PrometheEUs

EXECUTIVE SUMMARY

THE N(EU) WAY TO ARTIFICIAL INTELLIGENCE

Challenges and Perspectives for Southern Europe

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Introduction[1]

Looking at data, a pattern of competitive disadvantage of Europe compared to the US and China seems to emerge.

In terms of patents, according to the European Commission's Joint Research Center (2018), between 2009 and 2018, Chinese AI players filled 57% of requests, versus 13% from the US and 7% from South Korea and the European Union.

In 2018, over 51% of published AI patents were attributed to North America, with the share of Europe and Central Asia declining to 23%, less than two percentage points above East Asia and the Pacific (in 2002 the gap between Europe and East Asia was approximately 20 percentage points) (Source: Artificial Intelligence Index Report 2019, Stanford University).

Out of 41 AI unicorns in March 2019, 18 were based in the US, 17 in China and only 1 in the EU (Source: Global Artificial Intelligence Industry Data Report, China Academy of Information and Communications Technology).

In 2018, a wider look at the start-up environment allowed Roland Berger and Asgard to survey 769 EU startups specialized in AI, much less than in the US (1,393) but significantly more than in China (383). However, close to one-third of the EU startups were based in the UK, now no longer a EU Member State. Moreover, in a world ranking of hosting cities, the first EU hub (Paris) is only in 10th position, due to the extreme fragmentation in Europe.

Fragmentation is definitely one factor at play, reducing EU chances to become an AI world leader, frustrating the high potential to be found in the number of top EU scientists (by far the highest in the world, according to a recent study by Tsinghua University).

However, the gap in the overall amount of investments appears to be the most startling reason for Europe lagging behind the US and China.

In 2018, according to Stanford University estimates, US companies invested $18.7 billion in AI, compared to China's $14.35 billion. The largest 5 EU Member States were not even able to attain

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together the level of UK investment ($1.255 bn vs. $1.27 bn), and only slightly surpassing the much less populated Israel ($ 1.044 bn).
However, also in terms of public investments, the US is allocating large resources, projected to amount to approximately $5 billion ($ 4 bn from the Department of Defense) (Source: Artificial Intelligence Index Report 2019, Stanford University). The same holds true for China.

1. The Global Race for AI: China, the US, and the EU

1.1 Three main AI models

China, the US and the EU have shown different approaches to the development, implementation and regulation of AI, outlined in their respective strategies (New Generation of AI Development Plan, American AI initiative, and White Paper on AI). China designed a plan based on three sequential goals: (1) to reach a globally advanced level in terms of AI by 2020, (2) to use AI as the main driver for upgrading its economic and industrial capabilities by 2025, and (3) to become the main innovation hub in the world by 2030. This strategy is mainly focused on the role of the state, which protects and invests in those businesses that have made it to the top after an initial phase of fierce domestic competition.
On the other hand, the US gives a much more prominent role to the market and the investments made by big corporations, maximizing space for innovation through lighter public regulation. The US strategy relies to a greater extent on voluntary self-regulation, and the protection of values that they consider as "core", such as freedom, human rights or the rule of law. Finally, the EU is trying to develop legislation that paves a third way between the other two models, promoting what is dubbed as "ethical and trustworthy AI". Its strategy aims at fostering cooperation between the public and private sector, as well as ensuring a set of values that are considered to be key (e.g., transparency, accuracy, robustness and non-discrimination).

1.2 The need for a global governance framework

Each of the three models mentioned above is linked to a different set of priorities that could eventually inspire a global regulation. These differences thus reinforce the narrative of an "AI race". To be sure, competition between states in the development and governance of strategic technologies – such as AI – is not necessarily negative. However, we must be wary of the risks of that competition taking a confrontational turn. By constructing a network of shared principles, rules and institutions, we believe the balance can be tilted again towards a more desirable combination of competition and cooperation. But what concrete incentives do states have to adopt a global governance framework?
In our view, there are two main justifications for the development of this framework. Firstly, the need to preserve stability and a level playing field in international relations. A confrontational race, with countries desperately trying to overtake others in the development of their AI capabilities, could produce adverse outcomes such as a rise of "AI nationalism", loss of talent and resources (flowing from less developed nations to the leaders of the race), and unilateral rule-

setting by the superpowers and strong international firms. A new form of "data colonialism" could emerge, and the will of citizens from countries on the losing end could be easily subverted, with tensions in the realm of AI translating into more open conflicts, to the detriment of the superpowers themselves. Moreover, there would be no way to ensure accountability for any actions that threaten international stability.

