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A “New” Political Economy of Technological Innovation Strategies in the Post-Pandemic World?

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of the CEBRI-KAS Project on the future
directions of multilateralism.



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1 Introduction

Technological development is inseparable from geopolitics. Yet, contemporary schools of economic thought tend to overlook geopolitical motivations as drivers of technical change processes, even when analysing, for instance, the importance of military research and development (R&D) and procurement for civilian innovations. In my first CEBRI policy paper on geopolitics and the economics of innovation (Penna 2021), I discussed not how geopolitics is a driving force of technological development, but instead the geopolitical consequences of disruptive innovations. Adopting a Neo-Schumpeterian periodization of capitalist technological revolutions (Perez 2002), I argued that the current wave of digital innovations, which are part of the fifth capitalist technological revolution (of information and communication technologies – ICT), brought about the risk of ample disruption (for incumbent firms, regions and nations) as they also opened up opportunities for socio-economic development.

Historically, these dynamics also tended to be associated to hegemonic conflicts and disputed. Based on this understanding, I argued that the new coronavirus pandemic magnified interrelated geopolitical and techno-economic trends from the past decade, speculating that:

1. The manufacturing global value chains overly dependent on China would eventually be a central target of national policy, which would aim at making a country's economy less dependent on Chinese imports.
2. Upgrading industrial structures and reshoring of value chains would become "the flavour of the month" in the policymakers' menu of measures, providing a leitmotiv to a return of active industrial policy.
3. Industrial and innovation policies would increasingly be "mission-oriented", that is, aimed at not only seizing technological opportunities associated with the new wave of disruptive digital technologies, but also contributing to the solution of urgent societal challenges (like mitigating climate change or caring for an aging population).

4. As a consequence of the US-China technological and geopolitical competition, the policy space for multilateral governance of digital technologies would be diminished.

While these speculations were a logical conclusion from the observed empirical trends, they can also be explained from the theoretical perspective of (international) political economy. In this policy paper, I will draw on these theories to discuss the "new" political economy of innovation strategies in this post-pandemic world. I will argue, based on the notion of Polanyi's "double movement" (Polanyi 2001 [1944]), that contradictory forces govern capitalist development – on the one hand, a liberalizing principle promotes the expansion of free markets, on the other, social self-protection principles keep this expansion constantly in check. Such double movement can be interpreted as a secular pendulum (Kretschmer 2019; Nölke and May 2019; Stewart 2010), with periods when liberal policies promote free markets being superseded by periods when state regulations seek to protect society from the "ravages of this [free market] satanic mill" ((Polanyi 2001 [1944]: 73). Yet, more than a pendulum, Polanyi's double movement represents a constant dialectical process "the two principles have material and social roots that coexist in a necessary, permanent

and contradictory way within capitalism” (Fiori 2004: 60 – my translation). From this perspective, the four trends pointed out above were already in gestation since at least a decade ago. The political economy of current national technological innovation strategies is therefore not new, but the actual and longstanding political economy of such strategies.

The paper is structured as following: in the next section, we briefly present examples of recent developments that underscore and reinforce the four geopolitical and techno-economic trends identified in my first CEBRI policy paper. In section 3, I discuss Polanyi’s double movement, drawing on the work of Fiori (2004, 2010) and relating it to the notion of “creative insecurity” proposed by Taylor (2016), to explain the political economy of national technological strategies. Section 4 concludes with some reflections on implications for Brazil and emerging economies.



Contradictory forces govern capitalist development – on the one hand, a liberalizing principle promotes the expansion of free markets, on the other, social self-protection principles keep this expansion constantly in check.

