>

- GAIA-X. (2020). *GAIA-X: a federated data infrastructure for Europe*. Retrieved from <https://www.data-infrastructure.eu/GAIAX/Navigation/EN/Home/home.html>
- Galpin R. in Saull R. (2012). *Rethinking hegemony: uneven development, historical blocs, and the world economic crisis*. (Vol. 56, p. 323-338). University of London. London. Retrieved from <https://www.jstor.org/stable/23256784?seq=1>
- Gelsinger P. (28 April 2021). The EU must play a long game for semiconductor success. *Financial Times*. Retrieved from <https://www.ft.com/content/34b07427-6bca-431d-8406-62762fc46941>
- German, B. (2020). The starting place for Biden's electric vehicle charging push. *Axios*. Retrieved from <https://www.axios.com/biden-electric-vehicles-infrastructure-924d4d85-280d-41ee-8449-fd62dd3ccecfc.html>
- Gouvernement de la République (2020). *Launch of the Global Partnership on Artificial Intelligence*. Retrieved from <https://www.gouvernement.fr/en/launch-of-the-global-partnership-on-artificial-intelligence>
- Harada R. (16 December 2020). China's power is rising in an unstable world. *Financial Times*. Retrieved from <https://www.ft.com/content/821ade99-473f-46ee-9104-5e43749e1d7b>
- Hexa-X (2020). *The Hexa-x vision is to connect human, physical, and digital worlds with a fabric of 6G key enablers*. Retrieved from <https://hexa-x.eu>
- Hobbs C. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. Madrid. Catarata.
- Hobbs C., Torreblanca J.I. (2020). *La soberanía digital de Europa*. (p. 26). Madrid. Catarata.

- Kramp-Karrenbauer A. (November 2020). *Europe still needs America*. POLITICO. Retrieved from <https://www.politico.eu/article/europe-still-needs-america/>
- Macron, E. in Franke U., Varma T. (2020). Independence play: Europe's pursuit of strategic autonomy. *European Council on Foreign Relations*. Retrieved from https://ecfr.eu/wp-content/uploads/ECFR_Independence_play_Europe_pursuit_strategic_autonomy.pdf
- McGourty A., Maciejewski M., Ratcliff C. (December 2020). Digital agenda for Europe. *European Parliament*. Retrieved from <https://www.europarl.europa.eu/factsheets/en/sheet/64/digital-agenda-for-europe>
- Mearsheimer J.J. in Dixon W.J, Senese P.D. (2002). *Democracy, disputes and negotiated settlements*. (vol 46, p. 547-571). University at Buffalo. Buffalo. Retrieved from <https://www.jstor.org/stable/3176190?seq=1>
- Miailhe N. (2018). The geopolitics of artificial intelligence: the return of empires? *CAIRN*. Retrieved from https://www.cairn-int.info/article-E_PE_183_0105--the-geopolitics-of-artificial.htm#
- Michel C. (September 2020). 'Strategic autonomy for Europe - the aim of our generation'. *European Parliament*. Retrieved from <https://www.consilium.europa.eu/de/press/press-releases/2020/09/28/1-autonomie-strategique-europeenne-est-l-objectif-de-notre-generation-discours-du-president-charles-michel-au-groupe-de-reflexion-bruegel/>
- Morris I. (10 September 2020). Europe is showing Huawei the exit. *LightReading*. Retrieved from <https://www.lightreading.com/5g/europe-is-showing-huawei-exit/d/d-id/763814>

- Mukherjee S., Binnie I. (28 December 2020). Analysis: Europe plots catch-up in global 5G race to drive COVID-19 recovery. *Reuters*. Retrieved from <https://www.reuters.com/article/us-europe-5g-analysis-idUSKBN2920WJ>
- Mullen A. in Ortega Klein A. (2020). (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 69. Madrid. Catarata.
- Nakane T., Orita Y. (11 December 2020). Landscape analysis of 5G patent families. *Managing IP*. Retrieved from <https://www.managingip.com/article/b1plrrv4knsgnm/landscape-analysis-of-5g-patent-families>
- Nordström B. (11 September 2019). Can Europe compete in 5G? Not without addressing barriers in our way. *Ericsson.com*. Retrieved from <https://www.ericsson.com/en/blog/2019/9/can-europe-compete-in-5g-not-without-addressing-barriers-in-our-way>
- Nye J., Keohane R. in Rana W. (2015). Theory of Complex Interdependence: A Comparative Analysis of Realist and Neoliberal Thoughts. *International journal of business and social science* (No 2., vol 6.). Quaid-i-Azam University. Islamabad. Retrieved from http://www.ijbssnet.com/journals/Vol_6_No_2_February_2015/33.pdf
- Oertel J. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 53. Madrid. Catarata.
- Official Journal of the European Union. (19 March 2019). *Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 establishing a framework for the screening of foreign direct investments into the Union*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0452&from=EN>

