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EU Technological Sovereignty and Its Limits

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Protectionism, the pandemic and the sanctions wars that we have been witnessing over the past few years have contributed to the curtailment of globalisation as we knew it. The international division of labour at the global level is narrowing and is being localised in individual regions. The era of techno-economic blocs is coming, which means that high technology is moving into the geopolitical plane and taking on a strategic dimension. Technological independence and security are becoming critical for the main global politics players, and the EU is no exception.

To mitigate the geopolitical risks in an increasingly divided world, in which established production and supply chains are collapsing, the EU has resolved to master key core technologies in microelectronics, quantum computing, artificial intelligence and blockchain, and to find reliable supply chains.[1] In other words, the EU is seeking ways to resolve the technological sovereignty issue.

Defining concepts

The term “technological sovereignty” is often used to describe various forms of independence, autonomy, or control over digital technologies and content. However, this concept lends itself to different interpretations in scientific and political discourse. Some scholars believe that “technological sovereignty” can be interpreted as “the need for a country to develop or maintain autonomy with regard to key technologies, or to have the lowest possible level of structural

[1] Crespi F., Caravella S.,Menghini M.,Salvatori Ch. European Technological Sovereignty: An Emerging Framework for Policy Strategy // Intereconomics. Number 6. Volume 56, 2021. Pp. 348–354. URL: https://www.intereconomics.eu/contents/year/2021/number/6/article/european-technological-sovereignty-an-emerging-framework-for-policy-strategy.html

dependence." Others believe that it is about "the ability of a country (or a group of countries) to autonomously generate technological and scientific knowledge or to use technological capabilities developed by external players via activating reliable partnerships."[2]

Thus, in the first case, the emphasis is on independent development of key technologies, and in the second case the emphasis shifts towards establishing reliable partnerships.

European officials understand technological sovereignty as something lying in the middle of the above interpretations. Thus, talking about his understanding of strategic autonomy, which is overall directly related to the "technological sovereignty" concept, EU Commissioner for the Internal Market Thierry Breton said as follows in his keynote speech in 2020: "Strategic autonomy doesn't mean protectionism, it is not about closing the doors to our partners, isolating ourselves, or blocking foreign investments <...> It refers rather to the capacity to have a choice, in developing and maintaining our infrastructures, technologies, skills, competencies, and in reducing critical dependencies on third countries, so we can rely on our own if necessary."[3] This raises the problem of balance: What will prevail? Is it developing domestic high-tech production or engaging external cooperation partners? In order to understand this, let's see how Europe is getting ready for an autonomous "technological voyage" and whether this is even possible in the foreseeable future.

[2] Crespi F., Caravella S.,Menghini M.,Salvatori Ch. European Technological Sovereignty: An Emerging Framework for Policy Strategy // Intereconomics. Number 6. Volume 56, 2021.Pp. 348–354. URL: https://www.intereconomics.eu/contents/year/2021/number/6/article/european-technological-sovereignty-an-emerging-framework-for-policy-strategy.html

[3] Keynote Speech – Thierry Breton, Commissioner for Internal Market, European Commission // European Defence Review. 8.12.2020. URL:https://www.edrmagazine.eu/keynote-speech-thierry-breton-commissioner-for-internal-market-european-commission

Steps to achieve "technological freedom"

The first notable thing is the EU does not begin its journey to "technological freedom and security" from square one. EU members have a significant technological foundation. For example, everyone heard about Finnish Nokia, German Siemens and Bosch, French Orange and so on. In microelectronics, the EU countries can make equipment for manufacturing semiconductors that enjoy wide demand across the world (Dutch company ASML), cryptographic chips (German Infineon), semiconductor components (Dutch NXP) and the like. In addition, existing computing power also matters. For example, the French company Atos makes supercomputers and conducts research in the sphere of quantum calculations.[4]

However, despite this sizable technological potential, it is not enough in the current unstable geopolitical circumstances. Therefore, in order to ensure relatively autonomous and safe swimming in the "technological ocean" (and in the future, to compete with the US and Chinese "sharks,") the EU is active in several areas at once.