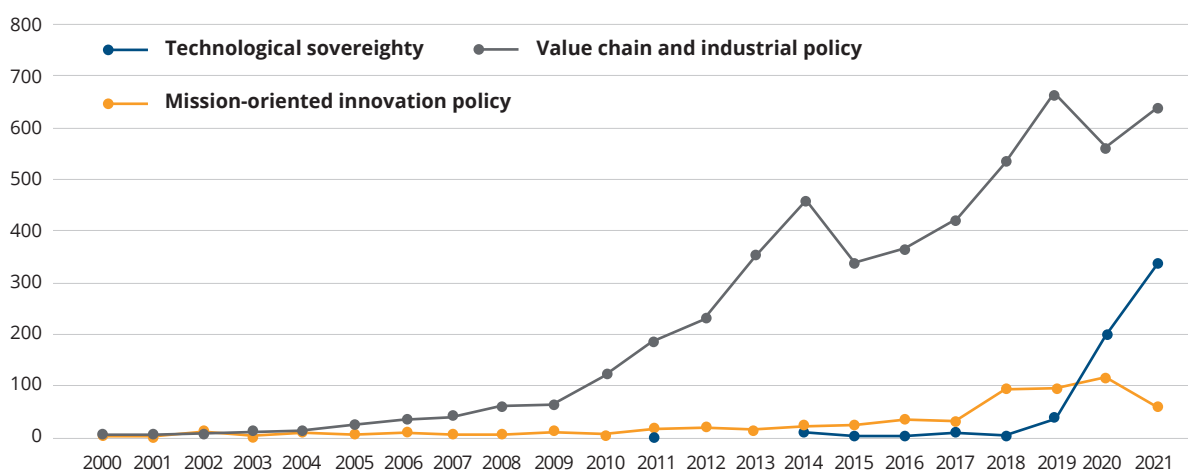


2 Deepening geopolitical and techno-economic trends

The four geopolitical and techno-economic movements discussed in Penna (2021) are not short-term processes triggered by the coronavirus pandemic: they are long-term trends that can be explained through international political economy theories (as we do in section 3). We can grasp a view of the first three decade-long processes, whereby governments started to take action to ascertain “technological sovereignty” and make their economies and value chains more resilient, while also focusing industrial and innovation strategies on the achievement of missions, by looking at the number of governmental documents citing such topics over time (Figure 1)¹.

Governmental attention to industrial policy seems to have increased substantively in the aftermath of the Global Financial Crisis (GFC) of 2007, reaching a peak in 2019, which is likely to be surpassed in 2021. Mission-oriented innovation policy receives an impetus in 2018, which coincides with the publication of the European Commission’s “Mazzucato Report” (Mazzucato 2018). The catalyst effect of the coronavirus pandemic seems most evident in the case of governmental attention to “technological sovereignty”, which was not mentioned in governmental document in the Overton database before 2014 (except for one *European Parliamentary Research Service* report in 2011 on the impact of the GFC on European defence).

Figure 1: Governmental documents citing technological sovereignty, mission-oriented R&I, and industrial policy (2000-2021)



Source: Author’s construction based on keyword search in the Overton database.

Notes: (a) Data for 2021 as of 27/10/2021; (b) Documents from Canada in 2002 were excluded, as they were published in different years but were indexed as being from 2002.

1. To construct this chart, I used the following search queries in the Overton database (<https://app.overton.io>): for technological sovereignty documents, (“technological sovereignty”); for value chain and industrial policy, (“industrial policy” AND (“value chain” OR “supply chain”)); for mission-oriented innovation policy, (“mission-oriented innovation” OR “mission oriented research” OR “mission oriented policy”). I restricted results to “government” as type source (excluding e.g. documents by policy think tanks). Overton claims to be “the world’s largest collection of policy documents, parliamentary transcripts, government guidance and think tank research”. While it is not expected to be complete, particularly for earlier years, it can provide an indication of governmental attention to certain topics in recent periods, which is the intended use here.

Yet, governmental concern with technological sovereignty seem to predate the pandemic, considering that the number of policy documents (in the database) citing the topic increase from four in 2018 to 33 in 2019 – but then to 196 in 2020 and 333 in 2021 as of October. The vast majority of these documents were published by the European Union, which is the source of 539 of the 586 documents citing technological sovereignty between 2011 and 2021. Indeed, in September 2019, when presenting her team and the new structure of the next European Commission, president-elect Ursula von der Leyen declared the issue as a priority for the next EC term, declaring that “We have to make our single market fit for the digital age, we need to make the most of artificial intelligence and big data, we have to improve on cybersecurity and we have to work hard for our technological sovereignty.” In February 2020, three months after assuming the presidency, von der Leyen announced a new “flagship initiative”: a digital strategy aimed at achieving the EU’s technological sovereignty,² defined as “the capability that Europe must have to make its own choices, based on its own values, respecting its own rules”.³

