Trade Fragmentation Unveiled: Five Facts on the Reconfiguration of Global, US and EU Trade

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TRADE FRAGMENTATION UNVEILED:
FIVE FACTS ON THE RECONFIGURATION OF GLOBAL, US AND EU TRADE

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ABSTRACT

In this work, we analyse the most recent shifts in trade patterns amid increasing geo-economic fragmentation. We document five facts about the recent reconfiguration of global, US and EU trade flows. First, a broad retreat from globalization is not taking place. Second, selective decoupling along geopolitical lines is ongoing, and is driven mostly by the weakening of specific trade relationships. Third, while the US dependency on China has been dropping since 2018, for the EU a decline is visible only in 2023, largely driven by few advanced technology products. Fourth, not all dependencies from China are diminishing. US and EU import shares of selected Chinese goods critical for the green transition have indeed even increased. Fifth, US supply chains from China are lengthening, at least for some production lines, as Chinese products increasingly flow through third countries to reach the US market; for the EU it is too early to tell. In general, micro data for Italy indicate that reductions in dependencies from China may be less significant than those emerging from aggregate data, as some EU hubs are increasingly exporting products originated in China to other EU partners such as Italy.

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Introduction[1]

In recent years, global trade and value chains have faced significant disruptions due to the US-China trade war, COVID-19 related supply chain strains, and the Russian invasion of Ukraine, which caused energy crises and heightened geopolitical risk.[2] The war, in particular, affected firms' economic and financial performance and countries' trade balances (Ferriani and Gazzani, 2023; Giordano and Tosti, 2023) and triggered a major drop in trade flows between Russia and sanctioning countries (Borin et al., 2023a; Mancini et al., 2024a). These challenges sparked debates among academics and policy-makers over the optimal degree of international integration (Baldwin and Freeman, 2022) and fostered the implementation of industrial policies in Western economies (Evenett et al., 2024), while China has been actively pursuing policies aimed at increasing its self-reliance through subsidies and state aid for many years (e.g., Made in China 2025 plan established in 2015). Amid heightened geopolitical risk threatening the stability and viability of supply, firms promptly started revising their internationalization strategies. For example, about half of the Italian, Spanish and German manufacturers relying on Chinese critical inputs have either implemented or planned de-risking strategies to reduce their exposure, mainly by turning to other EU partners (Balteanu et al., 2024).[3] Firms also adopted higher inventory levels and dual-sourcing strategies to secure supply chains (Di Stefano et al., 2022; McKinsey, 2022).

In this paper, we assess the current level of geoeconomic trade fragmentation among blocs of politically distant countries and identify patterns characterizing the trade relationships of the EU and the US with two key blocs: the opposite bloc, primarily consisting of China and Russia, and the bloc of non-aligned countries. We also highlight categories of products disproportionately impacted by this trade reconfiguration, drawing on multiple data sources, including aggregate trade statistics, intercountry input-output tables, and customs data.

Aiyar et al. (2023) and Norring (2024) provide a working definition of "geoeconomic fragmentation" as the reversal of global economic integration, driven by domestic economic policy objectives, geopolitical factors, and strategic considerations. "Trade fragmentation" refers to such a reversal specifically affecting trade flows between countries. The economic impact of trade fragmentation could be severe, especially for countries and regions deeply integrated into global production networks, such as the EU (Eppinger et al., 2021; Góes and Bekkers, 2022; Borin et al., 2023b; Campos et al., 2023; Felbermayr, Mahlkow and Sandkamp, 2023; Conteduca et al., 2024; Javorcik et al., 2024). Moreover, supply chain pressures are a key and persistent driver of inflation, as seen in the euro area in recent years (di Giovanni et al., 2022; Gopinath, 2023; Ascari et al., 2024). The weaponization of specific supply lines within a fragmenting global

[1] The views expressed in this work are solely those of the authors and do not necessarily reflect those of Banca d'Italia. We thank Alessandro Borin, William Connell Garcia and the EU Commission DG GROW's Chief Economist Team, Stefano Federico, Alberto Felettigh, and two anonymous referees for their comments.

[2] Figures B1, B2, B3 and B4 in Annex B document some of the economic consequences of these events.

[3] European firms see China as the main source of supply chain risk (Attinasi et al., 2023).

economy could exert sharp pressures on input and raw materials prices, with potentially significant consequences on inflation, as observed during the recent energy crisis (Alessandri and Gazzani, 2023), especially in the presence of capacity constraints (Comin, Johnson and Jones, 2023) or strategic dependency (Panon et al., 2024).

Our contribution to the existing literature is to provide comprehensive evidence of the ongoing reconfiguration of trade flows along geopolitical lines. By leveraging trade data across multiple levels of aggregation —global input-output tables, product-level trade flows, and detailed Italian customs data— we draw a parallel between recent trends in the U.S. and the largely unexplored trends in the EU. Differently from Baldwin and Freeman (2022) who review the existing literature on risks and exposure to GVCs, this paper puts forward state-of-the-art measures of GVC participation and complexity and tracks their developments over time for the main economies using the most updated inter-country input-output tables. Unlike Altman and Bastian (2024), we focus on trade flows and dig deeper into product heterogeneity, whereas the former report analyse macro trends in trade, capital, information, and people flows.[4] Differently from the literature specifically on trade fragmentation, which primarily analyses trade decoupling between the US and China at different level of aggregation (Alfaro and Chor, 2023; Dang, Krishna and Zhao, 2023; Dang and Zhao, 2023; Freund et al., 2024; Gopinath et al., 2024; Fajgelbaum et al., 2024), our focus is also on the EU. Moreover, we rely on multiple data sources, including timely bilateral and product-level merchandise trade data, and Italian customs data. A complementary and contemporaneous study to ours is Arjona, Connell Garcia and Herghelegiu (2024), which considers recent EU import reallocation with a focus on import price changes. Our analysis, instead, compares the trade fragmentation process of the US and of the EU, and delves into product-specific trade patterns and supply chain reorganization.

We uncover five facts about the ongoing reconfiguration of global and EU merchandise trade. First, there is no evidence of a broad retreat from globalization (Fact 1). However, selective decoupling is occurring between specific trade partners, notably Russia and the EU and China and the US (Fact 2). While the US decoupling from China started with the reciprocal tariff escalation in 2018, signs of a reduction in the EU's dependency on China emerged only in 2023; they were particularly evident for advanced technology products (Fact 3). Indeed, the decoupling has also been selective across the product space, as evidenced by the stable or even growing dependencies on Chinese products essential for the green transition (Fact 4). Lastly, supply chains between the US and China have noticeably lengthened as intermediate production stages are moving from China to third countries such as Mexico, Vietnam, and Taiwan, probably to circumvent trade barriers. For the EU it is too early to tell, given that input-

[4] Other papers that focus instead solely on foreign direct investment (FDI) fragmentation are Ahn et al. (2023) and Casella, Bolwijn, and Casalena (2024). EU economies' outward FDI is generally directed to advanced economies. For example, in the case of the EU only 3 per cent of total outward FDI is directed to China and investment from China to the EU slowed down substantially in the last few years (Kratz et al., 2024).

output tables end in 2022. However, micro data for Italian firms show that a rising share of products imported from other EU economies are of Chinese origin, suggesting that reductions in dependencies from China may be more contained than those emerging from aggregate data (Fact 5). This finding suggests that fragmentation might not fully eliminate interdependence among nations. Therefore, governments and policymakers need to find a balance between their legitimate concerns related to economic security and mitigating the negative welfare impacts of increased trade fragmentation.

Fact 1: A broad retreat from globalization is not taking place.

Over the three decades leading up to the Global Financial Crisis (GFC), trade liberalization and reduced transport and communication costs strengthened mainly goods market integration globally, leading to the dispersal of production processes across countries and to what has been defined as "globalization".[5] Consequently, global trade openness, measured by the trade-to-GDP ratio, increased (Fig. 1, left panel). In the subsequent decade, global trade integration of goods slowed, entering a phase called "slowbalization" (Antràs, 2020), on account of both structural and cyclical factors (IRC Task Force, 2016).[6] In recent years, despite the above-mentioned concerns about recent shocks triggering deglobalization, global trade openness remained broadly stable.[7]

Prior to the pandemic, differing trends were observed amongst the three global economies US, EU, and China (Fig. 1, right panel). Trade openness did not vary substantially for the US, whereas it increased for the EU, making it the most open of the three economies considered. After a strong hike until the mid-2000s, trade openness decreased for China as the country strengthened its self-reliance in several production lines in the context of a wider upstream integration of domestic producers in high-value-added activities. Moreover, the sustained growth of the Chinese economy expanded the domestic market relatively more than the foreign sector. In the most recent years, trade openness was however broadly stable in the three economies.

[5] More specifically, globalization has been defined as the process of growing interdependence among world economies, cultures, and populations (PIIE, 2024), while deglobalization represents the reversal of such a process.

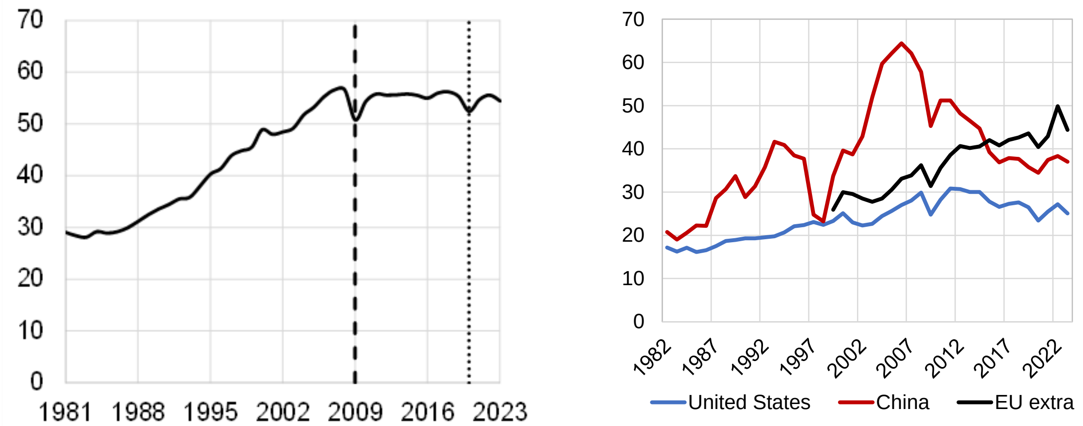
[6] Among the cyclical factors, the investment sluggishness after the GFC and the European sovereign debt crisis played an important role, as capital goods are very trade-intensive (Borin et al., 2018; Constantinescu, Mattoo and Ruta, 2020). Regarding structural factors, the impact of one-off drivers that fueled trade expansion in the past two decades faded out (e.g. China's accession to the WTO, trade liberalization).

[7] These general findings are confirmed even when netting out the US and China from the analysis (results available upon request). Interestingly, one can observe a slight decoupling between global trade openness and that net of US and China starting around 2018, with the latter series growing more, specifically because of the trade war because between these two countries and also reflecting the trend of energy commodities prices with the peak in 2022. For an analysis accounting more in depth for trade in services see Baldwin, Freeman and Theodorakopoulos (2024).

Fig. 1 – Trade openness

(percentage shares)

Global / Selected regions



Source: Authors' calculations on IMF WEO, World Bank Development Indicators and Eurostat data.
Notes: Trade openness is computed as the sum of goods and services exports and imports, as a share of GDP (at current prices). In the left panel, the dashed vertical line represents the GFC, the dotted vertical line represents the Covid-19 pandemic. In the right panel, for EU, we exclude trade among its members and data are unavailable prior to 1999 to achieve this exclusion. For China, data are available only since 1982.