The second reason for this global framework has to do with the negative spill-over effects that AI development may have beyond national borders. For instance, drones and other types of Lethal Autonomous Weapons (LAWs) could become more precise, attain a higher degree of autonomy and even operate without human oversight once they are sent on a mission. Similarly, cyber-attacks – with their associated economic, and possibly political damage – could increase the aforementioned tensions even more.

1.3 A two-tier governance model

In order to avoid the problems of an unregulated AI race, and to tame the potential for escalation, we advocate the adoption of a governance model that goes beyond "informal", trust-based arrangements, while at the same time avoiding overly intricated frameworks that entail the creation of new institutions and "global oversight bodies".

We distinguish between core and extended principles, depending on their substance and on who the adherents would be. On the one hand, the core principles are broad enough to be accepted by all nations but have enough depth to regulate some of the most acute problems the development of AI faces. On the other hand, the extended principles would expand the rules established in the core principles, and initially would be adopted by a "coalition of the willing", which would gradually become larger if said extended principles prove effective. The ultimate goal of this two-tier, multi-speed governance model is to strike a balance between ambition and realism. We have based our principles on previous work by the OECD and the G20, which made some progress on possible frameworks for future regulations.

Our first core principle would be a common definition on what is meant by AI, as it would set the foundation for all further discussions. Secondly, human oversight would be required in all operations involving LAWs. Thirdly, transparency in the functioning of AI would be ensured, in order to enable citizens to understand both the process and the outcome of the decisions taken by the machines. The final core principle focuses on the need for a robust AI, so that no malfunctioning could pose any risk to a human being.

The extended principles would build upon these foundations but adding several elements to them. Firstly, legal instruments would be developed in order to ensure the accountability of human operators, programmers or those giving the orders in the actions of LAWs, including a system of reparations. Secondly, a broad agreement would be reached on the protection of the private sphere of the citizens, especially with regard to their data. Finally, non-discrimination would be enshrined as a core principle in the development of AI, and the enforcement of said principle would take place both within countries and on the international level.

We believe that the EU is especially well positioned to spearhead the creation of this global governance framework, given its vast experience in multilateral negotiations and in brokering

deals amongst distant partners. At the same time, the EU is strongly associated with its soft power and its regulatory power, which has given rise to the so-called "Brussels effect". By becoming a referee, capable of setting the standards for the global regulation of this new technology, the EU could eventually emerge as a clear winner of the AI race.

2. The European Response: Adoption of AI in Europe and challenges ahead

2.1 The European AI landscape

Taking the above trends at the global environment what is Europe response? The Digital Economy and Society Index (DESI) for 2019 signals an asymmetry in EUs digital advance. Scandinavian countries outperformed among European members, while most of the Southern – Eastern European countries ranked below the EU average. The United Kingdom, Sweden, Finland, and Ireland seem more ready to welcome an AI transition since they ranked in the top 25% in AI Readiness Index for at least the half categories of the index. On the other hand, Spain, Portugal, Italy, and Greece did not achieve this percentile in any of the examined categories (Bughin et al., 2019). The European presence in several rankings about the AI technologies adoption worldwide is predominated by Germany (WIPO, 2019).

According to McKinsey's 2018 Digital Survey, European companies are less mature not only in their state of diffusion of digital technologies but also in the use of those technologies for new services and business models. Only two European firms are in the worldwide top 30 digitized companies, and at the end of 2017, none of the ten largest internet companies worldwide was based in Europe. Also, less than 50% of the European firms have implemented one AI technology, and most of them are in the pilot stage (Bughin et al., 2019). In terms of investment levels, startups in the United Kingdom received 55% of the EU total investment from 2011 to mid-2018, followed by Germany (14%) and France (13%), when the remaining 25 countries appropriated less than 20% of all private AI equity (OECD, 2019a).

Taking on AI requires a high level of business digitization. According to the Digital Intensity Index (DII), Finland and Denmark possessing more than 10% of highly digitized firms (percentage to total enterprises) followed by Sweden with 8%. In Bulgaria, Greece, Spain, and Italy, the majority of firms (over 55%) disposed of low investments in digital technologies. Likewise, the DESI index suggested a vast gap among European countries regarding the Integration of Digital Technology. Ireland, Netherlands, Belgium, and Scandinavian countries achieve the highest positions, whereas Cyprus, Greece, and Italy rank below the EU average.

The top five contributors to ICT sector value added in the EU for 2016 were the EU's five largest economies (Germany, the United Kingdom, France, Italy, and Spain) accounting for 69% of the total EU ICT sector value-added. As a proportion of GDP, Spain, Italy, Greece, and Portugal ranked below the EU average, and as a share of total employment, Southern European Countries are lagging as well. Bughin et al. 2019 state that Europe is already in supply shortage of the advanced skills needed for AI transformation. The lack of skills is also suggested by the Human capital

dimension of DESI 2019. Apart from Malta, the Southern European countries listed below the EU average, indicating a severe insufficiency in digital skills progress.