The coronavirus pandemic seems to have broadened the scope of this definition, bringing in more in line with that advocated by Leonard et al. (2019) in the *Bruegel-ECFR Policy Contribution* entitled “Redefining Europe’s economic sovereignty”, where they argued that contrary to China and the United States, Europe kept economic interests separated from geopolitical interests – and wrongly so, they argued. Therefore, the piece recommended the elaboration of an *economic sovereignty agenda* “to integrate economic and geopolitical considerations at the appropriate levels of governance” (Leonard et al. 2019: 20) with four goals: “[a] Boost Europe’s research, scientific, technology and innovation base; [b] Protect assets critical to national security from foreign interference; [c] Enforce a level playing field in both domestic and international competition; and [d] Strengthen European monetary and financial autonomy.” The authors

further recommend that this techno-economic sovereignty agenda “should be top of the policy priorities of the new European Commission when it takes office in late 2019... [and that] the new Commission president should outline this economic sovereignty agenda in his or her first speech to the European Parliament, and should publish a more detailed proposal by early 2020.” It seems that President Ursula von der Leyen listened to their call.

The emphasis on techno-economic sovereignty shall continue when France takes over the rotating presidency of the Council of the EU in January 2022. The French president Emmanuel Macron has given several declarations on the need to ensure Europe’s “digital” and “technological” sovereignty: “There is no sovereignty without local champions. The first sovereignty is industrial, business-related. The second one is regulation and the two go together. Without regulation, there are no standards.”⁴

While calling for a digital strategy at the EU level, Macron also announced in October 2021 its own technological and industrial strategy: a €30-billion plan to “reindustrialize France”⁵, and ensure the country’s domination of three revolutionary technologies – digital, robotics and genetics. The industrial and infrastructure plan of US president Joe Biden can also be seen as a technological (and economic) sovereignty strategy: it seeks to create “most resilient, innovative economy in the world.”⁶ Both the French and the US plans contains elements of “mission orientation”, in that – at least on paper – they seek to contribute to addressing climate change and promote environmental sustainability (Biden’s Plan would amplify the focus of missions from defence to other areas⁷, even though its emphasis was/is on infrastructure).

The tension between the interests and strategies of different countries was evident during the initial wave of the coronavirus pandemic, when each country fought to guarantee supplies of medical equipment (from individual protection equipment to ventilators) and, later, vaccines. The

2. https://ec.europa.eu/commission/presscorner/detail/en/IP_19_5542, accessed on 27/10/2021.

3. <https://www.twobirds.com/en/news/articles/2020/global/european-commission-unveils-regulatory-plan-to-achieve-technological-sovereignty>, accessed on 27/10/2021.

4. Quoted in <https://www.politico.eu/article/macron-aims-for-10-european-tech-giants-valued-at-e100b-by-2030/>. See also: <https://www.cnn.com/2020/12/08/frances-macron-lays-out-a-vision-for-european-digital-sovereignty.html>, both accessed on 27/10/2021.

5. <https://www.france24.com/en/live-news/20211012-macron-announces-30-billion-euro-plan-to-re-industrialise-france>, both accessed on 27/10/2021.

6. Quoted in <https://www.nytimes.com/2021/03/31/business/economy/biden-infrastructure-plan.html>. See also: <https://www.atlanticcouncil.org/commentary/transcript/the-biden-white-house-plan-for-a-new-us-industrial-policy/>, both accessed on 27/10/2021.

7. <https://www.science.org/content/article/biden-seeks-big-increases-science-budgets>, accessed on 27/10/2021.

reported episodes⁸ of China withholding supplies of medical goods or of the United States “hijacking” medical equipment shipped from China through the American territory to other countries⁹ show that, when a crisis looms, the actions of national governments sudden become “realist” and any

traces of the “liberal” international relations¹⁰ rhetoric disappear: the nation state and the interests and welfare of their citizens become the privileged frame of reference. But does this mean that the political economy of technological innovation strategies has changed?