Measures of integration in GVCs based on inter-country input-output tables also exclude outright deglobalization. More specifically, we compute the GVC-related share of trade (Borin et al., 2021) and a measure of GVC complexity (Antràs and Chor, 2019; Mancini et al. 2024b) relying on the OECD TiVA database and the Asian Development Bank Multi-Regional Input-Output tables (ADB MRIO). GVC-related trade is defined as products crossing at least two borders during the production process, while GVC complexity is defined as the average number of production stages at the global level from the origin of productions to their final consumption across industries and countries.

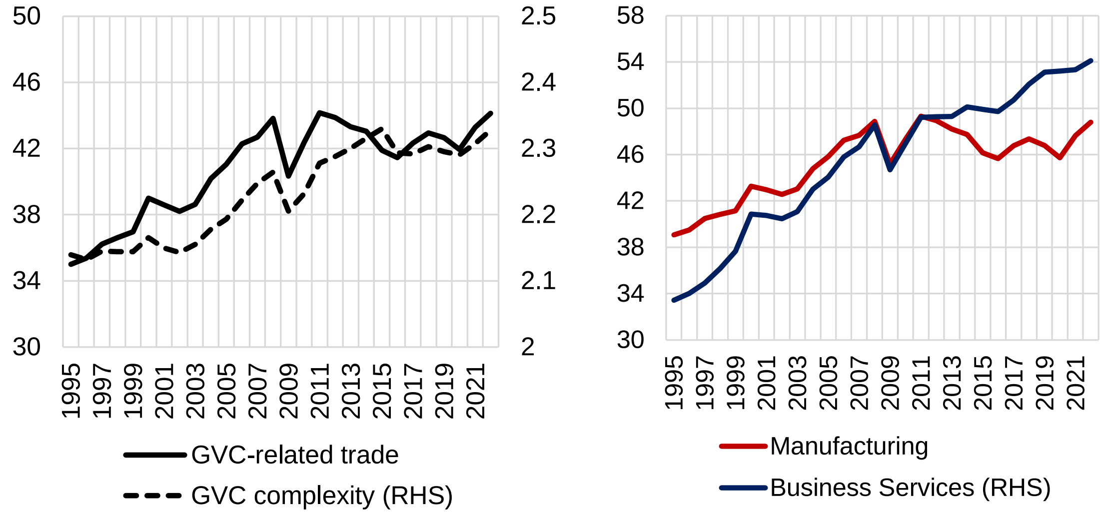
At the aggregate level, after having expanded markedly until the mid-2000s, GVC-related trade and complexity have remained broadly stable (Fig. 2, left panel).[8] The indicators registered only a temporary downturn in conjunction with the GFC and the COVID-19 pandemic. By 2022, about half of global trade is GVC-related. However, recent trends for manufacturing and services sectors are very different. While manufacturing is still more intensively engaged in GVC activities than services in absolute terms, services sector integration in GVCs has been on a steady trend of growth (Figure 2, right panel). This evidence, coupled with the long-lasting stall in GVC integration of manufacturing activity, suggest that the path of GVCs is already shaped by the digital innovations that are making services much easier to trade (Baldwin et al., 2024). Since timely and high-frequency services data are still scarce, in the following we focus solely on goods trade, and we leave the analyses of recent services trade developments for future research.

[8] The results shown in Fig. 6 are also robust to using current-prices series, as well as to calculations based on the less updated OECD TIVA input-output tables.

Fig. 2 – GVC participation and GVC complexity

(percentage shares of global trade)

Complexity and participation in GVCs **GVC-related trade, by sector**



Source: Authors' calculations based on OECD TiVA and ADB MRIO at constant prices. Indicators based on Borin et al. (2021) and Mancini et al. (2024b). Notes: Data for GVC participation are available in the World Bank WITS GVC, complexity is available in Mancini et al. (2024b) data section. GVC-trade measures the share of total exports related to GVC activities, i.e. crossing more than one border. Energy goods are excluded from total goods. Services sector focuses on business services, therefore it excludes hotels and restaurants, transport, public administration, education, health, social services.

Fact 2: Selective decoupling is ongoing, driven mostly by the weakening of specific trade relationships, namely US and EU imports from China and Russia.

Overall, various metrics indicate that there has been no significant retrenchment from GVCs . Does this mean that global trade patterns have remained unchanged? To answer this question, we rely on timely data on global goods trade flows at the bilateral and product level sourced from Trade Data Monitor and UN Comtrade. We account for the geopolitical dimension in our analysis by assigning countries to three blocs – US-EU and their aligned countries, neutral, and China-Russia and their aligned countries– following the approach developed in IRC Trade Expert Network (2024), which combines the index produced by den Besten, Di Casola and Habib (2023) and the classification of Capital Economics (2023).[9]

Over 2021-23, the US and EU economies markedly increased their import shares from each other to the detriment of China and China-aligned partners (Fig. 3, left hand-side panel). This pattern was already evident in the previous period (2017-2019), although much less pronounced. Similarly, in the most recent period, China-aligned economies significantly reduced their purchases from the US and US-aligned countries, increasing trade with each other. Overall, while there is no evidence of a decrease in either

[9] See Annex A for details on the data and on the methodology.

trade openness or GVC participation at the aggregate level, trade partnerships are shifting as trade appears to be realigning along geopolitical lines.[10]

This trade reconfiguration, however, is not widespread but rather driven by shifting trade ties between specific partners. The recent reduction in the US-aligned bloc's import share from the China-aligned bloc has been driven by the sharp drop in China's share in US imports and in EU imports from Russia (each contributing about 30 per cent to the overall decline; again see Fig. 3, left hand-side panel).[11] On the other hand, the overall loss in the China-aligned bloc's import share from the opposite bloc has been due mainly to a reduction in China's imports from Asian countries aligned with the US (namely, South Korea, Taiwan, and Japan),[12] altogether accounting for 60 per cent of the drop, and by the fall in Russian imports from the EU (accounting for one-third of the total).

A closer examination of recent trends in the EU and US reveals that in 2023 both economies have increased their mutual reliance while simultaneously reducing their dependencies on China and Russia (Fig. 3, right-hand side panel; on this point see also Altman and Bastian, 2024). With the nearly complete direct decoupling between Russia and the West due to sanctions and export controls imposed after the onset of the war in Ukraine,[13] in what follows we will focus on the reconfiguration of US and EU trade flows from China. China is the most significant supplier from the opposite bloc for Western countries. Moreover, the reconfiguration of trade *vis-à-vis* China has likely just begun for the EU and is far from concluded for the US, as business relocation strategies and FDI evidence – which usually are leading indicators of future trade patterns – seem to suggest (Balteanu et al, 2024; Kratz et al., 2024).

[10] The neutral bloc has significantly increased its import share from China and China-aligned economies between 2017 and 2023, especially during the COVID-19 pandemic. The share of US and US-aligned economies in neutral countries imports decreased in the same period.

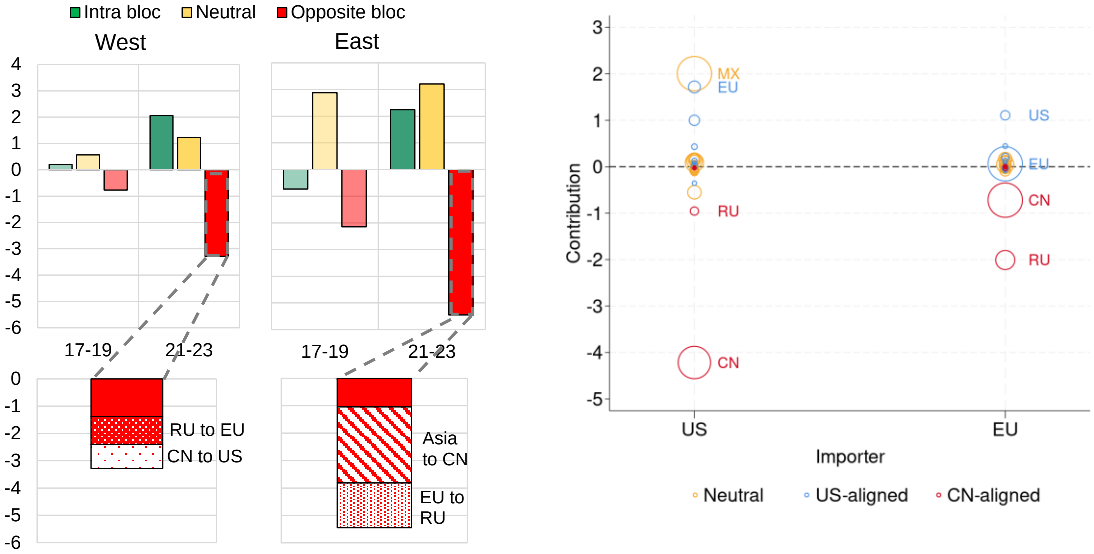
[11] In Fig. 7 energy flows are included, which explains most of the EU result vis-à-vis Russia.

[12] The drop in the relevance of South Korea, Taiwan, and Japan's share in China's imports may be due to the geopolitical tension between the countries, with these countries pivoting towards the US. Moreover, China increased its self-reliance in crucial sectors, such as the manufacturing of chips.

[13] This has been extensively analysed in recent studies (Bosone et al., 2023; Chupilkin, Javorcik and Plekhanov, 2023; Mancini, Conteduca and Borin, 2024a; Borin et al., 2023a; Borin et al., 2023b; Di Comite & Pasimeni, 2023; Demertzis et al., 2022). It is likely that Russia is partly able to escape sanctions through flows directed via third countries as shown in Chupilkin, Javorcik and Plekhanov (2023), though not completely (Borin et al., 2023a).

Fig. 3 – Changes in import shares within and between geopolitical blocs and countries

(percentage-point changes)



Source: authors' calculations on Trade Data Monitor (TDM), UN COMTRADE, den Besten et al. (2023), Capital Economics (2023) and Trade Expert Network (2024).

Notes: current price goods imports reported by 111 countries, excluding gold and other residual categories. See main text for details. In the right hand-side panel, each bubble's centre reports the selected country's contribution to the total variation between 2021 and 2023 of the bloc's weight in the importing country's imports. Each bubble area reflects the country's importance in the imports of each destination in 2021. We report the most positive and negative contributors for each destination, plus China, Russia, the EU, and the US.

Fact 3: Decoupling from China has been selective along the product dimension, with imports of advanced technology products driving the process.