First, in the EU, the focus is on developing cyberspace standards and norms, which should help establish control over technology. The General Data Protection Regulation (GDPR) is already operational and the Digital Markets Act (DMA) and the Digital Services Act (DSA) designed to limit the US technology giants' dominance in Europe and

[4] Quantum computing is still at an experimental stage, but has enormous breakthrough potential.

to protect users in digital space, will enter into force soon.[5] The European Parliament believes that the adoption of new draft laws is more than just an opportunity to set the trajectory for the development of the digital economy in the EU, but also a chance to become a global benchmark in developing standards, which can offset Europe's losses in the battle for technological leadership.[6] The opening of an EU office in the Silicon Valley[7] in early September to provide European regulatory bodies with direct access to the US technology juggernauts is indicative of the EU's serious plans to achieve leadership in technology regulation.

Second, Europeans are increasing R&D appropriations[8] and also drafting a framework scientific research and innovation programme titled Horizon Europe, whose 2021–2027 budget will amount to about 95.5 billion euros.[9] On a separate note, a few words should be said about EU research in quantum computing programmes, especially since in 2018 the EU made quantum technologies its priority and allocated 1 billion euros to fund joint research programmes during the next 10 years.[10] Quantum Flagship is one of EU's most ambitious research initiatives and is believed to be the world's largest quantum technology funding entity. The EU fears it may fall behind in the quantum race, which

[5] According to experts, European companies are 90 percent dependent on US service providers to manage their data, which creates risks in terms of control over third-party access to data, espionage, cyber threats and secure access.

[6] Facebook whistleblower Frances Haugen testifies in Parliament on 8 November // European Parliament. 03.11.2021. URL: https://www.europarl.europa.eu/news/en/press-room/20211028IPR16121/facebook-whistleblower-frances-haugen-testifies-in-parliament-on-8-november

[7] Why the European Union is opening a Silicon Valley 'embassy' // World Economic Forum. 16.08.2022. URL: https://www.weforum.org/agenda/2022/08/why-the-european-union-is-opening-a-silicon-valley-embassy

[8] In 2021, public budget allocations for R&D in the EU amounted to 109.25 billion euros (0.75 percent of EU GDP), which is 35 percent more than in 2011, 81.139 billion euros. See: URL: https://3dnews.ru/1071691/bolshe-vsego-v-evrope-byudgetnih-sredstv-na-niokr-videlyayut-v-shveytsarii-i-norvegii-a-v-es-v-lyuksemburge

[9] European Community Research and Innovation Framework // National Research University Higher School of Economics. URL: https://fp.hse.ru/frame

[10] Pannier A. Europe's Quest for Technological Power // CIRSD. URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

is fraught with major risks, including cybersecurity risks (it is believed that quantum computers will be able to break existing encryption protocols in a matter of seconds). Also, according to experts, quantum cryptography and quantum computers may end up on lists of defence and strategic items and will thus fall under export restrictions.[11]

Third, efforts went to developing and producing domestic high-tech products. In February 2022, the European Commission published a law on European chips.[12] The EU plans to develop and produce its own state-of-the-art chips to prevent future shortages. Under this law, the commission plans to allocate 11 billion euros from state funds for research, design and production of semiconductors. In all, 43 billion euros in public and private investment should be raised by 2030 to bring the EU share on the international market of semiconductors from 9 percent to 20 percent.[13]

In addition to computer chips, in order to ensure technological autonomy and successful entry into the era of the "data economy," the EU also needs its own advanced computing power in the form of supercomputers and quantum technology. To this end, the EU is advancing an initiative to create supercomputers, including exaFLOPS high-performance computing. In particular, on July 13, 2021, the European Council adopted a resolution on creating the Euro HPC joint venture, the purpose of which is to deploy first-rate supercomputer infrastructure throughout Europe to meet user needs, as well as to develop a research and innovative ecosystem for high-performance computing technology. By 2023, it is planned to create two exaFLOPS computers that France and Germany hope