3 The Political Economy of Technological Innovation Strategies

In the beginning of first chapter of “The Great Transformation”, Karl Polanyi (2001 [1944]: 3-4) explains that his thesis:

“...is that the idea of a self-adjusting market implied a stark Utopia. Such an institution could not exist for any length of time without annihilating the human and natural substance of society; it would have physically destroyed man and transformed his surroundings into a wilderness. Inevitably, society took measures to protect itself, but whatever measures it took impaired the self-regulation of the market, disorganized industrial life, and thus endangered society in yet another way”.

Later on, in chapter 11, Polanyi (2001 [1944]: 130) refers to this dynamic of the capitalist society “a double movement”: whenever the market “expands itself continuously [...] this movement [is] met by a countermovement checking the expansion in definite directions.” Some authors interpret the double movement as a secular pendulum, meaning that in certain historical periods self-regulating markets (and free-market supporting institutions) prevail, while in others institutions regulating markets and promoting social welfare dominate. Indeed, Polanyi (2001 [1944]: 147) himself alludes to such periodization by saying that:

“...various countries of a widely dissimilar political and ideological configuration. [...] ...each of them passed through a period of free trade and laissez-faire, followed by a period of antiliberal legislation in regard to public health, factory conditions, municipal trading, social insurance, shipping subsidies,

public utilities, trade associations, and so on. It would be easy to produce a regular calendar setting out the years in which analogous changes occurred in the various countries”.

Based on the works of Burawoy (2010); Kretschmer (2019); Nölke and May (2019); Stewart (2010), for Western economies, we propose the following periods for the Polanyi pendulum (the dates are approximate):

1795-1830: state-led

1830-1870: free-market

1870-1920: state-led

1920-1940: free-market

1940-1970: state-led

1970-2010: free-market

8. <https://www.nytimes.com/2020/03/13/business/masks-china-coronavirus.html>; <https://www.wsj.com/articles/chinas-export-restrictions-strand-medical-goods-u-s-needs-to-fight-coronavirus-state-department-says-11587031203>; accessed on 27/10/2021.

9. <https://www.businessinsider.com/coronavirus-us-accused-of-diverting-medical-equipment-from-countries-2020-4>; <https://oglobo.globo.com/brasil/carga-chinesa-com-600-respiradores-artificiais-retida-nos-eua-nao-sera-enviada-ao-brasil-24349142>; accessed on 27/10/2021.

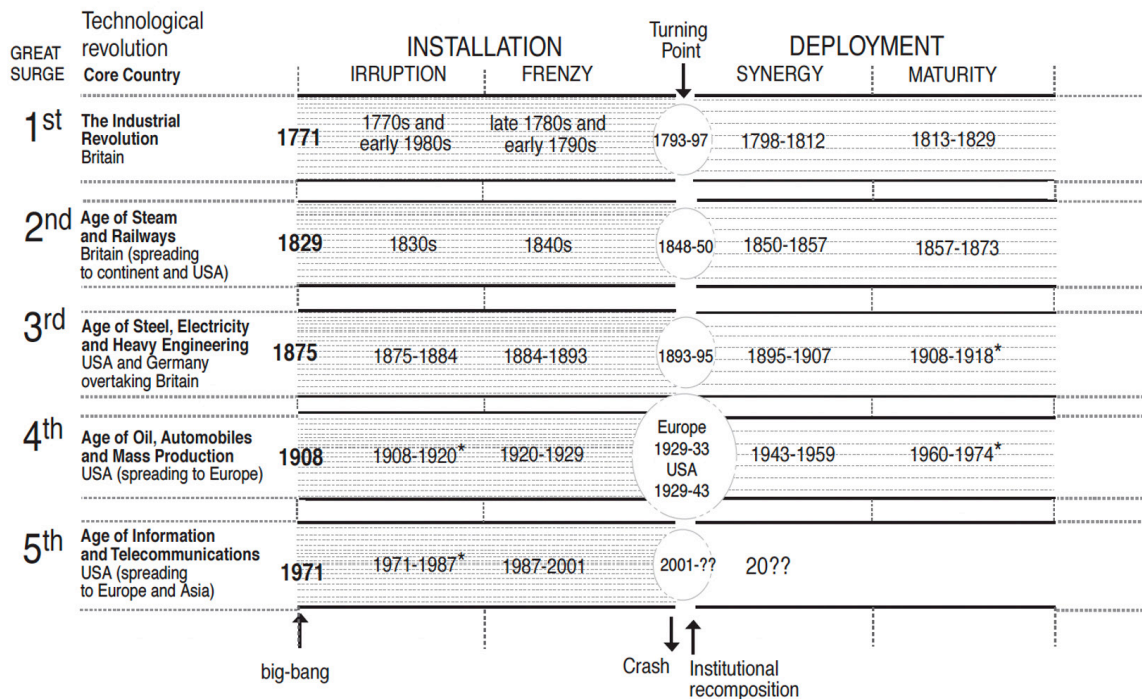
10. On the different schools of international relations, see Snyder (2004).

