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*Edited by Luca Bortolotti and Marta Marson, University of Turin and OEET*

### **A FRAGMENTING GLOBAL ECONOMY**

OEET has organized its 8<sup>th</sup> Workshop on the 1<sup>st</sup> and 2<sup>nd</sup> December 2022 at Collegio Carlo Alberto, Turin, titled “A fragmenting global economy: Economic and geo-political shocks and international / regional trade and investment agreements among advanced and emerging countries”.

The Workshop aimed at examining the economic and geopolitical shocks that have affected the global community since 2008, and their impact on the relations among advanced and emerging economies. The Workshop also aimed at exploring how Global (and Regional) Value Chains were reshaped by those shocks. Indeed, shocks as the Global Financial Crisis and the ensuing Great Recession, the US-China trade war, the Covid-19 pandemic, and the Russia-Ukraine conflict have severely damaged the world economy. Moreover, relevant consequences of this fragmentation have emerged in the fields of global action on climate change and on international trade agreements.

This issue of the OEET newsletter collects contributions based on three lectures given at the Workshop, which provide a brief but detailed picture of the current challenges faced by the global community disentangling the different and sometimes opposite interests of different countries, therefore linking the field of economic and technological development with those of geopolitics and international relations. A special focus is reserved to the largest players in the global arena, including of course China.

The first article, *Changes in global economic power and the main emerging countries in the XXI Century*, by Vittorio Valli, is the one with the broadest scope, as it reviews the main factors that triggered a change in the global power balances in the last two decades, through an analysis of the main economic, political and social variables describing the dynamic of the main countries.

The second article, *China in energy geopolitics*, by Ignazio Musu, shifts the attention on the role played by China in the fight against climate change. This topic is strictly connected with the Belt and Road Initiative, which in turn has an impact on international relations. The article also reviews the main announcements in terms of goals and commitments stated by president Xi Jinping, acknowledging that their realization depends upon the international situation.

The third and last article, *The US-China trade war and technological race*, by Giovanni Graziani, goes into details of an issue that already appeared in the two preceding articles, being a crucial aspect of the geopolitics of this millennium: the US-China trade relations. The article reviews the trade strategy adopted by these two countries and the costs generated by their decisions, observing these phenomena through the lens of the fight for technological leadership. Abstracts in Italian are also available for this issue.

# Changes in global economic power and the main emerging countries in the XXI Century

by Vittorio Valli\*

*This article describes the crucial changes that occurred in the global economic power of major countries in the first part of the XXI Century. In particular, we focus on the changes occurred in terms of economic size, military force, financial power and social cohesion (i.e. some of the pillars of global economic power).*

*Moreover, in the period 2000-2022 four trends and shocks crucially influenced the global order: (I) diverging trends in terms of energy dependence from foreign sources, with the US almost fully independent thanks to shale oil and shale gas productions, while most of the EU countries have increased their dependence from Russia and other energy exporting countries; (II) a rapid growth in CO2 emissions, triggering global warming and other disruptive effects only tackled by timid and partly ineffective reactions; (III) a sequence of three great shocks (the 2008 financial crisis and the “Great Recession”, the Covid-19 pandemics and the Russian invasion of Ukraine) affected the world economy and, in particular, the Western countries; (IV) Besides economic crises and the disruption or weakening of several global value chains, since 2022, inflation pressures rose rapidly, while traditional restrictive monetary policies seems unable to tackle without severe social and economic consequences.*

*Nella prima parte del XXI secolo l'economia mondiale e il potere economico globale dei maggiori paesi hanno avuto cambiamenti cruciali. La dimensione economica, il livello tecnologico, la forza militare, il potere finanziario e la coesione sociale interna di ciascun paese sono le principali determinanti del potere economico globale di un paese.*

*Quattro tendenze o eventi centrali hanno profondamente influenzato l'ordine economico globale negli anni 2000-2022: (I) in termini di dipendenza energetica si registra il rapido sviluppo e il vasto sfruttamento del petrolio e del gas da scisti negli Stati Uniti, che hanno ridotto e poi praticamente eliminato la loro dipendenza energetica, mentre la maggior parte dei paesi dell'UE ha, al contrario, aumentato fortemente la propria dipendenza da gas e petrolio dalla Russia e da altri paesi esportatori di energia. (II) La rapida crescita delle emissioni di CO2 e di altre forme di inquinamento ha portato al riscaldamento globale e ad altri effetti dirompenti, mentre il tentativo di ridurre il riscaldamento globale è stato timido e in parte inefficace. (III) La crisi finanziaria del 2008 e la "Grande Recessione", le pandemie di Covid-19 e l'invasione russa dell'Ucraina sono stati tre grandi shock per l'economia mondiale e in particolare per i paesi occidentali.*

*(IV) alle crisi economiche e alla rottura o l'indebolimento di diverse catene globali del valore si aggiunge, nel 2022, il rapido aumento delle pressioni inflazionistiche, che le consuete politiche monetarie restrittive non possono facilmente affrontare senza determinare gravi recessioni economiche e conseguenze sociali.*

## **Changes in global economic power**

In the first part of the XXI Century, the world economy has undergone crucial changes in the global economic power of major countries. *Global economic power* is principally determined by the *economic size, technological and military levels, financial power* and *internal social cohesion* of each country (Figure 1).

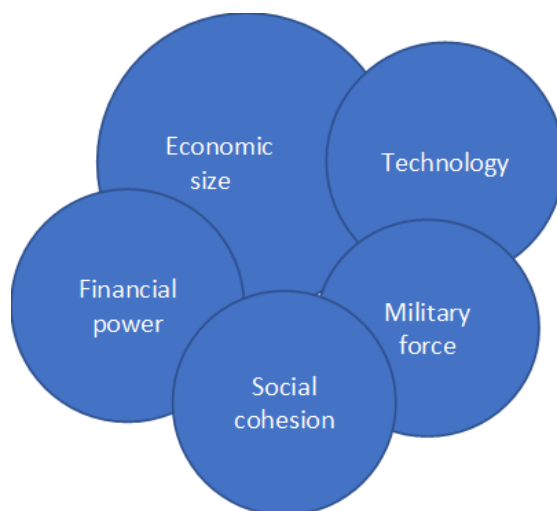
However, it is also extremely important to consider the international economic and financial relations of a country taking into account the different power of the various countries and the phases of globalization and world economic development. Since 2008 most countries have been exposed in various degrees to the consequences of financial crises and the “great recession”, trade conflicts, Covid-19 pandemic and

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\* Professor emeritus of Economic Policy at the University of Turin, president of OEET.

its social and economic impact, wars, embargos, periods of fragilization of global value chains, logistic problems, more arduous and costly access to energy and other strategic raw materials, inflation spurts, severe environmental problems. All this has contributed to change international economic relations, fragmenting the global economy and slowing down world economic development.

**Figure 1. Global economic power**



### ***Changes in economic size***

In terms of *economic size*, roughly measured by total GDP in PPP, China has overtaken the United States since 2016; in the 2000-2021 years India has overtaken Japan and Germany; Indonesia and Brazil have overtaken France and the UK, while Mexico, Turkey and South Korea have approached the level of Italy (Table 1).