After the introduction of US-China tariffs in 2018, US goods import shares from China decreased dramatically, by 10 percentage points over five years, to 15 per cent (Fig. 4; left panel).[14] By contrast, until 2022, the weight of China for the EU, both net or gross of intra-EU trade, actually increased, boosted by the rotation of demand towards selected goods, such as medical equipment and electronics, induced by the COVID-19 pandemic.[15] However, the Chinese import share for the EU declined in 2023, driven by the two manufacturing powerhouses, Italy and Germany, even if it remained

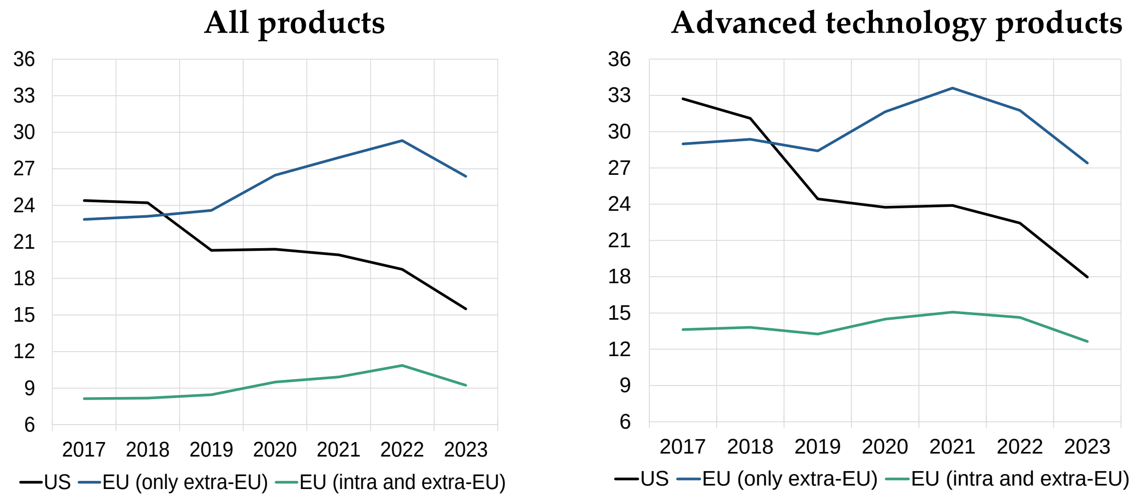
[14] In this paper we employ customs data of the reporting country. According to Chinese export data, the fall in bilateral trade with the US after 2018 was significantly more muted (Fig. A3 in the Annex), since discrepancies between the value of Chinese imports in the US and of Chinese exports to the US according to the two data sources are significant. One possible explanation has been suggested by Clark and Wong (2021), namely that US importers underreport imports to US customs, perhaps utilizing low-ball invoices supplied by their Chinese suppliers, in order to evade US tariffs (on the importance of *de minimis* regulation, see also Fajgelbaum and Khandelwal, 2024). This explanation cannot however explain the whole discrepancy observed. By contrast, mirror data between China and the EU and with the main EU economies appear to be significantly more consistent: Chinese exports are only slightly lower than EU imports and this can be explained by cif-fob adjustments (Fig. A4).

[15] Unlike the US, the EU has not broadly increased duties on imports from China between 2017 and 2023.

slightly above pre-pandemic levels.[16] Unlike the US, assessing whether a trend of decoupling from China is under way also for the EU is not trivial.

Fig. 4 – China's share in goods imports of the US and of the EU by selected product categories

(percentage shares)



Source: authors' calculations on TDM.

Notes: Imports shares are computed net of energy items and non-monetary gold. Advanced technology products are defined in Annex A.

Several pieces of evidence suggest that the recent drop in EU dependencies on China might be non-temporary and driven not (only) by post-COVID normalization but by actual decoupling. In fact, recent patterns observed in the EU are similar to those seen in the US with business survey evidence highlighting that firms are engaging or plan to engage in de-risking activities (Balteanu et al., 2024) First, the main driver of the US and EU decline in the import share from China was, in both cases, the drop in the share of advanced technology products (hereafter ATP;[17] Fig. 4, right panel). While the tech decoupling has been ongoing for quite some time for the US, the ATP share dropped considerably for the EU only recently, in 2023, *below* pre-pandemic values.[18] Second, the drop was of similar size for the US and for the EU, over 4 percentage points in just one year, and mostly driven by the same 5 key ATP, as reported in Table 1: laptops, monitors, mobile phones, and communication apparatus, semiconductors and electric integrated circuits. Third, in these key products, what were previously Chinese shares in the EU and US were gained by the same trade partners:[19] India, for mobile phones; Vietnam, for laptops and monitors; Taiwan, for semiconductors and electric integrated circuits (Table 2). In the US case, also Mexico gained market shares

[16] See Fig. B5 in Annex B. Similarly to Fig. 4, and as to be expected, trends are more pronounced when only extra-EU trade is considered, but all main results hold even when including intra-EU trade.

[17] This classification is defined by the US Census Bureau and detailed in Annex A.

[18] See Fig. B6 in Annex B for country-level evidence.

[19] For the four top EU economies, some heterogeneous patterns of market shares reallocation out of China also emerge (see Table B1 in Annex B). For example, Vietnam gained market shares in Italian, German and Spanish laptop imports, and together with India they were the two winners in mobile phone import shares in those countries and in France. As for monitors, the trends are heterogeneous across EU countries.

(due mostly to increased imports of cars and car parts). These trends align with the ongoing reorganization of supply chains that top multinational enterprises are implementing (HSBC Global Research, 2024). However, relocation of Chinese production to neighbouring Asian countries may also play a role (more on this in Fact 5 below).

Table 1 – Import shares from China of total goods and of ATP

(percentage points)

	All		ATP		5 key prod		Other ATP	
	2023	change 23-22	2023	change 23-22	2023	contr. 23-22	2023	contr. 23-22
US	15.5	-3.2	17.5	-4.6	42.7	-2.9	7.3	-1.7
EU	26.4	-2.9	29.9	-4.4	55.5	-3.5	17.7	-1.0
France	21.5	-2.7	16.3	-2.7	35.0	-1.3	12.2	-1.4
Germany	23.4	-5.2	21.4	-3.4	36.7	-2.0	15.1	-1.4
Italy	27.9	-2.8	35.9	-5.8	67.5	-5.5	25.1	-0.3
Spain	26.2	-1.2	26.1	-3.7	67.2	-5.4	14.9	1.7
EU (intra and extra)	*9.2*	*-1.6*	*14.0*	*-2.1*	*30.3*	*-1.6*	*7.7*	*-0.5*

Source: authors' calculations on TDM.

Notes: Imports shares are computed net of energy items and non-monetary gold, where relevant. ATP are defined in Annex A. The five key ATP HS6 product codes are: 847130 for laptops (Automatic data processing machines: portable, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display), 851712 for mobile phones (Telephones for cellular networks or for other wireless networks), 852852 for monitors (Monitors: other than cathode-ray tube: capable of directly connecting to and designed for use with an automatic data processing machine of heading 8471), 851762 for communication apparatus (Communication apparatus (excluding telephone sets or base stations): machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus), 8541 (Diodes, transistors, similar semiconductor devices; including photovoltaic cells assembled or not in modules or panels, light-emitting diodes - LED, mounted piezo-electric crystals) and 8542 (Electronic integrated circuits) for chips. Column 6 and 8 report the contribution of the selected products to the change in China's market shares in the respective category.

Table 2 – Change in US and EU import shares from China and other relevant partners, selected ATP

(percentage points)

	Product	China		Other relevant partners					
		2023	23-22	Other Partner	2023	23-22	Other Partner	2023	23-22
US	Laptops	77.5	-14.2	VN	17.2	13.5	TW	4.5	0.4
US	Mobile phones	71.6	-4.0	VN	14.8	-3.9	IN	7.7	6.0
US	Monitors	79.7	-5.0	VN	5.3	2.2	MX	5.0	0.8
US	Communication apparatus	15.5	-3.3	VN	19.6	-2.2	MX	17.2	1.3
US	Chips	5.0	-0.9	MY	27.1	-7.1	TW	19.5	2.6
EU	Laptops	91.9	-2.3	VN	4.4	2.0	TW	1.2	0.3
EU	Mobile phones	66.1	-2.0	VN	16.9	1.3	IN	9.8	2.2
EU	Monitors	72.2	-7.6	VN	14.4	5.2	JP	3.3	0.8
EU	Communication apparatus	47.5	-6.9	TW	10.4	1.5	VN	9.9	1.2
EU	Chips	37.0	-1.9	TW	15.1	1.3	MY	12.1	-1.3

Notes: Besides China, other partners are the ones with the highest share in US or EU (extra-EU) imports in 2023. The HS6 product codes of the five goods are those reported in the notes of Table 1.

Are recent reallocation trends out of China seen in EU and US widespread across products, or mostly driven by and confined to the five key advanced technology products? To shed light on this aspect, we test whether *product-level* changes in the US and the EU import shares from China are correlated with changes in their import shares from third countries reported in Table 2, particularly for ATP. For this purpose, we use the following panel specification for $i = US, EU$:

$$\begin{aligned} \Delta impshare_{i,x,p,2023-22} &= \beta_0 + \beta_1 \Delta impshare_{i,CN,p,2023-22} \\ &+ \beta_2 \Delta impshare_{i,CN,p,2023-22}\, ATP_p + \beta_3\, ATP_p \\ &+ \beta_4 \Delta impshare_{i,x,p,2022-17} + FE_{\tilde{p}} + \varepsilon_{i,x,p} \end{aligned} \quad (1)$$

where the dependent variable is the change between 2022 and 2023 in the share of US or EU[20] imports of HS4 products p from selected supplier countries x, chosen on the basis of the evidence presented thus far. $\Delta impshare_{i,CN,p,2023-22}$ is the corresponding change in the import share from China and when it is interacted with *ATP* – which is a dummy variable taking value one for ATP[21] and 0 otherwise – it captures the change in US and EU imports specifically of ATP from China. We also include as covariates the lagged five-year change ($\Delta impshare_{i,x,p,2022-17}$) in the dependent variable, to control for pre-trends in the reporter country's propensity to source from that location, as well as the ATP dummy itself and HS2 product fixed effects ($FE_{\tilde{p}}$), and we use the imports from China in 2017 for each HS4 as a weight.[22] If the share of a non-ATP from China is declining, a statistically significant negative β_1 coefficient in the first row of each panel in Table 3 (for the US) and in Table 4 (for the EU) implies that the share of imports from the reported alternative location is rising in a statistically significant fashion; when β_2 is also negative, then the substitution away from China for ATP is even stronger.

For the US, in 2023, there is evidence of significant import reallocation away from China towards several among our selected partners (Table 3). The reallocation is stronger for ATP products in the case of Vietnam, whereas in the case of Mexico it involves non-ATP products. This evidence complements that in Alfaro and Chor (2023), in which significant import substitution away from China to the benefit of Vietnam and Mexico is found for the period 2017-22, especially for goods covered by US tariffs. In the case of the EU, the evidence is less strong (Table 4).

[20] As in the rest of the paper, only imports from non-EU partners are considered.

[21] In particular, an HS4 product code is defined as ATP if at least one of its corresponding HS6 product is an ATP.

[22] The results of an unweighted version of the specification (1) suggest that, as expected, larger flows account for the aggregate results in Tables 3 and 4.

To conclude, our empirical evidence points to signs of decoupling from China in favour of selected Asian countries in 2023 both for the US and for the EU (as well as of Mexico solely for the US).

Table 3 – 2023 changes in the US import shares

	Dep. Var: Change in US product-level import share from country x (2022-2023)				
Partner country x:	VN	TW	IN	MY	MX
Δ China (2022-2023)	**-0.280*** **	0.032	**-0.045***	-0.006	**-0.293*** **
	(0.07)	(0.03)	(0.03)	(0.03)	(0.05)
Δ China (2022-2023)*ATP	**-0.573***	-0.09	0.05	-0.006	**0.633*** **
	(0.33)	(0.07)	(0.04)	(0.09)	(0.15)
ATP	-1.727***	0.681	1.265	0.057	0.609***
	(0.46)	(0.61)	(0.91)	(0.33)	(0.21)
Δ country x (2017-2022)	-0.234***	0.530***	0.006	-0.045	-0.064
	(0.06)	(0.07)	(0.08)	(0.03)	(0.05)
HS2 product fixed effects	Y	Y	Y	Y	Y
Adjusted R-squared	0.612	0.792	0.384	-0.072	0.467
N	805	957	1,058	746	1,044

Notes: Estimations based on HS4 product-level imports from TDM. ATP is a dummy variable taking value 1 if at least one HS4 product code in the corresponding HS4 category is an ATP. Estimation is by weighted least squares, with the 2017 value of imports from China for each HS4 product as weights. Standard errors are clustered by HS2 codes and are reported in brackets. ***, **, and * denote statistical significance at the 1%, 5% and 10% confidence levels, respectively.