These dates are impressionistic and as the underlying processes are always present, the distinction from a state-led period to a free-market period is not clear-cut. For instance, state-centric forces are already emerging in the 1930s (In the US, but also in countries preparing to war in Europe), while free-market forces are present in the 1870-1920 period (especially in Europe), and shows signs of re-emergence already in the 1970s. Yet, what is interesting for our analysis is that these periods largely overlap with the Installation and Deployment periods of the most recent "great surges of development" (triggered by the associated technological revolutions), as proposed by Perez (2002, 2010) – see Figure 2. This does not seem to be a mere coincidence, even though those authors and Perez developed their periodization of capitalism from different – Polanyian and Neo-Schumpeterian, respectively – perspectives. A closer look at Perez' theory reveals why the coinciding periodization does not seem to be an accident.

to a technological revolution "can be termed the installation period. It is the time when the new technologies irrupt in a maturing economy and advance like a bulldozer disrupting the established fabric and articulating new industrial networks, setting up new infrastructures and spreading new and superior ways of doing things. [...] The second half is the deployment period, when the fabric of the whole economy is rewoven and reshaped by the modernizing power of the triumphant paradigm, which then becomes normal best practice, enabling the full unfolding of its wealth generating potential." Moreover, Perez (2002) explains that, on the one hand, the installation of a new technological revolution is led by financial capital, which thrives in free markets, while, on the other, deployment is promoted through state activism that supports production capital. Note that in geographical terms, Perez' theory is also centred in Western countries, which were at the core of the technological the technological revolutions. In my view, what Perez does is to offer an (implicit) explanation to the political-economic double movement identified by Polanyi, an explanation linked to technological dynamics.

According to Perez (2002: 36), the first half of the great surge of development (GSD) triggered by the technological innovation that gives birth

Figure 2: Installation and deployment periods of each great surge of development



Note: * Observe phase overlaps between successive surges.

Source: Perez (2002, p. 57)

The geopolitical implications of Perez (2002) theory are seldomly explored, yet they are also key to understanding the political economy of technological innovation strategies.

Two recent studies discuss the role of wars in great surges of development.¹¹ Kaldor (2018) and Johnstone and McLeish (2022) seem to concur that wars can both create new technological innovations that lead to technological revolutions, as well as contribute to ingraining the best-practice principles¹² to apply the technological revolution to modernize the whole economy – a process Johnstone and McLeish (2022) call “imprinting”. Kaldor (2018) goes further and contrasts the “one-hundred-year cycle of hegemonic wars”, as identified in the literature on long cycles in war, with the periodization of the theory of GSD theory. She argues that the hegemonic wars¹³ “largely coincide with turning points” (Kaldor 2018: 217) of the great surges of development. While Kaldor seem to adopt a different periodization of great surges (closer to Kondratiev’s long-wave cycles¹⁴) and discuss the “turning point” between two surges (and not between installation and deployment, as in Perez’ theory), she puts forth an important hypothesis: that wars are key to both the emergence and diffusion of technological revolutions. We may add that wars create legitimacy and power for the State to centralize, coordinate, impose and invest in technological development and deployment. Yet, she speculates that in the current ICT surge, “war is not likely to take the form of the classic interstate war between great powers... [...] Rather, what is likely to happen is what I call a new war on a global basis” (Kaldor, 2018, p. 217-218).

Kaldor’s speculations raises two important insights about the political economy of technological innovation strategies. The first has to do with the reason why nation states innovate.