Of course, China and India have a very large economic size also because of their immense population (over 1.4 billion people for China and India versus about 335 million for the US and 280 for Indonesia), but in the 2000-2021 years also their per capita GDP and their productivity have increased much faster than in the US, the other Western countries and Japan.

In the 2000-2021 years, in terms of per capita GDP in PPP, the gap between Western countries and some of the main emerging countries has rapidly diminished, though remaining large.

For example, China in the year 2000 had a per capita GDP in PPP equal to 8% of the one of the USA, 27.9% in 2021; India in 2000 had 5.8% of the US level, 10.6 % in 2021; Indonesia went up from 13% to 18.6%; Turkey from 26.5 % to 44%. However, some other countries, such as Brazil (which went down from 24.9% to 23.2%) and Mexico (which went down from 30.5% to 28.9%), had a rather disappointing performance. Table 2 shows a more detailed comparison between the USA and China, the two dominant economies in the XXI Century<sup>1</sup>.

The rapid catching up in per capita GDP in some emerging countries is largely due to a substantial catching up in productivity<sup>2</sup>, at least in the formal part of the economy. It is also mainly due to

<sup>1</sup> For a more detailed analysis of the technological power of China and the US, see Valli (2021).

<sup>2</sup> See World Bank (2021).

industrialization, the scale economies and the rise of some modern services, the increase in physical and human capital and in technological level and a positive insertion in the globalization process.

**Table 1. Changes in economic size (GDP in PPP in current international US \$).**

Rank 2021	Countries	2000	2007	2019	2021
1	China	35.9	62.1	109.7	118.8
2	USA	100.0	100.0	100.0	100.0
3	India	21.6	28.9	44.6	44.4
4	Japan	33.8	31.0	25.0	23.5
5	Germany	21.9	20.7	21.6	21.0
6	Russian Federation	9.8	16.4	20.6	20.8
7	Indonesia	9.8	11.6	15.6	15.5
8	Brazil	15.4	16.5	15.2	14.9
9	France	15.5	15.0	15.4	14.9
10	United Kingdom	15.2	15.1	15.3	14.5
11	Italy	15.0	13.8	12.4	11.8
12	Mexico	10.7	10.8	11.8	11.3
13	Turkey	5.9	7.2	10.5	11.3
14	South Korea	8.5	9.7	10.4	10.6
15	Canada	8.8	9.0	8.7	8.7
16	Spain	8.5	10.0	9.2	8.4
17	Saudi Arabia	8.0	8.6	7.9	7.6
18	Australia	4.9	5.3	5.7	6.2

Source: World Bank (2022). Our elaborations.

**Table 2. USA and China: selected indicators**

Indicators	USA		CHINA	
	2000	2021	2000	2021
1. Population as % of USA	100.0	100.0	446.5	425.4
2. Total GDP in PPP as % of the US	100.0	100.0	35.9	118.8
3. Per capita GDP in PPP as % of the US	100.0	100.0	8.0	27.9
4. GDP per person employed in constant 2017 PPP \$ as % of the US	100.0	100.0	6.1	24.5
5. Capital stock in US dollars 2017 as % of the US (a)	100.0	100.0	28.0	147.3
6. Gross capital formation as % of GDP (b)	24.0	21.0	34.0	43.0
7. Mean years of schooling of adult population (25+ years)	12.7	13.7	6.5	7.6
8. Expected years of schooling (c)	15.1	16.3	9.9	14.2
9. Spending in R.& D. as % of GDP (b)	2.6	3.4	0.9	2.4

Notes: (a) 2019 instead of 2021; (b) 2020 instead of 2021; (c) 2001 instead of 2000 for China.

Sources: World bank (2022) for indicators 1-4; FRED (2022) for indicator 5; World Bank (2022) for indicator 6; UNDP (2022) for indicators 7 and 8; OECD (2022) for indicator 9. Our elaborations.

### ***Military Force***

In terms of *military force*, the US has remained the leading power and the Russian Federation maintains its enormous arsenal of nuclear and conventional weapons, but China is rapidly rising, massively increasing its army, navy and air-space forces and its technological level in the military field (Table 3). From 2000 to 2021 global military spending increased by about 80% in constant US\$. In 2021 the first five big spenders were the USA (801 current billion \$; 37.9% of global spending) China (293 B \$; 13.9%), India (76.6 B \$; 3.6%), UK (68.4 B \$; 3.2%), Russia (65.9 B \$; 3.1%)<sup>3</sup>. Of course, in 2022, due to the Russian invasion of Ukraine, the two conflicting countries and the ones supporting Ukraine have sharply increased their military budget.

Moreover, India and countries such as Japan, South Korea and North Korea, Pakistan, Brazil, Egypt, Turkey, Iran, Indonesia, Saudi Arabia and Israel, are striving to expand their military force. France and the UK maintain a solid position in terms of nuclear and air-force equipment, but in an ancillary way to the US military power under the NATO umbrella. After the start of the Ukraine war Germany, Poland and other countries have recently announced a sharp increase in their military budget.

### ***Financial Power***

In the important field of global financial power, the United States, EU, China, Japan, UK maintain a strong leadership, but Canada, South Korea, India, Brazil, some oil-rich countries are improving the size, attractiveness and sophistication of their financial markets. As it happened in China in the last three decades, in the long run, with a considerable delay, the rise of an economy usually contributes to determine the rise of its financial strength (Table 4 shows the stock market capitalization of listed domestic companies, which represents a rough and partial, albeit important, aspect of financial power).

Although China has an excessive debt position in several of its main public enterprises and in some private ones, and it is plagued by the consequences of the three great shocks in the world economy, the extremely large saving rate of its population can contribute to sustain the gradual strengthening of its financial system. India's economic development is also sustaining the growth of Indian financial system. However, the sharp formal-informal duality of India's economy and the lower saving rate of India with respect to China limit the growth rate of its financial sector and the access of a large part of the population to modern financial services.

In Brazil the growth of the financial sector has been limited by the unstable trend of its economy in the last two decades and the large inequalities persisting in its economy, in which the wealth position of a consistent part of its population is largely negative.

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<sup>3</sup> Source: SIPRI (2022).

**Table 3. Index of military strength**

Rank	Countries	Global firepower index	Rank	Countries	Global firepower index
1	United States	0.0453	11	Italy	0.1801
2	Russian Federation	0.0501	12	Egypt	0.1869
3	China	0.0511	13	Turkey	0.1961
4	India	0.0979	14	Iran	0.2104
5	Japan	0.1195	15	Indonesia	0.2251
6	South Korea	0.1261	16	Germany	0.2322
7	France	0.1283	17	Australia	0.2377
8	United Kingdom	0.1382	18	Israel	0.2621
9	Pakistan	0.1572	19	Spain	0.2901
10	Brazil	0.1695	20	Saudi Arabia	0.2966

Notes: The Index of military strength derives from a number of indicators of military strength, but excludes nuclear capabilities. Ukraine is 22<sup>nd</sup>, North Korea is 30<sup>th</sup>.

Source: Global firepower (2022).