Table 4 – 2023 changes in EU import shares (from non-EU suppliers)

	Dep. Var: Change in EU product-level import share from country x (2022-2023)				
Partner country x:	VN	TW	IN	JP	MY
Δ China (2022-2023)	-0.018	**0.043** **	**-0.022***	**-0.090*** **	0.02
	(0.02)	(0.02)	(0.01)	(0.03)	(0.02)
Δ China (2022-2023)*ATP	-0.17	-0.352	0.024	**0.071***	**-0.051***
	(0.14)	(0.22)	(0.02)	(0.04)	(0.03)
ATP	0.674	0.993***	0.386**	0.142	-0.31
	(0.62)	(0.24)	(0.16)	(0.24)	(0.3)
Δ country x (2017-2022)	-0.151***	0.152	0.085	-0.108	0.031
	(0.03)	(0.14)	(0.08)	(0.11)	(0.05)
HS2 product fixed effects	Y	Y	Y	Y	Y
Adjusted R-squared	0.385	0.675	0.205	0.129	0.095
N	1,023	1,076	1,152	1,151	1,008

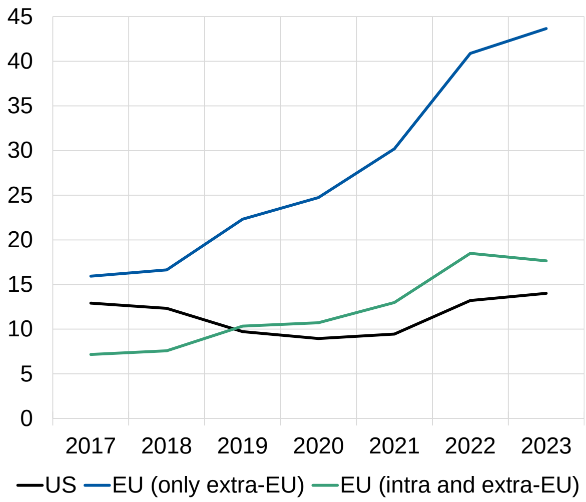
Notes: Estimations based on HS4 product-level imports from TDM. ATP is a dummy variable taking value 1 if at least one HS4 product code in the corresponding HS4 category is an ATP. Estimation is by weighted least squares, with the 2017 value of imports from China for each HS4 product as weights. Standard errors are clustered by HS2 codes and are reported in brackets. ***, **, and * denote statistical significance at the 1%, 5% and 10% confidence levels, respectively.

Fact 4: The reliance on selected Chinese products needed for the green transition has instead increased for both the US and, especially, the EU.

While a reduction in the import share of ATP is ongoing, the pattern is very different for other products key for the green transition. In fact, in recent years, Western economies have faced a growing critical dependence on such products.[23] The share of imports from China for these items has increased significantly for both the US, the EU and its main economies (Fig. 5; Fig. B3 in Annex B), likely due to China's strong market position and the surge in global demand (Javorcik et al., 2023). Probably also as a result of US tariffs that target some of these products, such as electric vehicles and solar panels, over the period considered, China's share of critical goods for the green transition is higher in EU imports than in US imports.

Fig. 5 – China's share in goods imports of the US and of the EU of critical goods for the energy transition

(percentage shares)



Source: authors' calculations on TDM.

Notes: Critical goods for the energy transition are defined in Annex A.

Significant boosts to these import shares came from 4 key products (Table 5): lithium batteries and their components, photovoltaic cells, and electric vehicles. To state some figures, an impressive 70 per cent of US purchases from abroad of lithium batteries were sourced from China in 2023; amongst the top EU economies, this share was even higher (reaching 90 per cent for Italy and 96 for Spain). By contrast, the US shares of imports of both photovoltaic cells and electric auto vehicles from China have become negligible. China instead remains the top global supplier of photovoltaic cells for the

[23] See Annex A for their definition in this paper.

EU economies, whereas the share from China of electric auto vehicles is heterogeneous, albeit generally higher than in the US (e.g. under 20 per cent in the case of Italy,[24] against 77 per cent in the case of Spain).

Table 5 – Import shares from China of total goods and of critical goods for the green transition

(percentage points)

	All		Green		4 key prod		Other green	
	2023	change 23-22	2023	change 23-22	2023	contr. 23-22	2023	contr. 23-22
US	15.5	-3.2	14.0	0.8	24.2	2.0	6.1	-1.2
EU	26.4	-2.9	43.7	2.8	76.5	4.9	15.7	-2.1
France	21.5	-2.7	35.5	3.3	67.7	4.7	17.1	-1.4
Germany	23.4	-5.2	36.2	6.6	63.3	7.8	13.6	-1.2
Italy	27.9	-2.8	26.6	3.0	74.8	6.1	12.9	-3.1
Spain	26.2	-1.2	49.1	2.8	87.3	4.4	9.4	-1.6
EU (intra and extra)	*9.2*	*-1.6*	*17.6*	*-0.9*	*34.1*	*0.5*	*5.9*	*-1.4*

Source: authors' calculations on TDM.

Notes: Imports shares are computed net of energy items and non-monetary gold, where relevant. Critical goods for the energy transition are defined in Annex A. The four key HS6 product codes are: 850760 (Electric accumulators: lithium-ion, including separators, whether or not rectangular, including square), 850790 (Electric accumulators: parts n.e.c. in heading no. 8507), 870380 (Vehicles: with only electric motor for propulsion), 854140 (Electrical apparatus: photosensitive, including photovoltaic cells, whether or not assembled in modules or made up into panels, light-emitting diodes - LED).

Fact 5: Supply chains between the US and China have lengthened; for the EU is too early to tell. Granular data for Italy indicate that reductions in dependencies from China may be smaller than those emerging from aggregate data, as an increasing share of goods imported from EU partners are of Chinese origin.

The trade reconfiguration documented thus far reflects a reorganization of supply chains. The observed reduction in import shares from China for the US and the EU, however, does not rule out the possibility that supply chains are lengthening, with third countries exporting to Western economies products or components originating in China. Indirect dependencies may arise in several ways. First, third countries may host foreign affiliates of Chinese-national entities in the manufacturing and logistics sectors. Second, firms in third countries might simply re-export Chinese inputs or final products without further processing (e.g., carry-along trade; Bernard et al., 2019). Third, Chinese inputs might enter the production process in other countries at later

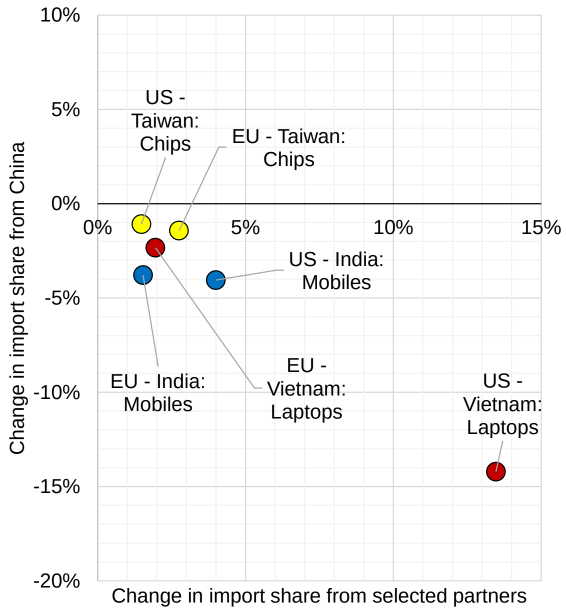
[24] In 2023 Italy's imports of electric auto vehicles from China increased by over 70 per cent relative to the previous year, contributing positively to overall purchases from this country; however, Italy also marked a 130 per cent increase of electric auto vehicle imports from all countries in the world (Table B2 and Table B7 in Annex B).

stages. In all these cases, the dependency on China could be still high and the documented fragmentation would hence not be reducing the risks of sourcing from China as much as what the aggregate direct trade data alone suggest.

As a first step in Figure 6 we provide some descriptive evidence of the decline in the US and EU import shares from China of specific products going hand-in-hand with an increase of import shares from Taiwan, India and Vietnam.

Fig. 6 – Change in import share from China vs. China in import share from selected partners for US and EU, selected products

(*percentage points change*)



Source: authors' calculations on TDM.

Next, we address the issues of lengthening and second-degree dependency on China econometrically and test whether some degree of supply-chain lengthening is occurring by considering the following panel specification:

$$\Delta imports_{p,h\rightarrow d,t-b} = \beta_0 + \beta_1 \Delta imports_{p,CN\rightarrow h,t-b} + \varepsilon \text{ with } d = US, EU \tag{2}$$

where the dependent variable, $\Delta imports_{p,h\rightarrow d,t-b}$ is the change in US or EU (indexed by d) imports from a potential hub h of product p (defined as an HS-4 digit code) between $t = 2021, 2023$ and a base year b, whereas $\Delta imports_{p,CN\rightarrow h,t-b}$ represents the change in the imports of a potential hub h from China of product p between $t = 2021, 2023$ and the base year. Given the above evidence, we select 2017 and 2019 as baseline years, b, and focus on the main common partners, emerging in Fact 3 and Fig. 6, i.e., Vietnam, Mexico, India, and Taiwan as potential hubs, h. Moreover, we only consider products for which $\Delta imports_{p,CN\rightarrow h,t-b} > 0$ under the assumptions that the additional imports from China can be exported from the hub to the final destination.

A positive and statistically significant estimate of β_1 in (2) would be consistent with the hypothesis that imports from China may transit through potential hubs instead of following a direct route to their destinations, indicating that de-risking may be weaker than what appears from aggregate data. Another interpretation could be that a product imported from China to the hub may receive some minimal transformation which does not substantially alter the nature of the product itself.

Table 6 reports our estimates for specification (2). The results suggest that some rerouting of trade and lengthening of the supply chains may have occurred for some trade partners of the US and the EU, since the outbreak of the US-China trade war. As far as concerns the US, the estimate of β_1 is positive and significant for Vietnam, India, and Taiwan for the period 2017-2019 and for Mexico, Vietnam, and India for the period 2021-2023. For the EU, the tendency seems to appear only recently in line with the descriptive evidence presented earlier: the estimate of β_1 is positive and significant for Vietnam, Mexico, and India for the period 2021-2023. Moreover, the magnitude of the coefficients for the EU appears smaller than for the US, signaling the different intensity of the phenomenon for the two areas. We also test whether the results in Table 6 may be driven by exceptionally large changes in trade flows by trimming our sample excluding the bottom and top 10% of changes in trade flows; we find some supporting evidence of the importance of large flows (Table B4).

Table 6 – Indirect imports from China in the US or the EU

		Potential hubs							
		Mexico		Vietnam		India		Taiwan	
	Coef.	2019 vs 2017	2023 vs 2021	2019 vs 2017	2023 vs 2021	2019 vs 2017	2023 vs 2021	2019 vs 2017	2023 vs 2021
US	β_1	0.985	1.708***	0.255***	-0.016	0.223**	0.287***	1.006***	-0.911
		(0.646)	(0.553)	(0.092)	(0.179)	(0.112)	(0.084)	(0.336)	(0.762)
	Obs.	585	543	533	400	578	580	500	311
EU	β_1	-0.011	0.131**	-0.015	0.288*	0.106	0.098*	0.047	-0.288
		(0.027)	(0.060)	(0.025)	(0.149)	(0.082)	(0.054)	(0.085)	(0.242)
	Obs.	576	543	654	503	614	627	537	336

Sources: TDM and authors' calculations.