Here Mark Taylor’s (2016) theory of “creative insecurity” is of relevance. Creative insecurity is “the condition of feeling more threatened by external hazards than by domestic rivals.” According to his theory¹⁵, a nation’s balance between domestic conflict and external security is the key factor explaining its innovation rate – and not the institutions that form the national innovation system, which provides the means (and not the reason) to innovate. The existence of external security concerns would make citizens more willing to accept the burdens (costs, risks, uncertainties, trade-offs) of forging the system’s institutions and technical capabilities. In the presence of pressures from external insecurity that are bigger than those due to domestic conflict, a nation will innovate even in the absence of the “right” institutions¹⁶. Creative insecurity theory seems to point to a specific manifestation of Polanyi’s double movement, between two types of politics: on the one hand, domestic distributional politics, which tend to slow down innovation, and, on the other, external security politics, which would favour innovation.

Indeed, Polanyi’s double movement occurs not only within nation states but also internationally. As Fiori (2004, p. 60 – my translation) explains, the self-protection countermovement to address the perverse consequences of self-regulating markets manifests itself both “(i) within national societies through various forms of political and social democratization and the construction of collective protection networks for populations; and (ii) within the international system, in the form of a defensive reaction by states that decide to protect their national economic systems, in situations of crisis or unequal competition.” It is when these two manifestations align that a nation state deploy the right institutions – through national technological strategies – and begin to innovate.

11. Other important studies relating wars to technological development and economic growth are Forman (1987) and Ruttan (2006).

12. Perez (2002) calls it a “techno-economic paradigm”.

13. Referring to Wright (1942), Kaldor (2018) mentions the following hegemonic wars: Wars of the Spanish Succession (1701 to 1714), the Napoleonic Wars (1795 to 1815), and the two World Wars (1914 to 1945); and the following minor wars: the Seven Years’ War (1756 to 1763), the American Civil War (1861 to 1865), Crimean War (1853 to 1856), Franco-Prussian War (1870 to 1871), and Austro-Prussian War (1866).

14. Named so by Joseph Schumpeter after Russian economist Nikolai Kondratiev, who identified the long term periods of high economic growth followed by periods of relatively slow growth. Neo-Schumpeterian authors like Carlota Perez (2002) and Freeman and Louça (2001) theorized about the underlying causes of the Kondratiev waves.

15. Taylor (2016) provides rich statistical evidence complemented by qualitative case studies of nations with different degree of success in technological innovation to corroborate his theory.

16. Burawoy’s (2010) analysis highlight the importance of social networks, industrial clusters, and technology standards for a country’s S&T prowess.

“...a nation’s external threats (both military and economic) appear to act as a counteracting force that supports innovation. Innovation is often the best strategy for a society to use against particular external threats. These include the threats of military conquest, severe cuts to strategic imports, or massive flights of capital abroad. When these particular types of external threats loom large enough to outweigh those posed by domestic rivals, both popular and elite support tend to shift in favour of S&T and its supporting institutions and policies.” (Taylor 2016: 278)

Indeed, as an example of this fact, is all the Chinese rhetoric of overcoming and preventing a new “century of humiliation”¹⁷, including as the foundation of its innovation-driven development. Conversely, the emergence of China represents the “external threat” to developed countries, most notably the United States, but also European countries and Japan. And as we saw in section 2, the new coronavirus pandemic came to represent a new external threat, which magnified the risks associated to the technological and industrial dependence to imports (especially of medical products) from China. Faced by this new threat, national governments deployed innovation and industrial policies aimed at technological sovereignty or the achievement of missions (or started to plan so).

Edler et al. (2021) provide a nuanced discussion of the technological sovereignty impetus in Europe, identifying it as a new rationale for innovation policies. Recognizing that sovereignty discourses tend to re-emerge in times of crisis (“when a nation’s ability to maintain status-quo processes is at stake”), they associate the new “technology sovereignty” trend to “a turbulent decade influenced by the financial and economic crisis, increasing protectionism in the USA and China, and the Covid-19 pandemic”, and argue that “that sovereignty discourses function as a self-legitimising, protective mechanism of states faced by challenges originating from their external environment” (Edler et al. 2021: 26).