[11] Pannier A. Europe's Quest for Technological Power // CIRSD. URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

[12] European Chips Act – Questions and Answers // European Commission. 8.02.2022. URL: https://ec.europa.eu/commission/presscorner/detail/en/qanda_22_730

[13] Ibid.

to deploy on their territories. In addition, it is assumed that these supercomputers will run on European-made chips.[14] So, the EU plans to develop energy-efficient microprocessors for extreme computing, known as European Processor Initiative (EPI). The young company SiPearl is in charge of developing the chips. It plans to launch the Rhea processor in 2022 and deliver it on time for the European exaFLOPS supercomputers in 2023.[15]

The EU member states are pursuing quantum technology cooperation with a Memorandum of Understanding recently signed by France and the Netherlands to establish academic cooperation and to create synergy between French and Dutch companies.[16]

What stands in the way of the desired goal?

According to Thierry Breton, "a radical change needs to be achieved quickly to manage… the digital transition and to avoid external dependencies in the new geopolitical context."[17] However, despite the achievements, there are major headwinds, such as:

[14] Pannier A. Europe's Quest for Technological Power // CIRSD. URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

[15] Ibid.

[16] Ibid.

[17] Crespi F., Caravella S., Menghini M., Salvatori Ch. European Technological Sovereignty: An Emerging Framework for Policy Strategy // Intereconomics. Number 6. Volume 56, 2021. Pp. 348–354. URL: https://www.intereconomics.eu/contents/year/2021/number/6/article/european-technological-sovereignty-an-emerging-framework-for-policy-strategy.html

- Structural dependence on foreign companies in a variety of sectors from raw materials and components[18] to digital platforms and telecom infrastructure.[19] For example, there is deep dependence on US and Asian semiconductor products made by companies such as Intel, TSMC, AMD, and Nvidia. In addition, the European market is dominated by US IT companies that supply software, processors, computers, and cloud technologies[20], to name a few, to Europe. The EU largely depends on China when it comes to automatic data processing machines, telecommunication equipment and electric power equipment. Also, 98 percent of rare earth metals are imported.[21]

- Inadequate private and public investment (as compared with the United States)[22] in high-tech industries and inadequate amounts of venture capital, which fact, analysts believe, poses the risk of takeovers of European enterprises and start-up

[18] About 90 chemical elements are used in today's chip production. Also, all raw materials used in microelectronics need to be highly purified, which is a separate labour-intensive and costly process that can currently be done by only a few companies around the world.

[19] Crespi F., Caravella S.,Menghini M.,Salvatori Ch. European Technological Sovereignty: An Emerging Framework for Policy Strategy // Intereconomics. Number 6. Volume 56, 2021.Pp. 348–354. URL: https://www.intereconomics.eu/contents/year/2021/number/6/article/european-technological-sovereignty-an-emerging-framework-for-policy-strategy.html

[20] According to *Synergy Research Group,* the world's three largest cloud service providers – *Amazon, Microsoft* and *Alphabet Inc.* – account for 69 percent of the European cloud market. Europe's largest cloud service provider, *DeutscheTelekom,* has only 2 percent of the European market share, followed by *OVHCloud* with 1 percent. See.:URL: https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/microsoft-s-burgeoning-cloud-business-draws-eu-scrutiny-69718304

[21] Europe in the Geopolitics of Technology: Connecting the Internal and External Dimensions // 9.04.2021. URL: https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf

[22] For example, the EU Chip Act provides for 11 billion euros in public investment. In August 2022, the US passed the *CHIPS and Science Act,* under which $170 billion will be released in five years to boost scientific research in the US and about $52 billion in government subsidies will be set aside for US semiconductor manufacturing. An investment tax loan worth of $24 billion will be issued to the manufacturers of microcircuits as well. See.: URL: https://www.reuters.com/business/majority-us-senate-backs-bill-boosting-chipmakers-compete-with-china-2022-07-27/

companies by foreign capital, and, even worse, their relocation from the EU to third countries.[23]

- Falling behind in the patents race to China and the United States, which makes it difficult for the Europeans to enter markets with their inventions and technology.[24]

- The problem of exporting European technology to other countries amid sanctions and off-limits markets in the United States and China.[25] Access to markets is extremely important if you want companies to be competitive and profitable.