Notes: Estimation of coefficient β_1 of equation (2). Robust standard errors in parentheses. Base years are 2017 and 2019. Observations are weighted by the US and EU imports from China in 2017. Bottom and top 1% are trimmed. Trade flows aggregated at the HS4 level. ***, **, and * denote statistical significance at the 1%, 5% and 10% confidence levels, respectively.

While these results might suggest that products are rerouted through potential hubs with minimal transformation, equation (2) cannot detect more profound reorganizations of supply chains, such as if Chinese inputs undergo significant transformations.

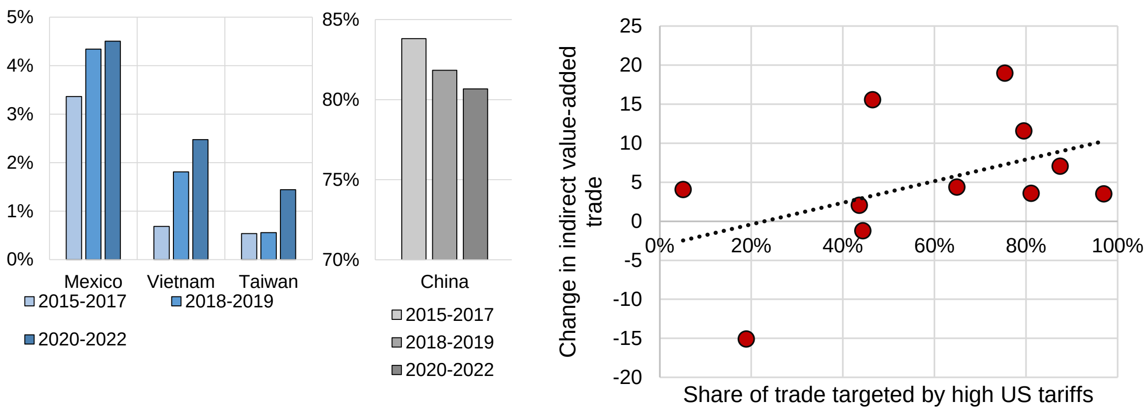
In this case, products manufactured in third countries will still include Chinese inputs, which will be indirectly imported into the destination markets, such as the US and the EU. Consequently, supply chains will lengthen and the de-risking strategies adopted by firms will be less effective, given that imported products still contain Chinese inputs. We test this hypothesis using the most recent inter-country input-output tables available up to 2022 (Asian Development Bank) and a method that allows us to trace Chinese value-added through its indirect routes to the West (Borin and Mancini, 2023).

Figure 7 illustrates how Chinese value-added is increasingly imported by the US through third countries, such as Vietnam, Mexico, and Taiwan, instead of being directly shipped from China to the US (left panel). Consistent with Qiu, Shin, and Zhang (2023), this suggests a possible restructuring and lengthening of supply chains, with production stages in third countries increasingly relying on Chinese inputs.[25] The growth in indirect trade of Chinese products has been more remarkable in sectors more targeted by US import tariffs (Fig 7, right panel). Overall, it is important to note that the increase in indirect trade has yet to fully compensate for the decline in direct trade from China to the US. Thus, US dependency on China has decreased despite longer GVCs, though perhaps not as much as direct trade data alone would suggest.

Fig. 7 – China's value added in US imports

Share of Chinese value-added in US imports from selected countries
(percentage shares)

Change in the share of Chinese value-added reaching the US indirectly between 2022 and 2017 vs share of US imports targeted by high tariffs
(percentage points)



Notes: authors' calculations.
Source: The left hand-side chart is based on ADB MRIO data and Borin and Mancini (2023); the right hand-side chart is based on ADB MRIO, TDM data, Peterson Institute data.

[25] The Inter-Country Input-Output tables used in this analysis do not differentiate between production by domestic firms and foreign affiliates of Chinese entities. Therefore, the increase in indirect trade we observed likely represents a lower bound, as it does not account for the rise in production by Chinese multinationals in third countries. This increase could be significant, given the sharp rise in Chinese FDIs to Mexico, Vietnam, Thailand, and Malaysia, as shown in Fig. B8 in Appendix B.

For the EU, a similar pattern was not observed up to 2022, likely due to fewer barriers to Chinese imports compared to those imposed by the US. However, the EU-China trade reconfiguration seen in 2023, as previously documented, might suggest that a similar increase in indirect dependencies may also be occurring in the EU. Given that inter-country input-output tables are not yet available for 2023, this is not easy to test.

To show that the reduction in EU dependencies on China recorded in 2023 in traditional trade statistics might partially conceal an increase in indirect dependencies, we employ detailed foreign transaction data for Italy. We focus on Italian firms importing from other EU countries flagship ATP, which are driving the reduction in direct dependencies on China (namely, laptops, mobile phones, monitors, communication apparatus, semiconductors, and electronic integrated circuits; see Fact 3). These unique data provide a valuable micro-level source of information to quantify the evolution of indirect dependency of a large EU country, as they include details on both the provenance and origin of goods for each foreign transaction.[26]

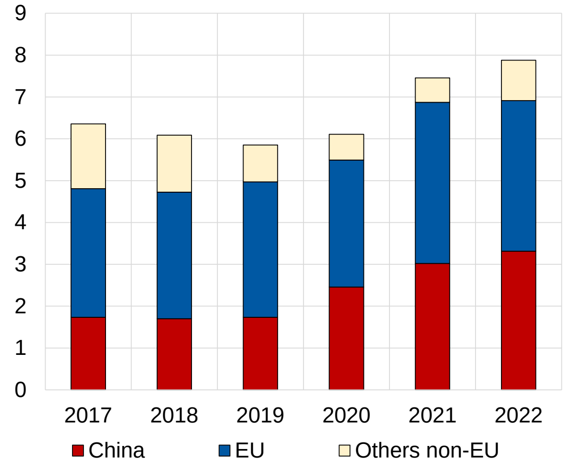
In 2022, the most recent data available show that approximately 45% of Italian imports from EU partners for these ATP actually originated from China. This represents a significant increase from 2017, when the share was below 30% (Fig. 8, left panel). At the product level, there is substantial variation, with laptops originating from China accounting for nearly 85% of imports from EU partners, and mobile phones and monitors close to half of the total (see Fig. B9). These products often transit through the Netherlands, Germany, Ireland, and France, where local affiliates and branches of Chinese multinational enterprises are typically located (Fig. 8, right panel).

[26] According to the 2022 Edition of the "European business statistics compilers' manual for international trade in goods statistics", country of origin of goods is "where they underwent their last, substantial, economically justified processing or working in an undertaking equipped for that purpose, resulting in the manufacture of a new product or representing an important stage of manufacture", whereas the country of provenance of goods in the case of EU imports is "the last Member State from which the goods were initially exported to the Member State of import if neither a commercial transaction (e.g. sale or processing) nor a stoppage unrelated to transport has taken place in an intermediate Member State or nonmember country."

Fig. 8 – Italy's imports of selected ATP by country of origin

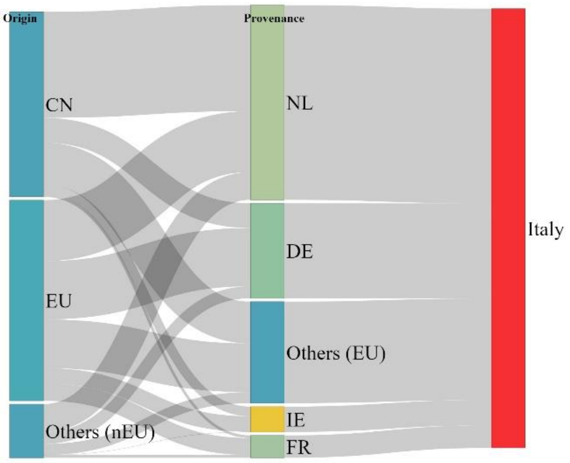
Origin of imports

(*values in EUR billion*)



Trade routes in 2022

(*percentage shares*)



Source: authors' calculations on Italian customs data for the upper panel and on Italian customs data for the lower panel.

Notes: For the right panel, the breadth of each grey arrow reflects the size of the flow between an origin country and a provenance country, and provenance country and Italy. Flows representing less than 5% are aggregated in 'Others (nEU)', for non-EU origin, and 'Others (EU)', for EU origin. For the definition of 'origin' and 'provenance', see footnote 26.

According to trade statistics, as shown in previous sections, in 2023 the EU import share from China in these products dropped considerably, by about 4 percentage points in just one year. On the contrary, the import share from other EU partners increased by 2.7 percentage points. This evidence resonates with information coming from business surveys. Survey data on Germany, Italy and Spain suggest that a relevant share of manufacturing firms already substituted Chinese suppliers of critical inputs with closer ones, mostly located in the EU market (Balteanu et al., 2024).[27]

However, the reduction in the Chinese direct import share and the substitution of Chinese suppliers might not result in a proportional decrease in dependency on China. We provide suggestive evidence that the EU country-product combinations that experienced an increase in their direct share in Italian imports in 2023 also have higher shares and values of flows actually originating from China. This is shown by estimating the following panel regression:

$$\Delta impshare_{p,j} = \beta_0 + \beta_1 originChina_{p,j} + \varepsilon \quad (3)$$

where $\Delta impshare_{p,j}$ is the change in the import share from the EU partner j in product p for Italy between 2023 and 2022, while $originChina_{p,j}$ is either the 2022 share (Table 7, columns 1 and 3) or the 2022 value (in millions of euro; Table 7, columns 2 and 4) of total Italian imports from the EU in product p originating from China and coming from the EU partner j. The results suggest that Italian import shares in 2023 from EU

[27] While firms may be aware of their direct linkages, it is hard to assume they are fully in control of their second-order dependencies; in particular, their suppliers, located away from China, may in turn source some key inputs from Chinese suppliers.

trade partners with higher shares originating from China and transiting through them increased more. Therefore, it is likely that a portion of the reduction in direct trade with China observed in 2023 has been offset by an increase in indirect trade flows from China through EU partners.

Although additional evidence is needed to shed light on the drivers of such increase, these patterns may be the result of structural changes in logistics occurred after the pandemic and the related supply chains disruptions (Sforza and Steininger, 2020; Bonadio et al., 2021; Simola, 2021; Berthou and Stumpner, 2022; Liu, Ornelas and Shi, 2022). Another explanation might come from the reorganization of global high-tech supply chains driven by trade tensions between China and the US, which may have also affected the delivery of goods to the EU (HSBC Global Research, 2024).[28]

Table 7 – Change in import shares from EU partners

	(1)	(2)	(3)	(4)
Share of Chinese origin	0.020**		0.020***	
	(0.008)		(0.008)	
Chinese origin (mln EUR)		0.001**		0.001**
		(0.000)		(0.000)
Product FE	No	No	Yes	Yes
Obs	299	299	299	299

Sources: TDM, Italian customs data, and authors' calculations.
Notes: Estimation of coefficient β_1 of equation (3). Robust standard errors in parentheses. Bottom and top 1% are trimmed. Trade flows for the 5 key ATP analyzed in Table 2 are considered. ***, **, and * denote statistical significance at the 1%, 5% and 10% confidence levels, respectively. 'Share of Chinese origin' refers to the share in Italian intra-EU imports of goods of Chinese origin, as measured in 2022. 'Chinese origin (mln EUR)' refers to the value (in million EUR) of Chinese goods imported by Italy through other EU countries, as measured in 2022.