2.2 European challenges for successful AI adoption

Ensuring inclusive and sustainable growth requires that the geographical disparities regarding AI adoption inside the continent are confronted. An apparent gap in AI readiness inside Europe is evident, with Southern and Eastern Europe being critically behind than the Northern states. Furthermore, it is vital to promote collaboration among research institutions and encourage synergies with the private sector.

Human skills are imperative for AI adoption since both high technological capabilities and emotional intelligence abilities, which cannot be developed by machines, are equally important. Human capital skills are already in shortage of more developed countries concerning AI applications. Vital regional differences are also present in this dimension. Southern EU member states demonstrate a severe insufficiency in digital skills progress. Considerable risk of a potential digital exclusion exists. For instance, in Portugal and Greece, approximately half of their citizens do not possess at least the necessary digital skills. The vast disparity among EU states is present as regards the share of the labour force that has no digital skills. What is more, ICT specialists are not equally shared among EU member states as well. The South experiences a significantly less proportion of them relating to the total level of employment. Slightly more encouraging is the landscape pertaining to the ratio of ICT graduates to the total number of graduates, but still, there is potential to improve.

Challenges can be traced to the notably lower business digitalization and e-commerce development in the Southern countries in contrast to the Northern ones where it is blooming. Investment in AI development is significantly lower in the Southern firms compared to their Northern counterparts. This is also evident in the small share of R&D investment, where current statistics point out a high concentration in the four largest economies in the EU. In general, firms located in the South of Europe appear to be less capable of developing, adopting and transferring innovation and technology breakthroughs. Furthermore, small business size, which is a structural characteristic of the business demography in the South, is a significant barrier and affects any efforts to improve the technological advancement and invest heavily in AI.

Specifically, SMEs have to deal with a series of issues for being able to follow the current trends in AI adoption. Cultural barriers and a fear of change and transition to a new business model, are affecting negatively such decisions. The transition to an AI model, in most cases, is not included in the strategic business objectives. Evidence might suggest that firms in Southern Europe cannot fully appropriate the benefits that AI could offer to their operation and services. The shortage of technology experts and the difficulty for SMEs to attract them is another critical issue that delays the AI escalation. From the infrastructure perspective, digitization of the firm and its services is key for AI enabling. However, endeavours of SMEs in this direction are evolving at a slower pace relating to bigger players.

On another note, the lack of prominent technology companies in Europe affects the development of novel firms. A new entrepreneur would be more willing to undertake AI investments if larger firms that could buy or invest in this venture were available. This possibility mitigates the undertaken risk substantially, encouraging SMEs' growth. Furthermore, startups and SMEs might be in an adverse position compared to larger firms regarding their ability to absorb public funding, since the bureaucratic and technical procedures are not negligible.
These differences matter. Countries that are AI leaders could have faster growth and higher productivity than the rest, making the lag even more substantial and difficult to catch up. Primarily, if the potential digital gap among the EU and the other digital leaders (China and the US) is taken into account, the in-house challenges should be addressed holistically and instantaneously.

3. The European Commission's Digital Strategy and the AI White paper

The first Von der Leyen Commission digital proposals were published on 19 February 2020, including two Communications (Shaping Europe's digital future & A European Strategy for data), a white paper (Artificial Intelligence: a European Approach to excellence and trust) and two reports (B2G Expert Group Report: Towards a European Strategy on business-to-government datasharing for the public interest and the Commission Report on Safety and liability implications of AI, the Internet of Things and Robotics).
The current EC updated and upgraded the DSM strategy, with its priorities and proposals. In the **Communication "Shaping Europe's digital future"**, the Commission establishes three key objectives to ensure digital transformation complies with European values: 1) a technology that works for people; 2) a fair and competitive economy and 3) an open, democratic and sustainable society.
As data is the essential enabler for AI, the **European Data Strategy** aims at Europe emerging as a leader in the data economy, providing for a single market for data and a larger role for European companies.
The Commission starts from acknowledging that the EU has the potential to be successful in the data-agile economy, thanks to its technology, its know-how and its highly-skilled workforce. However, several issues are holding the EU back from realising its potential in the data economy, mainly due to the fragmentation between Member States (compared to the small number of US and China-based Big Tech firms). Among the most important issues, the strategy lists: 1) availability of data; 2) imbalances of market power; 3) data interoperability and quality; 4) data governance; 5) data infrastructures and technologies; 6) empowering individuals to exercise their rights; 7) skills and data literacy; 8) cybersecurity.
Included in the actions envisaged by the strategy, the Commission aims at supporting business-to-business data sharing, investing in a High Impact Project on European data spaces and federated cloud infrastructures, by the establishment of EU-wide common, interoperable data spaces (in manufacturing, environment, mobility, health, finance, energy, agriculture, public

administration and skills) and the setting up of a cloud service marketplace, empowering individuals regarding their data and investing in skills and general data literacy.