- Increased military spending, which diverts investment that could be used for technological development. In the short term, the EU will allocate an additional 200 billion euros for military needs.[26]

- Difficulties in developing and conducting a coordinated technological policy among 27 EU members.

- The energy crisis is a key obstacle to the stable production process. Enormous amounts of electricity are needed for the supercomputers or chip-making factories to function properly.[27] The current "emergency

[23] Pannier A. Europe's Quest for Technological Power // CIRSD. URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

[24] Country ranking by number of patents // NONEWS. 22.10.2018. URL: https://nonews.co/directory/lists/countries/number-patents

[25] he United States and China are keeping their markets closed to foreign suppliers. For example, a European company like *Atos* cannot hope to export its machines to these countries and its market is mainly located in Europe, Brazil and India. See: URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

[26] Borrell: EU should increase military spending to replenish supplies transferred to Ukraine // TASS. 18.05.2022. URL: https://tass.ru/mezhdunarodnaya-panorama/14659435

[27] The electricity bill for the supercomputer runs into tens of millions of euros per year. For example, *Fugaku* (Japanese supercomputer) consumes 30 to 40 MW billed at 40 million euros per year. See.: URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

situation" in energy security, coupled with future uncertainty, are significantly slowing down the build-up of computing power in Europe and technological advances in the EU overall.

Most of the above issues are hard to resolve. Political will, time and massive investment are required to overcome them. But this is still not the most difficult part.

No one can afford it

The EU is unable to secure its technological independence and "to rely on its own resources, when needed" as Breton would like to see. Moreover, no country in the world can afford it, including the United States. And here's why.

The advancements that took place in the last few decades were possible due to globalisation and the international division of labour. Let's take microelectronics, the backbone of IT industry, as an example. Multiple companies scattered around the world work to create a microchip from the beginning to the end of the value chain. As a rule, some design chips (Fabless), such as US AMD or Qualcomm, while others make them (Foundry), such as Taiwanese TSMC.[28] True, there are IDM companies (Integrated Device Manufacture) that design, produce and market their processors (for example, American

[28] *TSMC* accounts for 60 percent of the semiconductor market and remains the undisputed leader. Also, the company has 80 percent of the world market in the production of semiconductor wafers with a manufacturing process from 5 to 32 nm. See.: URL: https://habr.com/ru/company/ua-hosting/blog/553838/

Intel, Micron Technology or South Korean SK Hynix.[29]) But they are not response for anything like the entire product line of equipment and components necessary for the production of semi-conductor products, and don't produce all the components, source materials, etc. that are used in microelectronics. With 90 percent of global supplies, China is the leading supplier of rare earth magnets.[30] Russia[31], Ukraine (stopped production in March)[32] and China are the main global suppliers of inert gases[33] that are needed for the production of semiconductors. Photolithographic machines[34] which are key to the production process are made by the Dutch ASML which owns 80 percent of the global market. German company Siltronic AG is among the world's leading manufacturers of hyper-pure silicon wafers. Japanese Showa Denko KK is one of the largest chemical suppliers for the production of microcircuits.[35] The British ARM designs one of the best processor cores. The examples abound.