**Table 4. Stock market capitalization of listed domestic companies in 2020 and 2003**

Rank 2020	Country	2020	2003	Rank 2020	Country	2020	2003
1	USA	40720	14266	11	Australia	1721	586
2	China	12214	513	12	Iran	1218	27
3	Japan	6718	2953	13	South Africa	1051	261
4	Hong Kong	6130	715	14	Brazil	988	235
5	Canada	2641	910	15	Spain	759	726
6	India	2595	309	16	Russia	695	.....
7	Saudi Arabia	2429	.....	17	Singapore	653	148
8	Germany	2284	1079	18	Thailand	543	119
9	South Korea	2176	329	19	Indonesia	469	55
10	Switzerland	2002	727	20	Malaysia	437	161

Notes: Some financially important countries such as UK, France, Italy are not included in the table because for them World Bank's data cover only the period up to 2014 (2018 for France).

Source: World Bank (2022 b). Values in current billion US dollars.

### ***Social Cohesion***

A country can have an important economic size and a good level of technology and competitiveness, but a bad score in *social cohesion*. From the economic point of view, social cohesion mainly depends on the level of inequality and of social mobility, i.e. the possibility to up-grade the economic and social status of a person. It depends also on the level of discrimination and the respect of basic civil rights. Authoritarian governments ruling through heavy police and military repression and feeding inequalities, discriminations, and nationalistic impulses, often lead to wars or revolts. In the long run all this conducts to the loss of social cohesion, the collapse of the regime and a severe economic crisis.

From 2000 to 2021 within-country global income inequality has badly increased, while between-country inequality has decreased<sup>4</sup>. In the US, Japan and in some EU countries, as well as in China, India, Brazil, Indonesia, South Korea, the percentage of total income owned by the top 10% of population has increased, while the percentage owned by the bottom 50% has decreased or stagnated. In 2021 Mexico, Brazil, India, Indonesia and the USA had huge differences between the top 10% adult population and the bottom 50%; a little less Russia, China, Nigeria, South Korea and Japan. Substantial, but smaller differences existed in Germany, UK, Italy and France (Table 5). The income gap, defined as the ratio between the average income of the top 10% of adult population and the average income of the bottom 50%, was enormous in Mexico, Brazil and India; very large in India, Indonesia and the US; large in Russia, China, Nigeria, South Korea and Japan; lower, but significant, in Germany, UK, Italy and France.

**Table 5. Inequality in income and wealth in selected countries (2021)**

Countries	% share of the bottom 50%		% share of the middle 40%		% share of the top 10%		% share of the top 1%	
	income	wealth	income	wealth	income	wealth	income	wealth
Mexico	9.2	-0.2	33.5	21.5	57.4	78.7	26.1	46.9
Brazil	10.1	-0.4	31.4	20.6	58.6	79.8	26.6	48.9
India	13.1	5.9	29.7	29.5	57.1	64.6	21.7	33.0
Indonesia	12.4	5.5	39.6	34.3	48.0	60.2	18.3	29.4
USA	13.3	1.5	41.2	27.8	45.5	70.7	18.8	34.9
Russia	17.0	3.1	36.6	22.8	46.4	74.1	21.5	47.7
China	14.4	6.4	44.0	25.8	41.7	67.8	14.0	30.5
Nigeria	15.5	5.7	41.8	36.2	42.7	58.1	11.6	25.2
South Korea	16.0	5.6	37.5	35.9	46.5	58.5	14.7	25.4
Japan	16.8	5.8	38.3	36.5	44.9	57.8	13.1	24.5
Germany	19.0	3.4	43.9	37.1	37.1	59.6	12.8	29.7
UK	20.4	4.6	44.0	38.2	35.7	57.1	12.7	21.3
Italy	20.7	10.0	47.1	42.4	32.2	47.7	8.7	18.0
France	22.7	4.9	45.1	35.6	32.2	59.5	9.8	27.0

Notes: The data refer to adult population in 2021.

Sources: WIR (2022) and WID (2022).

As to the wealth gap between the top 10% and the bottom 50%, the situation was in general much worse. Mexico, Brazil, the US and Russia had enormous wealth gaps; Germany, the UK, France, China, South Korea, Nigeria and Japan had a very large one, while Italy had a lower one mainly because of the diffusion of some ownership of the first house in a section of the bottom 50% of adult population, partly due to the scarcity of low-rent housing (Table 6).

The economic crisis of the lower middle class and the poor has contributed to the creation of various forms of populism in several countries. In the long run various form of discriminations between genders, ethnic groups, etc., as well as the negation of some basic civil rights, have contributed to weaken internal social consensus in several countries, especially in periods of prolonged economic stagnation.

<sup>4</sup> See WIR (2022), p.57.



**Table 6. Income and wealth gaps in selected countries in 2021**

Countries	Income gap	Wealth gap
Mexico	1 to 31	-----
Brazil	1 to 29	-----
India	1 to 22	1 to 55
Indonesia	1 to 19	1 to 54
USA	1 to 17	1 to 236
Russia	1 to 14	1 to 118
China	1 to 14	1 to 53
Nigeria	1 to 14	1 to 51
South Korea	1 to 14	1 to 52
Japan	1 to 13	1 to 50
Germany	1 to 10	1 to 89
UK	1 to 9	1 to 61
Italy	1 to 8	1 to 24
France	1 to 7	1 to 61

Notes: Income gap is the average income of the bottom 50% of adult population vis-a vis the average income of the top 10%. Wealth gap is the average wealth of the bottom 50% of adult population vis-a vis the average wealth of the top 10%. Mexico and Brazil had in 2021 an average negative wealth, i.e. a debt position.

Sources: WIR (2022) and WID (2022).

### ***Crucial trends and great shocks in the 2000-2022 years***

Some crucial trends and three main shocks have deeply influenced the global economic order in the 2000-2022 years. *First*, since 2006 the rapid development and vast exploitation of shale oil and shale gas in the United States have reduced, and then practically eliminated, the US energy dependence from foreign sources, though heavily increasing the pollution in the extraction zones and reducing the US propensity to expand renewables. In the same period, before the Russian invasion of Ukraine, most EU countries have, on the contrary, strongly increased their gas and oil dependence from Russia and other energy exporting countries and have too slowly increased the recourse to renewables.

*Second*, the rapid growth of CO2 emissions and other forms of pollution have brought global warming, water scarcity, devastating weather perturbations and other disruptive effects, contributing to reduce global economic growth and produce famine and massive migrations. The attempt to reduce global warming has been timid, and partly ineffective. One important reason consists in the fact that poor countries and some emerging ones usually have low per capita emissions and need more energy in order to grow and this will increase emissions, while several richer countries are not substantially decreasing their very high per capita emissions. Table 7 gives an idea of how the global situation both for total and per capita emissions have continued worsening in the 2000-2021 period. In 2021 rich countries such as the USA, South Korea, Japan and the EU 27, plus the main energy- exporters, such as Saudi Arabia, Russia and Iran, had per capita CO2 emissions much higher than the world average, though their trend in the 2000-2021 period has been different (somewhat diminishing in the USA, EU 27 and Japan while rising in all the other countries listed in Table 7).



In the 2000s Africa had very low and stagnating per capita CO2 emissions (1.04 t. in 2021), but very heavy consequences of global warming in terms of drought, water scarcity, bad crops, weather turbulences, famines and migrations.