Conclusions

To conclude, global trade integration has remained relatively unscathed by recent shocks. However, in addition to traditional forces which generally lead to trade reorientation, such as technological progress and wage and price competitiveness shifts, over recent years global trade has undergone a marked reconfiguration. In particular, trade is being reshaped by geopolitical considerations into country blocs: both the bloc of US, EU, and like-minded countries and the bloc of China and aligned economies appear to have become more self-reliant in terms of import sourcing. Whereas for the US, decoupling from China began in 2018, for the EU and its main economies direct dependence on China diminished only in 2023. Similarly to the US, this development was driven by ATP, whereas for critical goods for the energy transition the share of imports from China actually increased. The decline in ATP import shares is presumably not transitory in nature but rather due to strategic, de-risking considerations. Re-

[28] For the key four green products discussed in Fact 4, it is worth mentioning that the share of intra-EU imports with Chinese origin has been increasing for the past few years, though to a much lower extent than for ATP.

cent business survey evidence from Balteanu et al. (2024) indeed highlights that European firms are engaging in or planning to engage in decoupling from China for critical products in favour for example of “EU-shoring”.

ATP reallocation away from China has favoured Vietnam and other South-East Asian economies for the US and the main EU economies. For the US both the existing literature and evidence provided in this paper have pointed to a lengthening of supply chains, with China moving upstream, over the period 2017-2022. US dependencies from China have anyhow declined despite the lengthening of GVCs, as indirect flows have only partially offset falling direct trade. For the EU, no evidence of increasing indirect dependencies from China has been found, up to 2022. The lack of timely input-output tables for 2023 hinders the possibility of investigating this process further. Moreover, transaction-level customs data available for Italy until 2022 points to an increase in trade of products with a Chinese origin that transit through some EU partners, confirming that solely analysing direct dependencies is not sufficient.

Despite the documented trade reconfiguration, China remains a key (direct and indirect) supplier of flagship goods, especially for the EU. This macro result is also consistent with the fact that survey data in Balteanu et al. (2024), despite the afore-mentioned de-risking activity, underscore a non-negligible percentage of enterprises still strongly dependent on China and not intending or able to severe ties with this partner.

Observing trends in 2024 will be key to understanding the extent, duration and true nature of the trade fragmentation patterns under way at the global level, and especially for and within the EU. Some leading indicators, such as FDI data and survey evidence on firms’ future strategies, suggest that the ongoing changes in international trade described in this paper will become even more substantial in the next few years. Updated input-output tables, granular customs data, and further research, are also warranted to fully unveil the ongoing fragmentation process.

Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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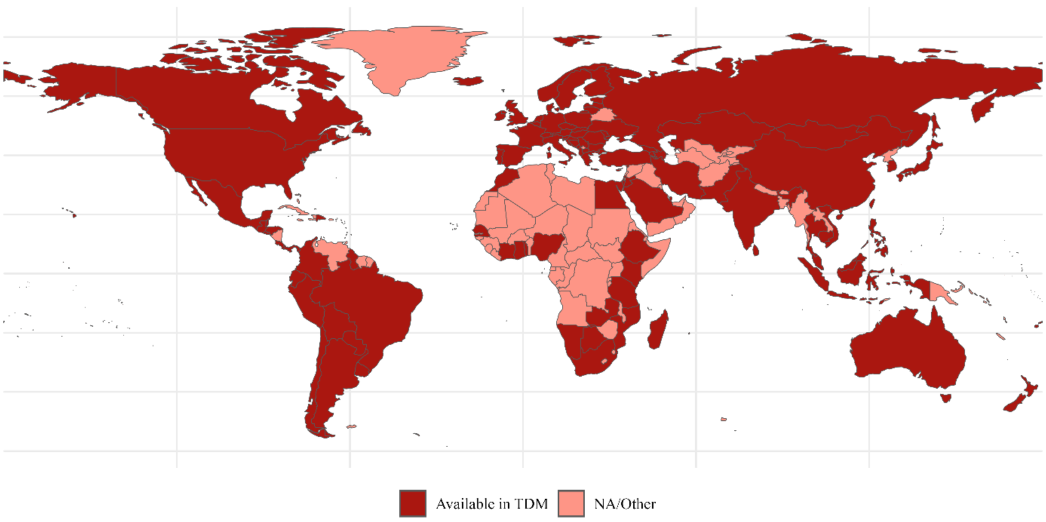
Annex A – Data and bloc methodology

We employ data on imports – defined at the country-HS6-month level – net of energy goods (if not explicitly stated otherwise) and of monetary gold, appraised at USD current prices from 2017 to 2023 from Trade Data Monitor (TDM). TDM provides merchandise trade data for over 100 reporting countries (Fig. A1) in a timely fashion, which makes it an ideal source to gauge the most recent patterns in world trade. For the period 2017-2022, the coverage for imports is always above 94.9 per cent. At the time of writing of this paper, UN Comtrade imports data for 2023 are not yet available for several countries (e.g., India, South Korea, and Singapore). Due to the delay in reporting to UN Comtrade, the coverage of TDM, which is more timely, may be larger for the most recent year than the historical average. Most analyses of the paper rely on monthly imports reported to TDM by the US, China, the EU, with all available partner countries. In particular, for EU countries we consider Eurostat foreign trade data, and not national sources. For some analyses, such as those involving trade between blocs, however, we construct an additional dataset that considers the imports reported from all available countries in TDM, and we keep the partners that are also reporters. To account for the late introduction of Vietnam in the pool of reporters in 2019, we use UN Comtrade data to make up for the previous years. Finally, as Russia is no longer reporting trade statistics since the invasion of Ukraine, we consider the mirror statistics for the whole period in order to include this partner country.

Fig. A1 – Reporting countries in Trade Data Monitor



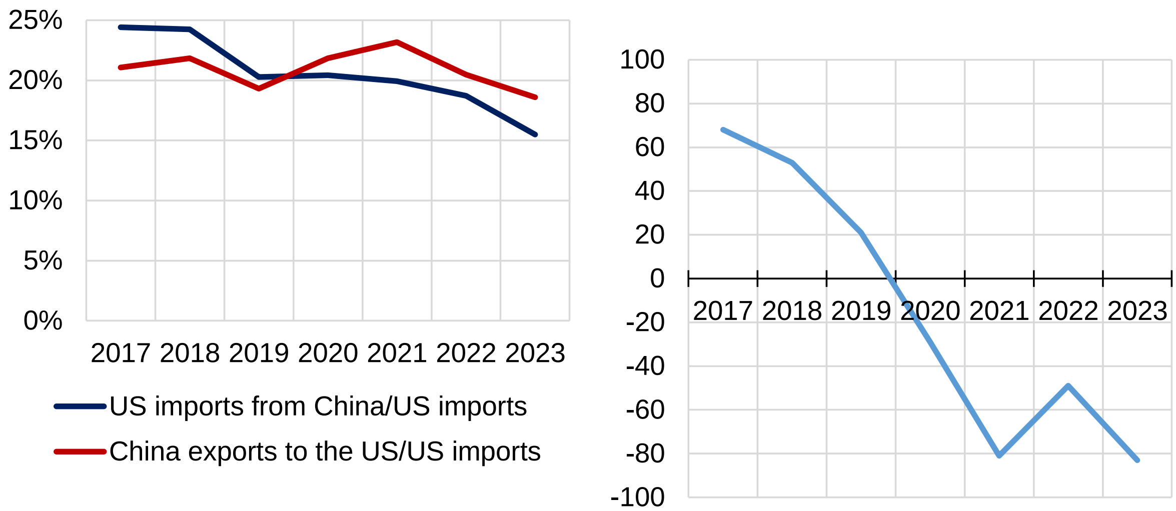
Notes: for Vietnam, UN Comtrade is used before 2019. Belarus is excluded as flows with Russia are missing after the invasion of Ukraine.

In this paper we employ customs data of the reporting country. According to Chinese export data, the fall in bilateral trade with the US after 2018 was significantly more muted (Fig. A2), since discrepancies between the value of Chinese imports in the US and of Chinese exports to the US according to the two data sources are significant. One possible explanation has been suggested by Clark and Wong (2021), namely that US importers underreport imports to US customs, perhaps utilizing low-ball invoices supplied by their Chinese suppliers, in order to evade US tariffs (on the importance of de minimis regulation, see also Fajgelbaum and Khandelwal, 2024). This explanation cannot however explain the whole discrepancy observed. By contrast, mirror data between China and the EU and with the main EU economies appear to be significantly more consistent: Chinese exports are only slightly lower than EU imports and this can be explained by cif-fob adjustments (Fig. A3).

Fig. A2 – Discrepancies between bilateral US import and China's export data

China's share in US imports
(*percentage shares*)

US imports from China - Chinese exports to US
(*USD bn*)

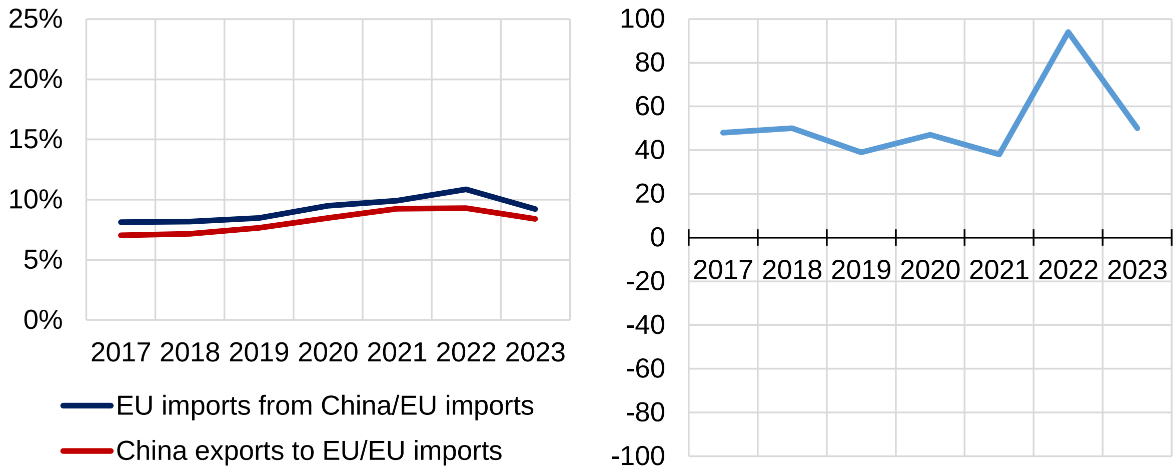


Source: Authors' calculations on TDM.
Notes: Imports and exports together with their respective shares are computed net of energy items and non-monetary gold.

Fig. A3 – Discrepancies between bilateral EU import and China's export data

China's share in EU imports
(*percentage shares*)

EU imports from China - Chinese exports to EU
(*USD bn*)



Source: Authors' calculations on TDM.
Notes: Imports and exports together with their respective shares are computed net of energy items and non-monetary gold.