[29] Leading semiconductor electronic component manufacturers and product shortages. Part 2. Integrated Device Manufacturer (IDM), end // Modern Electronics. URL: https://www.soel.ru/online/vedushchie-proizvoditeli-poluprovodnikovykh-elektronnykh-komponentov-i-chast2/

[30] A Transatlantic Approach to Digital Sovereignty // ISPI. 16.06.2022. URL: https://www.ispionline.it/en/pubblicazione/transatlantic-approach-digital-sovereignty-35455

[31] Russia limited its inert gas exports through the end of the year, including neon, which is what the approved government resolution says. These gases include argon, helium and others, which are widely used for the production of semiconductors, which, in turn, are used to make microcircuits. Russia supplies up to 30 percent of neon consumed globally. See.: URL: https://iz.ru/1343367/2022-06-01/rossiia-do-kontca-goda-ogranichila-eksport-inertnykh-gazov

[32] Ukrainian enterprises covered up to 90 percent of US IT companies' total needs and up to 40 percent of Taiwanese technology companies' needs. Disrupted neon exports from Ukraine caused a price shock on the market with neon prices shooting up 9 times over. Neon can't be obtained anywhere else in industrial volumes. Alternative suppliers – Russia and China – are not going to increase production to deliver it to Western countries, and Russia has lately completely stopped supplying inert gases to all countries in order to prevent companies of unfriendly countries from buying neon through intermediaries. In addition, Russia has stopped supplying valuable helium, argon and krypton. See: URL: https://vk.com/video-17733403_456239267

[33] Cyber Command chief tells Congress chip shortage has national security implications // Cyberscoop. 10.03.2022. URL: https://www.cyberscoop.com/cyber-command-chief-congress-chip-shortage-national-security/

[34] In addition to *ASML*, photolithographic machines are produced by Japanese Nikon and Canon, but they are much inferior in quality to the Dutch company. See.: URL: https://yandex.ru/video/preview/13478062475003201025

[35] The Japanese threatened the world to inflate the price for chemicals used in chip production // CNEWS. 05.07.2022. URL: https://www.cnews.ru/news/top/2022-07-05_yapontsy_ugrozhayut_vzvintit

The semiconductor industry is an industry of scale. Not a single country and not a single company can afford to substitute imports of the semiconductor value chain or numerous other high-tech products for that matter.

The EU will not avoid "external dependencies in the new geopolitical context" and must consolidate and establish cooperation with the partners and allies it finds convenient.

Cooperation

Let's revisit the EU Chips Act, which is designed not only to encourage investment in the industry, but also to ensure uninterrupted supply of microcircuits, including by way of localising the production of the world's largest manufacturers of state-of-the-art chips, such as Intel or TSMC. This step is very important, because, according to experts, if the supply chains are disrupted, some industrial sectors of Europe could run out of microcircuits in several weeks, with factories forced to slow down or stop production altogether.[36]

Intel agreed to invest 80 billion euros in expanding the semiconductor industry in the EU in the next 10 years.[37] During the first stage, this American company will invest more than 33 billion euros into creating research centres and production facilities in Germany, France, Ireland, Italy, Poland and Spain.

[36] *TSMC* is the world's most in-demand company // The Epoch Times. 12.03.2022. URL: https://www.epochtimes.ru/mnenie/tochka-zreniya/tsmc-samaya-vostrebovannaya-kompaniya-v-mire-148536/

[37] Intel to invest €80 bn in building research centres and plants in Europe // 3DNEWS. 15.03.2022. URL: https://3dnews.ru/1062019/intel-rasskazala-o-planah-po-investirovaniyu-bolee-33-mlrd-v-poluprovodnikovuyu-otrasl-evrosoyuza

The EU does less business with TSMC than Intel. Even though Taiwan welcomed the EU Chips Act,[38] no serious moves have been made to localise TSMC production in Europe. In 2021, this company negotiated with the German government to build a plant, but the dialogue came to a standstill most likely due to state subsidy-related issues, staff issues and customer demand, as reported by TSMC's Senior Vice President for Europe and Asia Sales Lora Ho.[39] Notably, a study by Ernst & Young shows that the number of foreign investment projects in Germany has been gradually decreasing since 2017 due to drawn-out coordination processes, red tape and high production costs.[40] Things look much better, though, in the United States compared to the EU. Following a number of invitations coming from the United States, TSMC announced in May 2020 that it would build a $12 billion plant in Arizona. Mass production is scheduled to begin in 2024. According to some experts, this move indicates TSMC's plan to reproduce its integrated Taiwanese supply chain in the United States out of fear of a potential Chinese invasion.[41]