**Table 7. CO2 Emissions in selected countries (2000-2021)**

Countries	Total emissions Billion tonnes		2000-2021 % change	Countries	Per capita emissions (tonnes)		2000-2021 % change
	2000	2021			2000	2021	
<b>WORLD</b>	25.45	37.12	+46%	<b>WORLD</b>	4.14	4.69	+13%
<b>China</b>	3.64	11.47	+215%	Saudi Arabia	13.75	18.70	+36%
<b>USA</b>	6.02	5.01	-17%	USA	21.30	14.86	-30%
<b>EU (27)</b>	3.60	2.79	-22%	Russia	10.07	12.10	+20%
<b>India</b>	0.98	2.71	+177%	South Korea	9.40	11.89	+26%
<b>Russia</b>	1.48	1.76	+19%	Japan	9.97	8.57	-14%
<b>Japan</b>	1.26	1.07	-16%	Iran	5.63	8.52	+51%
<b>Iran</b>	0.37	0.75	+103%	Germany	11.03	8.09	-27%
<b>Germany</b>	0.90	0.67	-25%	China	2.88	8.05	+179%
<b>Saudi Arabia</b>	0.30	0.67	+127%	EU (27)	8.44	6.28	-26%
<b>Indonesia</b>	0.28	0.62	+124%	Indonesia	1.29	2.26	+75%
<b>South Korea</b>	0.44	0.62	+40%	India	0.92	1.93	+109%

Source: Our World in Data (2022)

*Third*, the 2008 financial crisis and the “Great Recession”, the Covid-19 pandemics and the Russian invasion of Ukraine have been three great shocks to the world economy and in particular to Western countries, with important adverse consequences also for emerging and developing countries.

Four great lessons from these crises have been largely forgotten. The 2007-8 US financial crisis and the consequent great recession are basically due to the de-regulation of the financial system since the 1990s and to decades of excessive financialization of the world economy. Little has been made to structurally face these two problems.

Moreover, the “austerity” measures followed in most countries at the start of the “great recession” have proved to be as fuel thrown on the fire of the economic crisis. Therefore, we must devise mechanisms which can sustain the economies during the crises and restore stability during the expansions.

The COVID-19 pandemic has shown how a well-organized and well financed public health system is important to avoid, or significantly reduce, great pains in terms of deaths, long and sorrowful hospitalizations and economic disruption. The budget cuts made in the 1990s and 2000s in several countries in their public health system have backfired contributing to severely reduce the possibility to promptly and effectively react to the pandemic.

The brutal Russian invasion of Ukraine and all the other wars or harsh social-political conflicts raging in the last two decades in Afghanistan and several parts of the Middle East, Africa, America, Asia and Europe remind us the inner fragility of an international order essentially based on economic and military strength and full of nationalistic, or ethnic and religious divisions amplified by power-seeking political leaders.

The impotence of the United Nations in solving international conflicts is crying for a radical reform of this institution. Wars badly contribute to destroy lives, communities, housing and infrastructures and to create poverty and massive migrations. The rapidly increase of war drones, missiles and other lethal instruments operating at distance and so decoupling the attacks from the direct sacrifice of soldiers, is raising the risk of wars and terrorism.

*Fourth*, the lack of regulation of globalization and, since 2008, the slowing down of the process of globalization, partly due to the three great shocks, have contributed to produce economic crises, the disruption or weakening of several global value chains and, in 2022, the rapid rise of inflation pressures. It has also increased the feeling that, in turbulent or war-time periods, the excessive dependence from other countries for strategic materials, such as energy sources, rare earth, chips, batteries and food, can be very dangerous. Severe bottlenecks in the global supply chain can lead to shortages in production and to inflation spurts, which the usual restrictive monetary policies cannot easily face without determining severe economic recessions and the rise of unemployment, economic and social inequalities, poverty and famine. Globalization is not ending but is slowing down and the global economy is more and more fragmented.

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## China in energy geopolitics

by Ignazio Musu\*

*China plays a crucial role in energy geopolitics, both in terms of fossil fuels, which still constitute the core of its energy system, and in terms of renewable energy and fight against climate change. The Belt and Road Initiative is an important infrastructure, because of oil and gas pipelines from Central Asian countries, as Kazakhstan and Uzbekistan, and from Russia, involved in a closer relationship after the outbreak of the Ukraine war, because of the oil imports from the Middle East and because of the role of natural resources in the South China Sea, claimed by China and by other coastal countries. Dealing with renewable resources and commitment in fighting climate change, the role of China is becoming more and more crucial: President Xi Jinping announced the goal of “have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060”. Solar, wind power, nuclear and hydrogen energy are expected to increase, so low-carbon energy are expected to reach a 75% share in 2060, contextually with a reduction of carbon (-80%), oil (-60%) and natural gas (-45%) demand.*

*La Cina gioca un ruolo cruciale nella geopolitica dell'energia sia nel campo dei combustibili fossili che rappresentano ancora il pilastro del sistema energetico di quel Paese, sia nel campo delle energie rinnovabili e della lotta al cambiamento climatico. Per soddisfare la domanda di energia con combustibili fossili è cruciale la Belt and Road con oleodotti e gasdotti da paesi dell'Asia Centrale come Kazakistan e Uzbekistan e dalla Russia con la quale i rapporti si sono intensificati dopo la guerra in Ucraina, con le importazioni soprattutto di petrolio dal Medio Oriente, e per il ruolo del Mar della Cina ricco di risorse fossili che la Cina contende agli altri paesi che vi si affacciano.*

*Nel campo delle energie rinnovabili e della lotta al cambiamento climatico, il ruolo della Cina sta diventando sempre più importante con l'annuncio del presidente Xi Jinping dell'obiettivo di arrivare al massimo delle emissioni di CO2 nel 2030 e all'annullamento delle emissioni nette entro il 2060, con la quota delle energie a basso contenuto di carbonio (solare, eolica, bioenergia, nucleare e idroelettrica) che dovrebbe salire al 75% nel 2060, quando la domanda di carbone dovrebbe essere caduta dell'80%, quella di petrolio del 60 per cento e quella di gas naturale del 45%.*

### **Energy has been at the foundation of China's extraordinary economic growth.**

China's role in the energy geopolitics concerns both the fossil fuels field, the energy system on which the Chinese economy is still based for 85 per cent, and the renewable energy sources, required to deal with the climate change challenge. China's importance in the energy geopolitics in the field of fossil fuels depends on the increase of imports of all the three types of fossil fuels, particularly through the most important Chinese geoeconomic and geopolitical initiative: the Belt and Road.

Belt is the set of land ways connecting China to Russia and to West through Central Asia countries, while Road is the set of sea ways connecting China to Russia through the North Sea, to the Arabian countries and the east coast of Africa through the Indian Ocean, to South-Est Asia through the South China Sea.

A crucial element of the Belt is Central Asia's energy richness. The 2500 km oil pipeline from the eastern coast of Caspian Sea in western Kazakhstan (20 million tons/year) is crucial to oil import by China. Turkmenistan, with the gas pipeline of 3600 km (25 billion cubic meters per year) to Xinjiang in China

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\* Ca' Foscari University of Venice

through Uzbekistan, has become the largest gas exporter to China.