The first two central premises of their definition of “technological sovereignty” is congruent with the above discussion of Polanyi’s double movement and the importance of external threats to technological innovation. Technology sovereignty “is a reaction to a changing world order, in which the preferable system of free trade and collaboration has come under attack and therefore no longer provides a reliable basis under all circumstances [and] it is a dynamic concept, focused on building competences and capacities through innovation policy and seeking to maintain, wherever possible, stable inter-national technological interdependencies” (*idem*). The authors refer to their definition as an “enlightened concept of technological sovereignty”, for it seeks to strike a desirable balance between openness and sovereignty, which in my view can be seen as a paradigmatic concept of capitalism: openness and sovereignty are part and parcel of the liberal movement and the self-protection countermovement that define the capitalist system.

Despite this disagreement, Edler et al. (2021) emphasize a challenge for implementing said technological sovereignty strategy, which seems consistent with the “creative insecurity” strategy: the fact that such strategy is prone to contestation by different economic and societal actors, as they force upon society “tough choices”. As Taylor (2016) argue, disputes associated with “distributional politics” are at odds with effective technological innovation strategies. Therefore, in my view, a techno-economic sovereignty strategy at the level of the European Union is doomed to fail as long as member countries continue to engage in a type of “distributional politics”, as it was clear from the divergent preferences¹⁸ that surfaced during the discussions over the EU recovery deal. Looking beyond Europe, the technology sovereignty rhetoric continues to be strong in the US and China, and is of paramount relevance to emerging countries like Brazil.

17. The term is how the Chinese refers to the period from 1839 to 1949, when Western powers and Japan intervened and subjugated China under the Qing Dynasty.

18. Article by the prime minister of Spain Pedro Sánchez: <https://www.theguardian.com/world/commentisfree/2020/apr/05/europes-future-is-at-stake-in-this-war-against-coronavirus>; article by the prime minister of Sweden Stefan Löfven, prime minister of Denmark Mette Frederiksen, prime minister of the Netherlands Mark Rutte and the Austrian Chancellor Sebastian Kurz: <https://www.ft.com/content/7c47fa9d-6d54-4bde-a1da-2c407a52e471>, both accessed on 27/10/2021.

4 Implications for Brazil and Emerging Economies

The political economy of technological (sovereignty) strategies is not “new”, because underlying these strategies are always geopolitical motivations, which come to the fore depending on the prevailing dynamics of Polanyi’s double movement. What is new is how these motivations and the double movement are manifesting themselves given the US-China geopolitical dispute and the coronavirus pandemic. As an external threat, the pandemic, however, was not sufficient to trigger (or accelerate) this countermovement in all countries. After all, the pandemic was (is) common to all. What is different is each nation’s internal coalition of forces, domestic disputes, and distributional politics.

In the concluding chapter to his book, Taylor (2016) offered his “predictions of national S&T performance over the next twenty years” – a bold move anchored on his confidence on the robustness of his theory of “creative insecurity”. He divides sixty countries in four categories: “continued leadership”, “potential surprises”, “potential disappointments” and “close calls”. Amongst the leaders (which include the US, Japan, Germany, France, Israel, among others), he does not expect any setbacks. As potential surprises, he includes countries where domestic tensions seemed to have calmed down – such as Croatia, Slovakia and Spain (which is a curious inclusion, given the independentist movements of Catalonia and the Basque country). Other curious predictions are the inclusion of Russia in the “potential disappointment” group, considering its military prowess coupled with geopolitical ambitions in Eurasia, and China in the group of “close calls” with a negative bias (likely disappointment), considering that are witnessing increasing tensions in the China South Sea and may soon see the intensification of economic and political competition for regional hegemony between China, Japan and Korea. While the “predictions” are dated to 2016, the emergence of China as a potential threat to the US power was already visible a decade earlier (Fiori 2004, 2010). As Fiori (2010) put it, the centre of the hegemonic

disputes in the capitalist interstate system lays in the US and China, “which are increasingly complementary from an economic and financial point of view and are now indispensable for the expanding functioning of the world economy.” (Fiori 2010: 148).