3.1 AI white paper: the striving for excellence and the need for regulation

The AI White Paper aims at setting a framework for trustworthy Artificial Intelligence, based on excellence and trust.

In the so called "**ecosystem of excellence**", among several planned actions, the Commission aims at proposing to the Member States a revision of the 2018 Coordination Plan, facilitating the creation of excellence and testing centers that can combine European, national and private investments. This involves working with MSs to ensure that at least one digital innovation hub per MS has a high degree of specialization in AI, setting up a new public-private partnership in AI, data and robotics in the context of the Horizon Europe Programme.

For the other ecosystem ("**ecosystem of trust**"), the Commission assesses the main risks associated with AI in order to ensure a European regulatory framework for a trustworthy AI.

The risk-based approach allows for a proportionate regulatory intervention, heavier for high-risk AI applications than for other lower-risk applications.

According to the white paper, an AI application should be considered high-risk when it meets the following two cumulative criteria: 1) it is employed in a sector where, given the characteristics of the activities typically undertaken, significant risks can be expected to occur (for instance, healthcare, transport, energy and parts of the public sector); 2) the AI application in the sensitive sector is used in such a manner that significant risks are likely to arise (based on the kind of impact on presumably affected parties). Moreover, the use of AI applications for employment processes, biometric identification and other intrusive surveillance purposes would always be considered as high-risk.

Mandatory requirements for high-risk applications would cover the following areas: 1) training data; 2) data and record-keeping; 3) information to be provided 4) robustness and accuracy; 5) human oversight; 6) specific requirements for certain specific applications, such as biometric identification.

These requirements would be at least in part verified under prior conformity assessments, in line with already existing mechanisms for a large number of products being placed on the EU's internal market.

Of course, ex post controls could be still enforced by competent national authorities.

For non-high risk applications, the Commission envisages a voluntary labelling scheme, allowing the economic operators to signal the trustworthiness of their products or services.

3.2 Some remarks: how to foster EU innovation and a thriving ecosystem based on SMEs

An ecosystem of excellence

While the EU should strive to improve its current standing in research and innovation, increasing public and private investments but also better coordinating existing initiatives, most companies, especially SMEs, would be either only or mainly AI users. Therefore, for a competitive economy,

the EU regulatory framework should lead the vast majority of companies to adopt AI easily and at a cost to be competitive.
EU objectives to increase R&D and productive excellence should not jeopardize the possibility for EU citizens and companies to have access to the best available AI technologies at a competitive price. A balanced approach should be used taking into full account the interests of all the concerned parties, including the vast majority of citizens and companies that would be adopters rather than R&D and/or commercial producers in the AI ecosystem.
Both training and advice to SMEs should be key activities for AI specialized digital innovation hubs (DIHs). For this reason, foreseeing only one DIH per Member State may involve a sizeable geographical barrier for SMEs, especially in larger countries. A more distributed network of DIHs providing expertise to SMEs in different regions should be pursued, possibly involving trade associations and larger AI technology players.

An ecosystem of trust

To start with, a EU-wide regulatory approach is preferable in order to avoid major risks of internal market fragmentation. Therefore, Member States should refrain from unilateral moves and look for agreements and alliances at EU level.
Although some new legislation is certainly required and a EU-wide regulatory framework is surely preferable to national, current legislation should apply whenever possible in order to avoid excessive market fragmentation and uncertainty and increase compliance costs for companies, especially SMEs.
Whenever possible, a clearer interpretation of current legislation to be applied to all products, including those embedding AI, should be chosen instead of new legislation reserved to AI products.
Although many mentioned concerns deserve a high level of scrutiny and sometimes need to be addressed by ad hoc regulation, it would be fairer to compare AI applications with a human-based benchmark. It would not be realistic to expect AI achieving an error-free perfection where, in the same field, the same standard is not currently applied. This requirement could significantly stifle innovation, especially from SMEs and new entrants.
If the two proposed cumulative criteria to determine “high-risk” AI applications seem quite logical and could help provide legal certainty, exceptional additional instances should be better defined and limited to specific cases in order to avoid any ambiguity, where the aim of the risk-assessment approach is exactly the opposite.
Concerning enforcement, the regulatory framework should mostly rely on ex-ante self-assessment, instead of an external procedure, in order to speed up the innovation process and ensuring a thriving European AI ecosystem, setting low compliance costs for SMEs, and ex-post enforcement, paramount to guaranteeing full compliance by AI developers and deployers.