The Ukraine war has increased cooperation between China and Russia. Russia has entered in the liquefied natural gas (LNG) market to export natural gas discovered above the Arctic Circle with tankers travelling the Northern Sea Route to Asia. The three thousand miles Eastern Siberian-Pacific Ocean (ESPO) oil pipeline (15 million tons per year) allowed Russia to eclipse Saudi Arabia as China's number one oil supplier. China provided finance for a thirteen-hundred-mile "Power of Siberia" gas pipeline (38 billion cubic meters per year) bringing natural gas not only to China but also to other East Asian countries. In 2030 Power of Siberia 2 gas pipeline (50 billion cubic meters per year) is expected to bring gas from a Russian deposit in North Sea to China through Mongolia.

On the Road, China is the biggest customer for oil flowing out of the Persian Gulf and the Strait of Hormuz. Middle East represents 47 percent of the oil imported by China e 12 per cent of its need of natural gas. Protection of oil transport through sea from Middle East has been the justification provided by China for its opening of a military base in Djibouti on the East African coast. The fact that China has to use the Indian Ocean to import fossil fuels is now the reason provided by the People Liberation Army to justify its increasing presence in the many ports opened by the Chinese on the shores of that sea. Huge investments made by China in those ports cannot be fully dependent on trade and development reasons; there also strategic reasons more generally related to the military Chinese expansion not only on the land, as it was the historical tradition, but also on the sea.

The Road passes also through South China Sea, faced by a number of countries (Indonesia, Malaysia, Singapore, Brunei, Philippines, Vietnam, Taiwan and China) and connected to Indian Ocean by the 1.5 miles wide Malacca Strait running between Malaysia, Indonesia and Singapore. South China Sea is the highway for one third of the world oil trade (15 million oil barrels per day) and one third of the world traded LNG. South China Sea is also the highway for two thirds of the sea trade of China and 80% of the oil imports by China.

### Strait of Malacca



Source: Wikipedia.

Chinese refer to the “Malacca dilemma” as the risk that, in the case of war, the US navy can close the strait, inhibiting China’s access to energy and trade by sea. Adjacent to the Malacca strait, a huge project “Melaka Gateway” is being built by the Chinese in cooperation with Malaysian partners within the Belt and Road Initiative. The project, expected to be completed in 2025, includes a residential district, a financial center and a deep-water port expected to accommodate big tankers carrying oil and liquefied natural gas. South China Sea is now where the risks of a military confrontation are higher: Taiwan is located there; Diaoyu Island occupied by Japan at the end of the World War II and claimed by China are there; there is a contrast on the control of the Spratly Islands occupying a large area from Vietnam to Philippines, and of Paracelsus Islands between China and Vietnam.

### The South China Sea claims



Source: South China Morning Post 2022

China claims the right on South China Sea using maps of the 17th century certifying the Chinese sovereignty; the other countries rely on the United Nations Convention on the Law of the Sea according to which in “territorial waters”, out to 22 km from the baseline, the coastal state is free to use any resource, while in “economic exclusive zones”, extending from the baseline, the coastal nation has sole exploitation rights over all natural resources. The opposition of United States to Chinese claims on South China Sea also refer to the UN Convention on the Law of the Sea, although the US have not signed the Convention. Claims by the other countries didn’t succeed in blocking China from digging tons of rocks and sand to build artificial islands on which install military bases; also, their initiatives didn’t succeed in blocking China from drilling operations to oil and gas.

South China Sea has abundant energy resources, with a huge potential of oil and natural gas on the seabed; estimates are that the South China Sea holds about 60 billion cubic meters of natural gas and 10 billion barrels of oil reserves. China’s initiatives to discover and drill oil and gas resources deep beneath the South China Sea have been a source of problems with Vietnam and even with Russia. In May 2014, China National Offshore Oil Corporation (CNOOC) placed a huge equipment, capable of drilling up very deeply under the seabed, in waters claimed by Vietnam east of its coasts as “territorial waters”; protests of Vietnamese in the streets led to evacuation of thousand Chinese nationals. In 2017, China threatened



to attack Hanoi's outposts in the Spratly Islands if it did not stop drilling in an area on Vietnam's continental shelf, thus overlapping with China's expansive claims. In July 2019, the Russian company Rosneft, in partnership with the Vietnam's state oil company, started drilling in what Vietnam was claiming its Exclusive Economic Zone; ships from Chinese navy sent to the area sailed away only after Rosneft and its Vietnam partner stopped drilling.

The role of China in energy geopolitics also concerns its commitment in fighting global warming and climate change.

China's yearly CO<sub>2</sub> emissions overcame, since 2006, those of United States, making China the world most important country emitting greenhouse gases; in 2019, China's greenhouse emissions overcame those of all the developed countries jointly considered. On the other hand, China is the biggest world producer of plants for solar and wind energy, and it is becoming the biggest world producer of batteries, crucial for storing intermittent solar and wind energy sources. China controls 90% share of the global production of downstream rare earth products, such as copper, graphite, lithium, and cobalt, used in manufacturing wind turbines, solar panels, and batteries. In extracting and processing these materials China has a first-mover advantage, as Chinese companies have invested in mines, particularly in the Democratic Republic of Congo (DRC), Chile, and Australia. In the DRC, China is estimated to have secured supply agreements with over half of the local cobalt producers; Chinese companies have stakes in projects accounting for one-third of Argentina's lithium reserves and two-thirds of Chile's lithium production.

Beyond resource extraction, China is also becoming dominant in battery manufacturing; CATL (Contemporary Amperex Technology) in Fujian, China, has become the largest world producer of batteries with 30% of the world's market. In 2019 China was able to sell more than half of all Electric Vehicles (EVs) sold in the world, its target being to have 40% of the vehicles sold in the country be electric by 2030; by 2025, the Chinese government aims to have in place EV charging infrastructure to meet the needs of more than 20 million cars.

In September 2020, President Xi Jinping announced that China will "aim to have CO<sub>2</sub> emissions peak before 2030 and achieve carbon neutrality before 2060". Also, China committed at the United Nations General Assembly in September 2021 to discontinue building coal-fired power projects abroad and to step up support for clean energy. The Chinese government asked the International Energy Agency (IEA) to write a roadmap on carbon neutrality. In the IEA Roadmap, the Announced Pledges Scenario (APS), reflects China's enhanced targets declared in 2020 in which emissions of CO<sub>2</sub> reach a peak before 2030 and net zero by 2060. In the APS, natural gas (with a carbon footprint half of coal and a quarter less than petroleum) is the only fossil fuel growing in the energy consumption mix, to 14% from 8%; coal's contribution has to shrink to 3% from 57%, while oil has to decline to 8% from 20%. Solar energy will rise from 1% to 22%, followed by wind power at 17% from 3%; nuclear energy's weighting could quadruple to 8%. Hydrogen will grow from almost zero to 11%; it is currently produced mainly from breaking down coal or natural gas, and through electrolysis (using electricity to split water into hydrogen and oxygen); but China aims at becoming a leader in producing the so-called "green hydrogen" with renewable power.