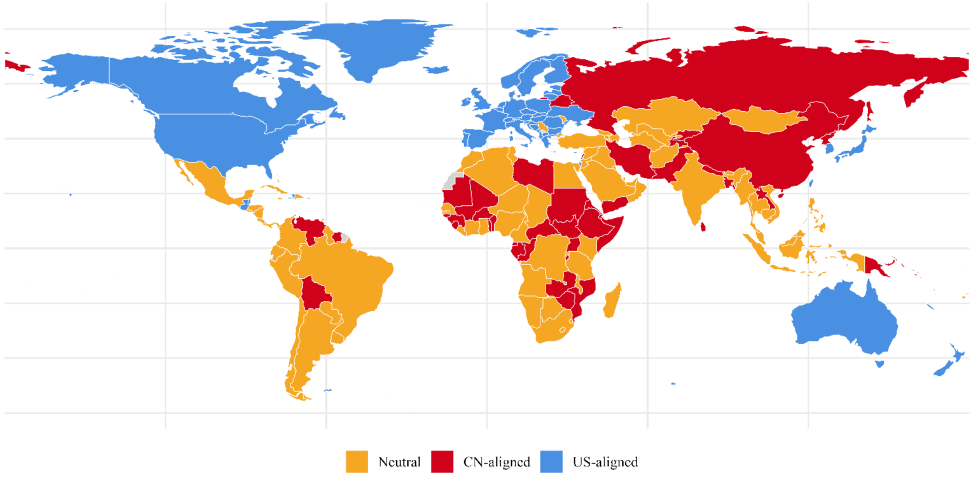
The index of den Besten et al. (2023) relies on a set of variables to assign a score to the countries, provided underlying data are available and ranges between 0 (close to US) and 1 (close to China). The version of the index we use relies on the following variables: the number of times the country was sanctioned by the US or China in the period 1950-2022, the relevance of these two economies in the country's military imports, China's official lending to the country, and the country's vote at the 11th Emergency Special Session of the United Nations General Assembly on the Russian invasion of Ukraine. Countries belong to the US-aligned bloc if their index is below 0.25, to the CN-aligned bloc if their index is above 1, and to the neutral bloc otherwise. When the index by den Besten et al. (2023) is not available for a given country, Capital Economics (2023) is followed. The Capital Economics (2023) dashboard considers bilateral relationships of the third countries with US and China and relies on several indicators. The most relevant ones are: (i) political alignment from the Pew Research Center, (ii) UN General assembly votes in agreement with the US and China between 2013-2019, (iii) UN Human Rights Council alignment, (iv) participation in the Belt & Road initiative, (v) security alliances and military presence, (vi) relations with Taiwan, (vii) goods and services exports share to the US minus goods and services exports share to China, (viii) stocks and flows of FDI from US and China, (ix) aid & non-concessional development funding (for more information, see Table A1). Capital Economic's *Global Fracturing Dashboard* considers five groups: US & allies, Leans US, Unaligned, Leans China, China & Allies. In particular, countries that are classified as 'US & Allies' (resp., 'China & Allies') in Capital Economics (2023) are assigned to the US-aligned bloc (resp., CN-aligned). Other countries are assigned to a neutral bloc. The resulting blocs are shown in Fig. A2. Clearly, the assignment of individual countries to these three blocs, although based on pre-existing classifications, discounts some degree of arbitrariness. Moreover, countries could vote in a certain direction at the UN, but act in a differing fashion. Finally, the composition of these blocs could shift over time, and even quite rapidly, given the high incidence of political elections in 2024 around the globe. Despite all these caveats, this allocation in blocs is a useful assessment tool in which to frame our analysis and flexible enough to accommodate for changes in political and economic alliances.

Table A1 – Measures used to identify alignment by Capital Economics (2023)

Indicator	*Description*
Political alignment	Sourced from the Pew Research Center. Single measure of where the public stands on US vs China by subtracting the share of respondents with a favorable view of China from the share of respondents with a favorable view of the US.
UN General Assembly votes in agreement with US vs China (%, 2013-2019)	Single measure of UNGA voting alignment by subtracting the share of votes in agreement with China from the share of votes alongside the US.
UN Human Rights Council alignment	Single measures of the signatures to UN statements condemning (or supporting) China's policies in Xinjiang and Hong Kong.
Official participation in the Belt & Road Initiative	Official participation to the Chinese BRI and to annual's BRI conferences.
Security alliances & US/China military presence	Foreign military presence of US or China in the country.
Territorial disputes	Presence of territorial disputes with China
Taiwan relations	Dummy for full diplomatic relationships with Taiwan
Other	Other country/region specific factors or data points where relevant. For example, the "State of Southeast Asia" survey published by the ISEAS-Yusof Isak Institute is used as an additional tool to help classify countries in the region.
Economic alignment	Goods and services exports to the US as a share of each country's GDP minus the corresponding share for exports to China.
FDI from US vs. China	Data on both flows and stocks.
Aid & non-concessional development financing	Net disbursement of Official Development Assistance (ODA) from the OECD's Development Assistance Committee (DAC), which is made up of the US and its allies. Comparable bilateral aid data for China are not available though they are small. By contrast, China is a major provider of development financing. We use bilateral financing data and compare against OECD data on ODA.

Source: Capital Economics (2023)

Fig. A4 – Geopolitical blocs



Source: den Besten et al. (2023) and Capital Economics (2023) and IRC Trade Expert Network (2024).
Notes: US-aligned (CN-aligned) includes the US (China). See the main text for more details.

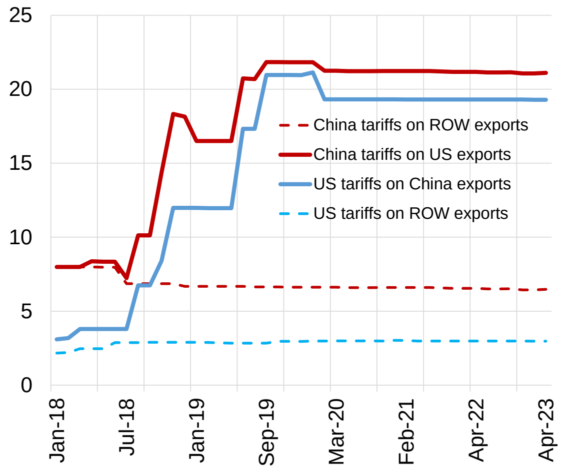
The classification of ATP used in this paper, available at ATP Code Descriptions (census.gov), includes biotechnology (i.e. medical and industrial applications of advanced scientific discoveries in genetics to the creation of new therapeutic items for both agricultural and human use), life science (i.e. the application of further scientific advances, other than biological, to medical science), opto-electronics (encompassing electronic products and components that involve the emitting and/or detection of light), information and communication, flexible manufacturing (which encompasses advances in robotics, numerically-controlled machine tools, and similar products involving industrial automation), advanced materials (i.e. advances in the development of materials that allow for further development and application of other advanced technologies), aerospace, weapons and nuclear technology. Given their differing trends, we however exclude from this classification four products which fall in the "critical goods for energy transition" category, namely: 381800 - Chemical elements; doped for use in electronics, in the form of discs, wafers or similar forms; chemical compounds doped for use in electronics; 853400 - Circuits; printed; 854140 - Electrical apparatus; photosensitive, including photovoltaic cells, whether or not assembled in modules or made up into panels, light-emitting diodes (LED); 854190 - Electrical apparatus; parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices.

The classification of critical goods for the energy transition employed in this paper is taken from IRC Trade Expert Network (2024). It considers the products included in the Inflation Reduction Act by the US Administration (e.g., electric vehicles, electric batteries, and rare earth elements), as well as other items highlighted by the European Commission as critical. In total, it comprises 129 HS subheadings. Differently to the Low-Carbon-Technology classification put forward by the IMF and employed, for example, in Della Corte, Federico and Oddo (2024), this classification thus also considers raw minerals that are critical for the energy transition.

Annex B - Additional charts and tables

Fig. B1 - US-China export tariffs

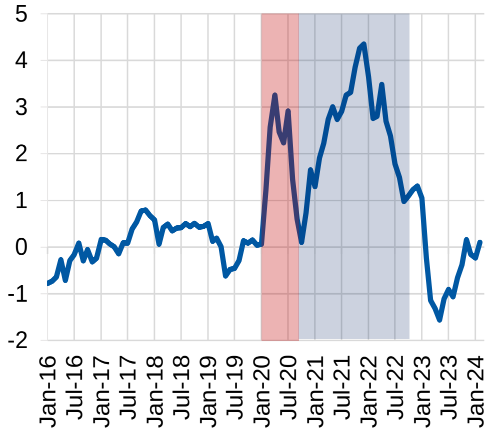
(tariff rates)



Source: Peterson Institute for International Economics. Notes: The US-China trade war initiated in July 2018; the Phase-one agreement was signed in February 2020. ROW is the rest of the world (other than the US or China).

Fig. B2 - Global supply chain pressures

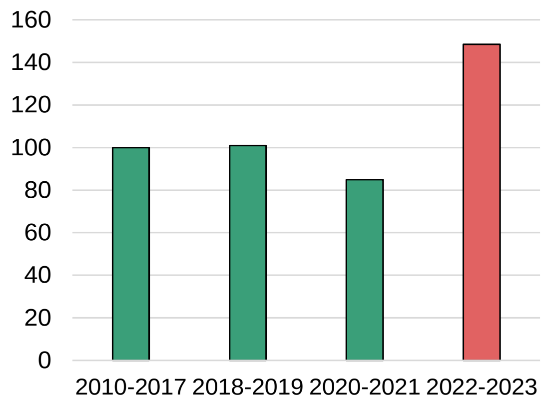
(Global Supply Chain Pressure Index; standard deviations from the index's historical average)



Source: Authors' calculations on NY FED data. Notes: The index integrates a number of commonly used metrics (Baltic Dry Index, Harpex, PMI, airfreight costs) with the aim of providing a comprehensive summary of potential supply chain disruptions. Red area: first COVID-19 pandemic wave; blue area: supply bottlenecks.

Fig. B3 - Geopolitical risk

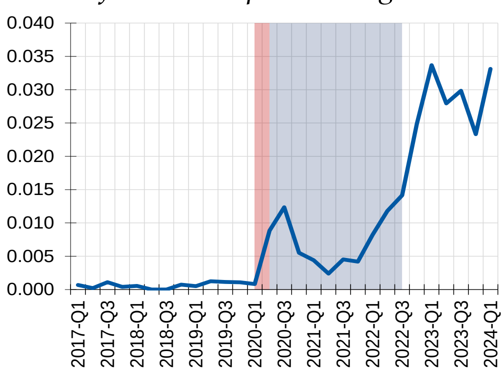
(2010-2017=100)



Source: Authors' calculations based on Caldara and Iacoviello (2022).
Notes: The measure is constructed by counting, each month, the share of press articles discussing adverse geopolitical events and associated threats.

Fig. B4 - "Reshoring", "onshoring", and "nearshoring" mentions in earnings calls

(number of mentions per earnings call)

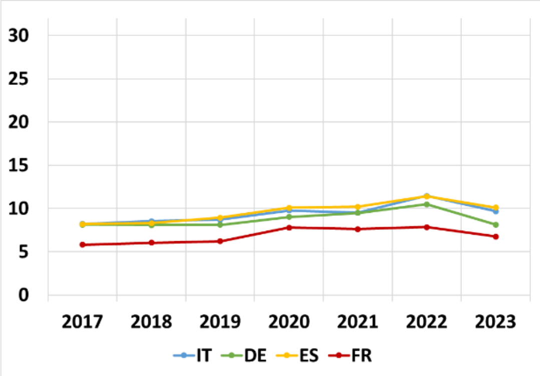


Source: Authors' calculations based on NL analytics data.
Notes: The red area refers to the first COVID-19 pandemic wave, and the blue area to the period in which global supply bottlenecks were rampant.