Taylor (2016) predicts Brazil to be a “disappoint” in terms of scientific-technological performance during the next 20 years, because domestic issues overshadow external threats in the country: while suffering from high inequality, political unrest and civil strife (such as periodic labour strikes), Brazil does not have border disputes or is overly dependent on resource (energy and food) imports.¹⁹ In this context, “creative insecurity expects that the contending domestic interest groups and elites in these countries will likely fail to cooperate to accept the risks, costs, and redistributive aspects of rapid S&T progress” (Taylor 2016: 282). The recent cut of 87% of the budget previously allocated to the Brazilian ministry science and technology²⁰ seems to corroborate this view. How can Brazil overcome its fate?

Fiori (2010) discusses three hierarchical groups of nations that follow in the trail of the hegemon. First are the nations that develop “under invitation” or the protection of the leading nation,

19. Taylor (2016) proposes that those are the key indicators of a country’s relative balance of security concerns (also the existence of a “recent civil war” and “anti-S&T, pro- status quo military dictatorship”, both of which would be detrimental to technological development.

20. <https://www.correiobraziliense.com.br/politica/2021/10/4954322-governo-bolsonaro-corta-87-da-verba-para-ciencia-e-tecnologia.html>, accessed on 27/10/2021.

such as happened with Canada, Australia and New Zealand when Great Britain was the hegemon, or with Germany, Japan and South Korea, which were supported by the United States after the Second World War. In the second group are countries that adopt their own economic (technological and industrial) development strategies to catch up with the leader, as happened with the United States, Germany and Japan in the late 19th century (which caught up with Great Britain), and is now happening with Russia, India and China. This strategy (which may be linked to Taylor’s theory of “creative insecurity”) is risky, as the leading nation may attempt to block it. And finally come the group of nations in the systems periphery, which may reach a high level of per capita income (as in the case of the Scandinavian countries – yet one must note that they are important Western allies and member of the NATO) or may even industrialize themselves (as in the case of Brazil in the second half of the 20th century). Despite the difficulty of promoting economic development, technological sovereignty and industrial catching up, national mobility in the capitalist system is possible, but it depends more on political-economic than on policy and institutional choices.

Opportunities for economic development are a “moving target” (Perez 2001), influenced by the trajectories of individual technologies, industries, and technological revolutions, and also by geopolitical developments. Technological revolutions create the prospects of widespread economic welfare, which facilitate the national upward mobility. Opportunities also open up in moments of intensified interstate disputes, which seem to be occurring in the beginning of the third decade of the 21st century. In order to seize them, Brazil and other nations in the periphery of the system, need to “tidy the house”, solving the internal conflicts that Taylor (2016) talks about, in order to form a power coalition (or a stable and strong “social network” formed of workers, capitalists and bureaucrats) capable of, first, identifying the moving technological opportunities and, second, sustaining a long-term strategy to protect the legitimate national interests and welfare of its people (Fiori 2010).

Such long-term strategy should rebalance policy priorities:

1. from redistributing wealth to promoting capacity and capability building: this does not mean abandoning redistribution policies and combating inequalities, nor does it mean abandoning industrial policy in favour of education investments. It is about reframing the strategic issues, to create institutional capacity and capability as part of a (re)industrialization effort (focused on 21st century industries) and as (an additional) way to address inequality and promote welfare.
2. from shielding selected firms and industries from competition to supporting domestic market competition (by backing the creation of new firms) and the competitiveness of national firms in international markets: this is beyond selecting winners and backing national champions; it is about identifying opportunities for willing and capable national firms to enter (and potentially transform) specific global value chains.
3. from prioritizing governmental austerity to maximizing the multiplier and crowd in effects of governmental investments: this means focusing not on the efficiency of public expenditures but on its efficacy. And one way of doing it is to establish concrete ‘missions’ (solving specific social-environmental challenges, like urbanization and sewage of ghetto areas).²¹

While the Brazilian capacity to establish an adequate economic strategy to seize open opportunities is not in question, the country’s capability and prospect of establishing a strong and stable political coalition still is. And this is the crux of the political economy matter for a successful technological and industrial catching up strategy.

21. Recent studies (Deleidi and Mazzucato 2021; Ziesemer 2021) have shown that mission-oriented R&D investments are associated with a higher fiscal multiplier (the impact of governmental expending on the gross domestic product) and crowd in effect (stimulating additional private investment in R&D) than any other type of public (R&D and non-R&D) expenditures – these effects would even contribute to the sustainability of the public debt.

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