In 2021 China kicked off its national carbon-trading exchange that will become the world's largest carbon market; when fully implemented, China's carbon market is expected to cover more than 70% of China's CO<sub>2</sub> emissions by 2025, with a China's carbon price surpassing \$50 in 2030. The latest China's Five-Year Plan accepted the IEA Roadmap, aiming to shift the focus of innovation to low-carbon technologies and



pursue new policy approaches. At the beginning of November 2022, China presented the result that its CO2 emissions per unit of GDP halved since 2005, with a fall of 51% compared with 2005, and 3.8% lower than 2021, while the share of non-fossil energy consumption increased to 16.6%.

However, recent tensions between China and US, related to the Ukraine war and the question of Taiwan, may affect negatively the China's commitment in fighting climate change.

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## The US-China trade war and technological race

by Giovanni Graziani \*

*The so-called trade war between the US and China, which started as a tariff war, has soon become a technological conflict. In fact, next to growing tariffs from both sides, covering 66% of US imports from China and 58% of Chinese imports from the US, the conflict has witnessed the increasing use of other policy tools in order to slow down reciprocal trade flows. The US have resorted to an export control policy for their semiconductors, software and equipment for their production. Controls have been extended to all the products that China might utilize for the development of its own industry in that field. Chinese retaliation has quickly materialized, especially through a new law on export control that obliges Chinese exporters to strictly comply with it and leaves a wide margin of manoeuvre to the Chinese authorities, when they want to prevent undesired exports. The ultimate reason of this technological conflict lies in the fact that the US technological predominance is being slowly eroded by Chinese advances in many technological fields, including artificial intelligence. The biggest American worries result from the activity of the Chinese firm Huawei, specialised in telecommunication infrastructure equipment, in particular concerning fifth generation (5G) technology. Trade war has not benefitted the two contending countries, which saw a decrease in their reciprocal trade and have undergone other negative, sometimes unintended, consequences, due to their insertion in the global value chains. Although other countries have derived short-term commercial advantages by substituting the reciprocal trade flows of the two superpowers, major global damages were caused by disruptions in the global value chains and by the wound to the international trade system centered upon the World Trade Organisation (WTO), insofar as both superpowers have behaved without respecting the WTO rules. Although many analysts point to a progressive decoupling between the American and the Chinese economies, the data so far do not support a general trend, but only a partial one, referred to the products involved in the export control policies. The fundamental pillars of their reciprocal economic dependency appear still in place. However, more recently, the policies adopted by the two governments, some international initiatives and their official declarations could foreshadow a process of partial technological delinking.*

*La cosiddetta guerra commerciale tra Stati Uniti e Cina, iniziata come guerra dei dazi, si è presto trasformata in conflitto tecnologico. Infatti, accanto a dazi doganali crescenti da una parte e dall'altra, che hanno finito per coprire il 66% delle importazioni americane dalla Cina e il 58% delle importazioni cinesi dagli USA, il conflitto ha visto l'uso crescente di altri strumenti per frenare le importazioni reciproche. Gli USA hanno fatto ricorso a una politica di controllo delle esportazioni di semiconduttori, software e attrezzature per la loro produzione. I controlli sono stati estesi a tutti i prodotti che la Cina potrebbe utilizzare per lo sviluppo della propria industria in quel campo. La ritorsione cinese non si è fatta attendere soprattutto a livello legislativo, con una nuova legge sul controllo delle esportazioni, che rende obbligatoria per gli esportatori cinesi una stretta compliance con tale legislazione e che dà ampio margine alle autorità di impedire esportazioni non desiderate. La ragione ultima di tale conflitto tecnologico risiede nel fatto che il predominio tecnologico degli USA viene progressivamente minato dai progressi cinesi in molti campi della tecnologia, ivi compresa l'intelligenza artificiale. Le preoccupazioni americane maggiori derivano dalle attività della società Huawei, specializzata nelle attrezzature per infrastrutture di tele comunicazione, in particolare relative alla tecnologia di quinta generazione (5G). La guerra commerciale non ha giovato ai due contendenti, che hanno visto diminuire le loro esportazioni reciproche e hanno subito altre conseguenze negative a volte inattese, dovute alla loro inserzione nelle catene globali del valore. Altri paesi hanno tratto vantaggi commerciali nel breve periodo, andando a sostituire i flussi reciproci delle due superpotenze. E soprattutto un grave danno è stato inferto al sistema commerciale internazionale incentrato sull'Organizzazione Mondiale del Commercio (OMC), nella misura in cui entrambi i contendenti hanno agito al di fuori delle regole dell'OMC. Si parla molto di progressivo scollegamento tra le due superpotenze, ma i dati per ora non mostrano un fenomeno generale in tal senso, se non riferito ai prodotti oggetto di controlli sulle esportazioni. Gli elementi fondamentali della dipendenza economica reciproca appaiono ancora presenti. Tuttavia, le politiche adottate dai due contendenti, alcune iniziative internazionali e le più recenti dichiarazioni ufficiali potrebbero preludere ad un futuro processo di parziale dissociazione tecnologica.*

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\* University of Parma

The so-called trade war between the US and China has started as a tariff war. The latter has proceeded in various stages since June 2018, when it was launched by the Trump administration, culminating in the truce of the Phase One Agreement in February 2020. Tariffs rapidly escalated: US average tariffs on Chinese exports, from a low of 3% to a high of 19%, while Chinese average tariffs in retaliation increased from 8% to 21.%. Despite the phase one agreement and the new US administration, tariffs between the two countries have remained rather stable and high. As a result, by the end of 2022 US tariffs covered 66% of imports from China, while China's retaliatory tariffs covered 58% of imports from the US.

### ***US trade policy***

US trade policy tools have fallen into three main categories: 1) renewed use of safeguard protection, on products like solar panels and washing machines; 2) national security tariffs on steel and aluminum; 3) tariffs and other remedies to address China's potential misuse of American intellectual property, forced technology transfer, and cybertheft.

The policy tool number 3), in particular "other remedies", applied to the semiconductor industry, seems to be at the core of the present US trade policy vis-à-vis China. The main reason: America is falling behind in chip manufacturing, production being more and more concentrated in East Asia, in particular in Taiwan. On the other side, China is seeking self-sufficiency. China imports over \$300bn-worth of chips a year because it lacks the manufacturing capability to meet its own needs. Chips have featured in government plans since the 1950s: large subsidies were offered by the government, while top universities have amplified their chip programmes.

In order to impede this development, the trade tool chosen by the US administrations has been an export control policy affecting American sales of semiconductors, software, and manufacturing equipment. The major worry has involved the Chinese company Huawei, whose main business is telecommunications infrastructure equipment, providing hardware for many countries' 5G (fifth generation wireless technology) networks and leading the race to develop 5G.

Already in May 2019 restrictions applied to Huawei's access to items produced in the United States. American companies could not sell goods or services to Huawei without a license. In August of the same year almost 70 Huawei affiliates around the world were added to the list, while Huawei designations were expanded to include its fabless semiconductor subsidiary, HiSilicon, plus 46 new designations, pushing the total number of Huawei entities designated to over 100. In May 2020 further restrictions applied to Huawei's acquisition of American software and technology used in semiconductor manufacturing from foreign companies. In August, the same licensing restrictions were implemented in the case of semiconductors developed outside the US that use American software or technology as chips manufactured within the United States itself. Finally in December, US sales limitations were applied to another firm, the Semiconductor Manufacturing International Corporation (SMIC), a major Chinese semiconductor producer.