Undoubtedly, in addition to semiconductors, cooperation covers other industries as well, such as quantum technology. At least two IBM Quantum System One-based quantum computers are under construction in Germany.[42]

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[38] Gov't welcomes EU Chips Act that aims to partner with Taiwan, TSMC // Focus Taiwan. 02.09.2022. URL: https://focustaiwan.tw/business/202202090011

[39] *TSMC* is negotiating a new plant with the German government // RBC. 11.12.2021. URL: https://quote.rbc.ru/news/short_article/61b4c14e9a7947275e5cb243

[40] Direktivestitionen in Europa: Wirtschafterholtsichlangsam von Pandemie – Schweizbleibtattraktiv // EY. 31.05.2022. URL: https://www.ey.com/de_ch/news/2022-press-releases/05/direct-investment-in-europe

[41] *TSMC* is the world's most in-demand company // The Epoch Times. 12.03.2022. URL: https://www.epochtimes.ru/mnenie/tochka-zreniya/tsmc-samaya-vostrebovannaya-kompaniya-v-mire-148536/

[42] Pannier A. Europe's Quest for Technological Power // CIRSD. URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

Nevertheless, opinions about EU cooperation with other states differ in some high-tech industries. The UK, Switzerland and Israel have major ecosystems for quantum research and are willing to join the EU's Horizon Europe quantum and space programmes. But Thierry Breton is opposed to the participation of third-party countries in the EU research quantum computing programmes and believes it is critically important to create independent European capability for developing and manufacturing quantum computers." Germany and a number of other countries insist on keeping the door open to associated countries for quantum and space research programmes, arguing that striving for technological sovereignty should not interfere with cooperation in scientific research.[43]

Anyway, the final go/no-go decision regarding foreign investment remains with the national capitals.[44]

Consolidation

The EU is committed to the unwavering principle of transatlantic unity in the military-political and technological sphere amid high levels of global uncertainty and new challenges. People on the other side

[43] Pannier A. Europe's Quest for Technological Power // CIRSD. URL: https://www.cirsd.org/en/horizons/horizons-winter-issue-20/europes-quest-for-technological-power

[44] Europe in the Geopolitics of Technology: Connecting the Internal and External Dimensions // 9.04.2021. URL: https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf

of the Atlantic share this approach. Antony Blinken calls the United States' allies and partners "force multipliers" and "a unique asset."[45]

The Trade and Technology Council, TTS, created in 2021 is one way to display the consolidation of the West. A new forum operating through at least 10 working groups is designed to maintain regular communication between US and EU officials on a broad range of issues from developing technical standards and moderating content to deploying 5G/6G networks and ensuring stable supply chains and cybersecurity.

TTC's main purported goal is to draft international technological rules and standards to promote Western values and interests.[46] However, this begs the question: Will the interests of the United States and the EU be taken into account equally? The ISPI experts are saying that TTC may guarantee that, once weakened by the powerful lobby of global corporations, EU regulations will be in line with American interests.[47] IFRI is also pointing to the asymmetric nature of transatlantic relations, which complicates cooperation on drafting universal norms.[48] In turn, the Centre for European Reform is overall quite sceptical about universal regulatory measures being developed any time soon, as they believe that there are clear limits to transatlantic digital cooperation, since the Americans are much less inclined to limit Big Tech than Europeans.[49]

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[45] A Foreign Policy for the American People // U.S. Department of State. 03.03.2021. URL: https://www.state.gov/a-foreign-policy-for-the-american-people/

[46] US-EU Trade and Tech Council: Paris Takeaways and Next Steps // Global Policy Watch. 13.06.2022. URL: https://www.globalpolicywatch.com/2022/06/u-s-eu-trade-and-tech-council-paris-takeaways-and-next-steps/

[47] EU-US Trade and Technology Council— a Litmus Test for Transatlantic Cooperation // ISPI. 16.06.2022. URL: https://www.ispionline.it/en/pubblicazione/eu-us-trade-and-technology-council-litmus-test-transatlantic-cooperation-35457