- Ortega Klein A. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 73. Madrid. Catarata.
- Ortega Klein A. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 75. Madrid. Catarata.
- Ortega & Oertel in Shapiro J. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 32. Madrid. Catarata.
- Pereira M. J. (8 April 2021). Energy ministers urge for regulatory framework on hydrogen. *Euractiv*. Retrieved from <https://www.euractiv.com/section/eu-council-presidency/news/energy-ministers-urge-for-regulatory-framework-on-hydrogen/>
- Puddephatt A. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 49. Madrid. Catarata.
- Puddephatt A. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 50. Madrid. Catarata.
- Renda A. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 96. Madrid. Catarata.
- Renda A. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 97. Madrid. Catarata.
- Rep. Robin Kelly (D-Ill.) in Overly S., Heikkila M., Politico (2021). China wants to dominate AI. The U.S. and Europe need each other to tame it. *Politico*. Retrieved from <https://www.politico.com/news/2021/03/02/china-us-europe-ai-regulation-472120>

Reuters (15 April 2019). *Belgian cybersecurity agency finds no threat from Huawei*. Retrieved from <https://www.reuters.com/article/us-huawei-tech-security-belgium-idUSKCN1RR1GP>

Reuters (20 January 2020). *Austria to collaborate with EU partners on Huawei 5G decision*. Retrieved from <https://www.reuters.com/article/us-austria-5g-huawei-tech-idUSKBN1ZJ10R>

Šefčovič M. in Simon F., Euractiv (2020). EU's Šefčovič: Europe must be 'much more strategic' on raw materials. *Euractiv*. Retrieved from <https://www.euractiv.com/section/energy-environment/interview/eus-sefcovic-europe-must-be-much-more-strategic-on-raw-materials/>

Shapiro J. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. Madrid. Catarata.

Shapiro J. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 25. Madrid. Catarata.

Shapiro J. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. P. 33. Madrid. Catarata.

Simón L. (24 March 2021). Descifrando la nueva Administración Biden desde la geoconomía y la geopolítica". *Real Instituto Elcano*. Retrieved from https://www.youtube.com/watch?v=hTUK2p__so0

Stephens P. (2020). Europe must takes sides with the US over China. *The Financial Times*. Retrieved from <https://www.ft.com/content/12279ebf-d462-41a5-af9e-50d27b1e132f>

Stolton S. (8 January 2021). EU nations divided on 5G security, auditors say. *Euractiv*. Retrieved from <https://www.euractiv.com/section/5g/news/eu-nations-divided-on-5g-security-auditors-say/>

Sullivan J. (December 2020). *Twitter*. Retrieved from <https://twitter.com/jakejsullivan/status/1341180109118726144>

Taylor K. (13 April 2021). Energy efficiency must apply across all renewables, EU Commission says. *Euractiv*. Retrieved from <https://www.euractiv.com/section/energy/news/energy-efficiency-must-apply-across-all-renewables-eu-commission-says/>

The Economist (2020). *Europe's "Sinatra doctrine" on China*. Retrieved from <https://www.economist.com/europe/2020/06/11/europes-sinatra-doctrine-on-china>

The Economist (13 March 2021). *A confident China seeks to insulate itself from the world*. Retrieved from <https://www.economist.com/china/2021/03/11/a-confident-china-seeks-to-insulate-itself-from-the-world>

Think Nexus (2019). *Artificial intelligence – comparison of US's and EU's regulatory approaches*. Retrieved from <https://thinknexus.ngi.eu/wp-content/uploads/2018/10/White-paper-artificial-intelligence.pdf>

Torreblanca J.I. (Hobbs C., Torreblanca J.I.). (2020). *La soberanía digital de Europa*. Madrid. Catarata.

Torreblanca J.I. (Hobbs C., Torreblanca J.I.). (2020). P. 39. *La soberanía digital de Europa*. Madrid. Catarata.

- Ulmann L. (2020). For a European strategic industrial autonomy. *The European files*. Retrieved from <https://www.europeanfiles.eu/magazine/for-a-european-strategic-industrial-autonomy>
- Uttamchandani R. (November 2019). California Consumer Privacy Act is coming: el pseudo-RGPD que será aplicable a partir de enero de 2020. *Legal army*. Retrieved from <https://www.legalarmy.net/california-consumer-privacy-act-is-coming-el-pseudo-rgpd-que-sera-aplicable-a-partir-de-enero-de-2020/>
- Varas A., Varadarajan R. (September 2020). Government incentives and US competitiveness in semiconductor manufacturing. *Semiconductor Industry Association*. Retrieved from [semiconductors.org/wp-content/uploads/2020/09/Government-Incentives-and-US-Competitiveness-in-Semiconductor-Manufacturing-Sep-2020.pdf](https://www.semiconductors.org/wp-content/uploads/2020/09/Government-Incentives-and-US-Competitiveness-in-Semiconductor-Manufacturing-Sep-2020.pdf)
- Verhofstadt G. (January 2020). *Twitter*. Retrieved from <https://twitter.com/guyverhofstadt/status/1346397250851917824>
- Waltz K. (1993). The emerging structure of international politics. *International Security*. (Vol 18., pp. 44-79). The MIT Press. Boston. Retrieved from <https://www.jstor.org/stable/2539097?seq=1>
- Wike R., Fetterolf J., Mordecai M. (September 2020). U.S. image plummets internationally as most say country has handled coronavirus badly. *Pew Research Center*. <https://www.pewresearch.org/global/2020/09/15/us-image-plummets-internationally-as-most-say-country-has-handled-coronavirus-badly/>