The Biden administration not only continued this kind of policy, but it even reinforced it. In August 2022, President Biden signed the CHIPS and Science Act into law, which included billions of dollars of tax credits to foster semiconductor manufacturing in the United States. Shortly afterwards, additional export limits were placed on semiconductor EDA (electronic design automation) software from U.S.

companies like Cadence and Synopsys and on advanced chips linked to artificial intelligence and advanced computing from Nvidia and Advanced Micro Devices. In October, new controls were applied on advanced computing and semiconductor manufacturing exports to China. License will be needed to export certain chips to China to be used in advanced AI calculations and supercomputing. The US also blocked foreign-made chips that are manufactured with American technology from being sold to China. Further controls were being placed on items China could use to develop its own manufacturing-equipment industry. By the end of the same month, the US Commerce Department added seven Chinese space, aerospace, and related technology entities to the Entity List. With this action, the Commerce Department has around 600 Chinese entities on the Entity List – more than 110 of which have been added under the Biden administration.

### ***China's retaliation on export controls***

After the US ban of public sector procurements of Huawei, in December 2019, in a tit-for-tat move, the Chinese government instructed public organisations and state offices to replace all non-Chinese computer equipment within three years. Some estimates suggest that as many as 30 million separate items of computer equipment might need to be replaced. The numbers may even be larger, due to the complex connections between the public and private sectors in China.

However, apart some counter-sanctions on a few American citizens and entities using a new anti-foreign sanctions law, China's actions have been characterized prevalingly by the enactment of new legislation. Starting from 2017, the Chinese Ministry of Commerce (MOFCOM) and China's Standing Committee of the National People's Congress (NPC) published various revised versions of the drafts of the Export Control Law of the People's Republic of China. China's Export Control Law is the first comprehensive export control legislation that will regulate the export of sensitive materials and technologies from China to overseas, obliging both Chinese exporters and foreign customers to scrupulously comply to Beijing's export control policy or be liable to penalties. More recently, China's State Council released a white paper on China's export control regime, laying out China's policy objectives, saying that "China maintains a holistic approach to national security, which means coordinating development and security, opening up and security, traditional security and non-traditional security, and China's own security and the security of others."

One should finally note that the import and export of technologies is covered by a separate set of regulations, i.e., the Regulations for the Administration of the Import and Export of Technology, that require licences for the export of, amongst others, artificial intelligence interactive interface technologies; speech synthesis and evaluation technologies; scanning and photo recognition technologies; cryptographic security technologies; information countermeasure and defence technologies; laser technologies; and space and aerospace-related technologies.

In May 2019 the Ministry of Commerce announced that China would introduce an "unreliable entity list" characterized by the following factors: (a) whether such entities have implemented a blockade, cut-off of supplies, or other discriminating measures targeting Chinese entities; (b) whether such entities' conducts are based on non-commercial purpose and violate market rules and the spirit of contract; (c) whether such entities' conducts have caused substantial damage to Chinese companies or relevant industries; (d) whether such entities' conducts pose a threat or potential threat to national security.

Although, unlike its US counterpart, China's Ministry of Commerce has not yet published a list of US entities that would be the target of retaliation, the implementation of China's Export Control Law may provide China with ample ammunition to counter US export control measures targeting China. Among others, it formally introduces trade concepts such as embargoes and "blacklists,"; it allows national export control authorities to conduct an assessment of countries and regions where controlled items are exported, identify the level of risks, and take corresponding control measures; it makes it possible for national export control authorities to ban the export of certain items or to certain countries or regions or to certain persons (both individuals and entities), in order to "safeguard national security"; finally the law asserts extraterritoriality, which means that China's new export control regime, if and when the extraterritoriality is enacted, will impact businesses within and outside China that deal with Chinese controlled items.

All these features provide a legal framework and ample discretion for China to impose export control measures whenever it wants. Together with licences, controls and the like, they make the compliance to the China's new export control regime a very time consuming, cumbersome and uncertain process for the firms involved.

### ***Winners and losers in the trade war***

*In the short term:* Winners in the US: domestic steel and aluminium producers, other protected industries and the US government (through the tariff revenues). But these gains are more than compensated by losses of millions of consumers plus the losses of producers who suffer from the price increase of their inputs. Winners in the rest of the world through export re-direction and supply-switching: some advanced countries (EU, Canada, Australia), Mexico and Argentina in Latin America; Vietnam, Malaysia, South Korea, Taiwan, Singapore, India, Pakistan and Thailand in Asia. Losers: these gains are more than compensated in the US by losses of millions of consumers plus the losses of producers who suffer from the price increase of their inputs. China appears to be a big loser altogether, apart from the tariff revenues accruing to the government. So, of the two contenders, neither side has really won on a net basis, from the trade point of view.

### ***The costs for China***

In the short run, China's total exports to the US went down. The decline was particularly sharp in all the groups of products on which tariffs were imposed, concerning, inter alia, many intermediate products, auto parts, machinery, rubber and plastics. Moreover, China's retaliatory tariffs on US goods ended up hurting Chinese importers of those goods.

However, China seems to have succeeded in re-directing a substantial volume of exports away from the US towards other destinations. The largest amount was destined to the EU. Among the emerging countries, Vietnam and Malaysia come way in front of the others, followed by Taiwan and Mexico.

Some Chinese-headquartered firm may have moved, through a subsidiary, to other locations, like Vietnam, in order to avoid tariffs. In this sense there could have been a loss of Chinese employment at the assembly line. But, if the product continues to use the same amount of intermediate inputs from Chinese suppliers, the loss will be limited. US tariffs may not be the only cause: some labour-intensive production was likely relocating anyway, because China was losing competitiveness in those industries.

In the longer term, the US export control policy could substantially impair China's domestic chip industry – at least until it is able to produce these components on its own.

### ***US losses due to China's retaliatory tariffs***

As China imposed retaliatory tariffs, the US total exports to China declined. The sectors most affected were agricultural commodities and products, chemicals, motor vehicles, various types of machinery, paper waste and cotton. Moreover, Chinese tariffs on US manufacturing exports made it harder for many American companies to maintain their access to the Chinese market. There were also a few cases of hollowing out the US manufacturing base. In July 2018, China retaliated with a 25% tariff on US autos, while it simultaneously lowered its auto tariff on imports from the rest of the world. US exports to China fell by more than a third. Tesla accelerated construction of a new plant in Shanghai, arguing that the uncertain trade picture, made it no longer competitive to manufacture electric vehicles destined for China in the United States. For similar reasons, BMW shifted some production destined for China out of South Carolina.

### **Some unintended consequences: economic costs to the United States of its own tariffs**

Trade wars have redistributive effects at the level of firms: they protect specific import-competing industries, but other related downstream sectors will lose due to the higher costs associated. Tariffs on inputs like steel, aluminium, or the hundreds of “parts”, enter the US goods manufacturing process, frequently through cross-border supply chains and are then exported by the US to third markets. Raising the prices of intermediate inputs raises the costs to downstream US industries and makes American firms less competitive both in the North American and global markets. These price hikes are then passed onto consumers or eat into profits.

Costs on consumers: higher prices, lower volume, reduced access to foreign varieties. All these costs outweigh the limited gains to local producers who face less import competition.