[48] Europe in the Geopolitics of Technology: Connecting the Internal and External Dimensions // 9.04.2021. URL: https://www.ifri.org/sites/default/files/atoms/files/pannier_europe_geopolitics_technology_2021_.pdf

[49] Reality bytes: the limit for transatlantic digital cooperation // Centre for European Reform. 13.07.2022. URL: https://www.cer.eu/insights/reality-bytes-limits-transatlantic-digital-co-operation

It appears that in the near term, TTS will focus on coordinating policies as the world passes through a period of increased geopolitical risks rather than unifying standards, and its core goal will be to maintain Western leadership in technology amid cut-throat competition with China and conflict with Russia. In particular, some experts are saying that TTS has become the "mainstay" of the transatlantic partnership that is indispensable for coordinating sanctions and export controls.[50]

Conclusion

Important takeaways:

- Technological sovereignty is a relative value and has its limits, because each country depends, to a certain extent, on other countries for technological development.

- Even though the international division of labour is shrinking and getting localised, economic interdependence will remain an important factor, and one that only grows stronger as possible alternatives for cooperation are cut off for political reasons.

- The EU is significantly limited in its ability to be an independent technology player and compete with the US or Chinese technology platforms, since it remains significantly and structurally dependent on external players in a variety

[50] US-EU Trade and Tech Council: Paris Takeaways and Next Steps // Global Policy Watch. 13.06.2022. URL: https://www.globalpolicywatch.com/2022/06/u-s-eu-trade-and-tech-council-paris-takeaways-and-next-steps/

of technology sectors and energy, and lacks public and private investment. The localisation of advanced foreign production in EU member states kills any chance for European companies to prove themselves in those critical niches in which the EU would like to succeed. So, by deploying its facilities in Europe, Intel will "cannibalise" emerging European start-up companies, such as SiPearl, which seek to create advanced processors. That way, the EU is likely to play the role of an important junior partner of the United States in a joint battle for technological leadership against the "Chinese dragon" and be limited to filling isolated niches and sacrificing some of its technological sovereignty in the process.

- There is a great risk that the US-EU technology alliance, TTC, will be dominated by the Americans (as is the case in NATO), since the transatlantic technology relationship is as asymmetric as the defence relationship. However, it cannot be ruled out that the EU will be able to exert significant influence on developing universal technological norms and standards, since it believes rule-making is its main asset and it will never stop defending its interests before US corporations.

- EU technological sovereignty can be reinforced by: **1)** providing leadership in areas where it already has an advantage or potential to create new markets; **2)** developing and implementing standards and norms in cyberspace for greater protection and control; **3)** coordinating its decision-making process and the pooling of scientific, financial and other resources of all member states; **4)** recruiting and retaining highly skilled personnel; **5)** ensuring reliable supply chains of raw materials, components, equipment, and energy.

- To survive in a fragmenting world, the West has opted for a strategy of cooperation and consolidation. The construction of a closed technological ecosystem is underway. It has become important to keep key advanced technologies out of the hands of competitors, so technology exports are reduced to zero in some cases.[51] This begs the question, though, of the system's economic sustainability given limited market for sales.

The high-tech industry is one of scale and it involves a certain amount of exports, otherwise production costs will be too high, and business unprofitable. To safeguard and increase profits, one needs to be integrated into the global market, which is impossible in a "bloc-based world." Until a leader is identified, the competitive struggle between the leading countries will remain fierce, and geopolitics will prevail over economic expediency in this exhausting race, while the division of the world into separate and isolated technical and economic blocs will negatively affect the global economy and may lead to a prolonged global recession.

[51] For example, in 2019, the United States placed *Huawei* on the sanctions list and since then that company has been banned from receiving modern microcircuits under 45 nm, as well as a number of other important components. Because of that, *Huawei* is rapidly losing smartphone market share.See.: URL: https://yandex.ru/video/preview/6754694362550471518

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