### ***Possible negative implications of the US export control policy***

- 1) Companies now face pressure to avoid setting up semiconductor, software, or toolmaking facilities in the United States. Even firms currently manufacturing in the United States may explore moving production and activities offshore to escape US export controls.
- 2) Substitutes from the world's other major equipment providers are currently available from other countries that are not subject to controls.
- 3) Major foreign consumers of US-made semiconductors may look elsewhere in the future, concerned that their supplies will get cut off, even if they make products that do not pose a national security risk.
- 4) The policy requires a new US bureaucracy, creating concerns over preferential treatments, non-transparency and discrimination.
- 5) The policy cuts off an important revenue source for American chipmakers, software designers, and toolmakers jeopardizes the research and development (R&D) that supports thousands of American jobs. Less R&D also means less American innovation.



- 6) The policy forces the industry to demand tens of billions of dollars of new federal subsidies as compensation.
- 7) The policy gives China an incentive to develop its own alternatives faster.
- 8) China is likely to retaliate with its own export controls.

### ***On the whole several WTO rules and practices have been undermined***

The United States had established a long-term strategy of writing new trading rules through megaregional agreements like the proposed Trans-Pacific Partnership, to address many of the limitations of current trade agreements. The Trump administration withdrew the United States from the TPP agreement, kept and even expanded only the first part of the previous US trade policy strategy, i.e. tariffs, completely abandoning bilateral, plurilateral, and multilateral forms of engagement with China on trade and refusing to appoint new members to the WTO's Appellate Body. The Biden administration has kept the level of tariffs established under the previous administration and has hardened the export policy control. In words, it wants to return to the WTO and to multilateral negotiations. It lifted the tariffs on allied countries, but did not contribute so far to nominate the missing member of the Appellate Body and has not signed into the Pacific Partnership agreement.

On the other hand, China retaliated outside the WTO rules, while declaring to formally abide by the WTO trade rules and betraying them in practice. As a consequence, the two largest partners of the trading system are no longer respecting the WTO rules.

### ***The struggle for technological leadership***

The struggle for technological leadership seems to be at the core of the present confrontation. Since the early days of the Cold War, the United States has led the world in technology. Until the beginning of this century, its balance in goods with advanced technology used to be positive, but started to be increasingly negative ever since.

On the other side, over the past two decades, China has evolved from a country that largely imitates technology to one that now also improves and even pioneers it. This is the result of the state's deliberate, long-term focus. China has invested massively in R&D. If current trends continue, China is expected to overtake the US in such spending by 2025.

In recent years China has undertaken impressive investments in robotics, artificial intelligence, microelectronics, green energy. Central to China's drive has been a strategy of "military-civil fusion," a coordinated effort to ensure cooperation between the private sector and the defence industry. Support might come in the form of research grants, shared data, government-backed loans, or training programs. The government is creating whole new cities dedicated solely to innovation.

The competitive threat from China encompasses semiconductor manufacturing, 5G technologies and synthetic biology, as well as AI and machine-learning. China's global R&D expenditure has increased enormously in recent years. Today, spending on domestic R&D is the second-highest figure in the world, behind the United States, but some forecasts say that it will surpass it in the coming years. Chinese R&D expenditures as a share of GDP amount to 2.2%, still lower than the US (3%), but on the increase, having just surpassed the EU27 (2.1%). Chinese researchers are publishing more scientific papers in the field of



AI than American ones do. China's 'Thousand Talents Program' targets high-level scientists and other experts from overseas, including foreign scientists. It offers significant financial support to relocate to China for conducting research in high-tech industries and technologies of the future. The program supports "national champion" firms (including Huawei, Baidu, Alibaba, Tencent, iFlytek, and SenseTime) to lead development of AI technologies at home, advance state-directed priorities that feed military and security programs under the rubric of military-civil fusion, and capture markets abroad. Moreover it funds massive digital infrastructure projects across several continents and it is trying to set global technical standards for AI development.

True, China: is not technology leader in the main economic sectors, while being runner up in more than half of them; does not appear among the 10 most innovative economies in the world; lags far behind as far as robot density in the manufacturing industry is concerned; depends on imports of some core technologies. More than half of purchases of foreign R&D comes from only three countries — United States, Japan, and Germany - and finally China does not lead in the "creation" stage, that produces the breakthroughs in core technology or invention of new paradigms for user interaction.

Nevertheless, the chairman of a special US commission on artificial intelligence recently warned the Congress that the United States is only one to two years ahead of China in developing artificial intelligence. For the near future, the US is likely to remain the world leader in AI, but trends are concerning.

### ***Decoupling: the evidence so far***

If we look at trade data, some decoupling has taken place. In 2017, before the onset of the trade war, China represented roughly 22% of global US goods imports. In 2021 it was down to 18%. At the product level, as expected, the trade war has had the largest impact on imports from China of products hit with the highest US tariffs, mostly intermediates, largely related to the technological sphere. But many other imports, where no or very low US tariffs were applied, like laptops and computer monitors, phones, video game consoles and toys gained market shares. On the other side, US exports to China slightly increased from 8.4% to 8.6% of total US exports to the world, in the respective years, largely pulled by American goods not affected by Chinese retaliatory tariffs.

Data provided by the General Customs Administration of China show that in 2017 the US constituted 19% of China's global goods exports. In 2021 it was down to 17%. On the import side, in 2017 the US represented 8% of China's imports from world, going down to 7% in 2021. Finally, even if some delinking is taking place with the US, China remains still one of the main hubs of global value chains.

Although trade presents contrasting evidence on decoupling between the two superpowers, the main ingredients of the historical "economic embrace" between them are still there: masses of Chinese cheap consumer goods are still flooding the US market (as an example, 74% of US imports of phones are still sourced from China) representing an enormous benefit for American consumers. At the same time they continue to fuel China's export-led growth, providing it with millions of jobs; US FDI in China, after decreasing in 2019, have continued the upward trend. Chinese FDI decreased slightly in 2018 and 2020, but resumed in 2021. There is some anecdotal evidence on reshoring and nearshoring, but it does not appear to be a tide for the moment. Finally, China is still the second world holder of US debt behind Japan.

Even if a clear decoupling does not appear in the trade data, some future technological delinking of the two superpowers might be suggested by the new directions taken by their policy.

As for China, the two key components of domestic development strategy (the so-called double circulation) seem to be the expansion of the internal market and technological self-sufficiency. This might imply a reorganisation of the global value chains. At an international level, the Regional Comprehensive Economic Partnership (RCEP), the world's largest trade agreement, constitutes China's first mega trade agreement and creates for the first time preferential trade flows amongst the three largest Asian economies (China, Japan, and the Republic of Korea). RCEP might signal a push toward diversifying trade away from the United States in favour of intra-Asian commerce.

The US strategic approach implies challenging China's state-led, non-market approach to the economy and trade, which includes China's industrial policies. It also bolsters supply chain resiliency to mend disruptions and major vulnerabilities and tries to prevent Chinese companies from not only having access to the latest high-performance chips and technology, but from having the ability to manufacture comparable technology itself. Finally, it includes launching the Indo-Pacific Economic Framework (IPEF) - aimed at "expanding US economic leadership" – and therefore curbing Chinese influence – in the region.

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