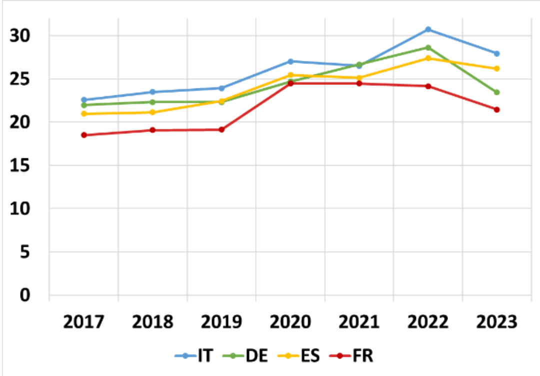
Fig. B5 – Share of total goods imports from China of the four main EU economies

(*percentage shares*)

Intra and extra-EU flows



Only extra-EU flows

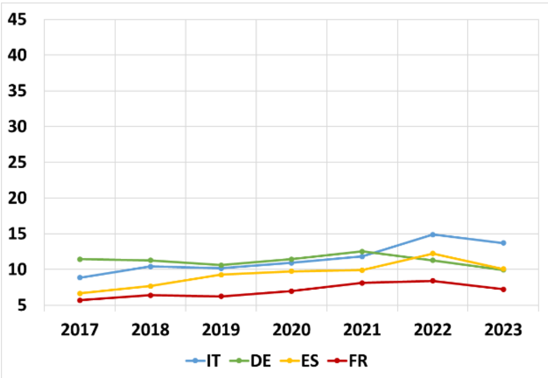


Source: authors' calculations on TDM.

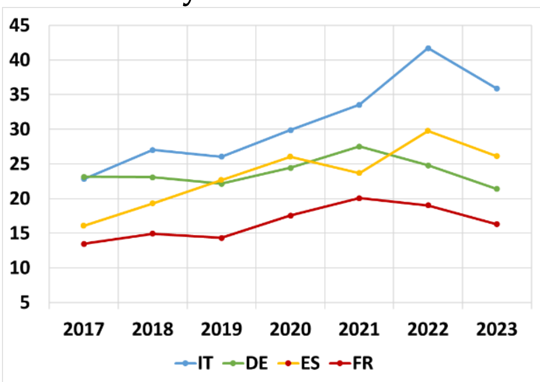
Fig. B6 – Share of ATP imports from China of the four main EU economies

(*percentage shares*)

Intra and extra-EU flows



Only extra-EU flows

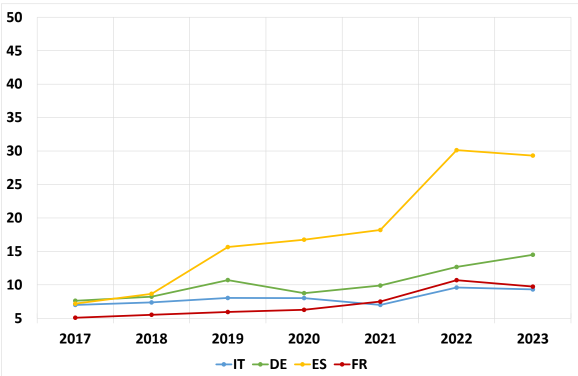


Source: authors' calculations on TDM.

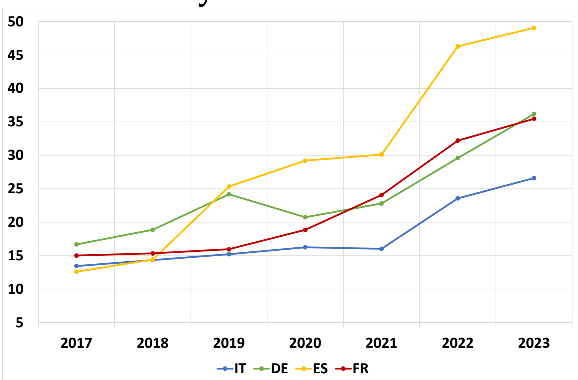
Fig. B7 – Share of critical goods for the energy transition imports from China of the four main EU economies

(*percentage shares*)

Intra and extra-EU flows



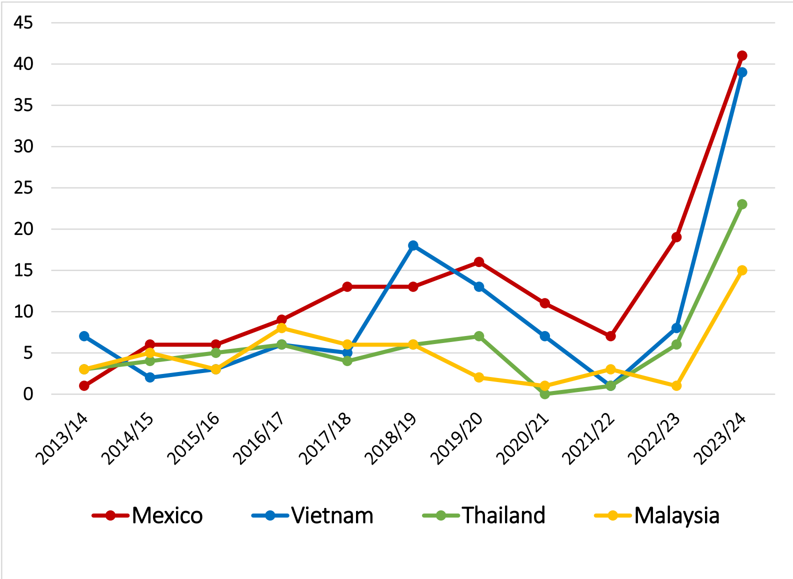
Only extra-EU flows



Source: authors' calculations on TDM.

Fig. B8 – Chinese FDI announcements in the manufacturing and logistics sectors, by destination

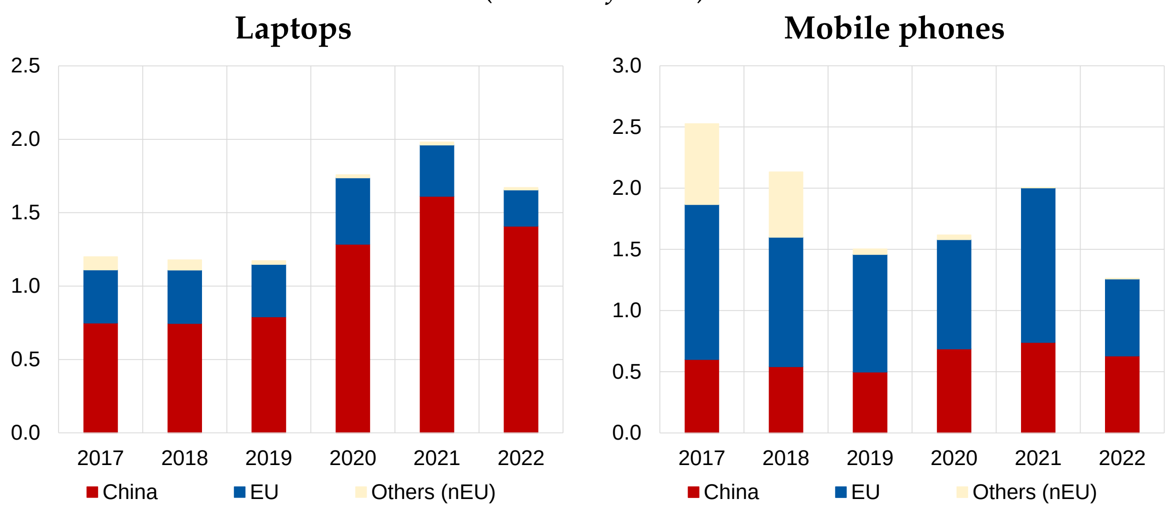
(*number*)



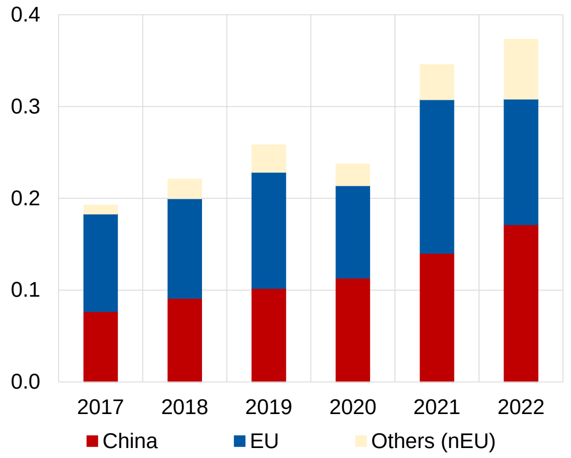
Source: Telling, Langley, Lin and Ho-Him (2024), FT and FDI Intelligence.
Notes: New projects and expansion of existing projects.

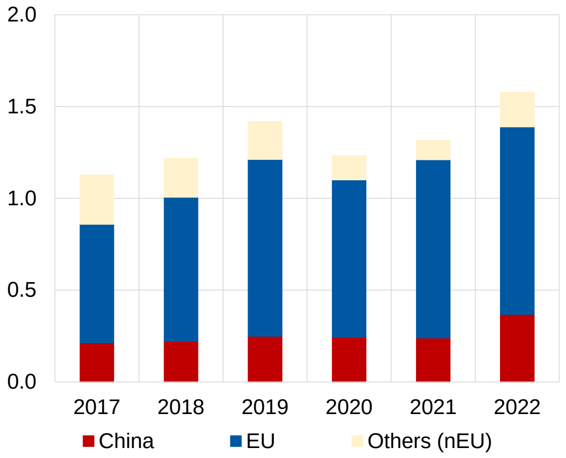
Fig. B9 - Italy's imports of selected ATP by country of origin

(*billions of euros*)

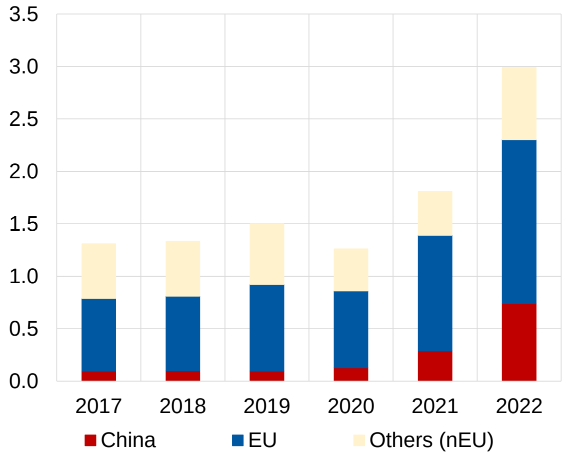


Monitors **Communication apparatus**





Chips



Source: authors' calculations on TDM.
Note: height of each node is proportional to the represented flow. Flows representing less than 5% are aggregated in 'Others (nEU)', for non-EU origin, and 'Others (EU)', for EU origin.

Table B1- The 2023 share and change in the main EU economies' import shares from China and other relevant partners, selected ATP

(percentage shares and yearly changes in percentage points)

	Product	China		Other relevant partners					
		2023	23-22	Other Partner	2023	23-22	Other Partner	2023	23-22
FR	Laptops	64.6	-2.6	VN	19.2	-0.5	US	5.1	0.8
	Mobile phones	37.7	-4.8	VN	33.4	2.6	IN	12.0	-0.3
	Monitors	60.0	-3.5	KR	12.6	5.2	US	7.7	-2.4
	Communication apparatus	41.2	-1.4	TN	12.3	-3.7	TW	8.6	0.7
	Chips	27.2	0.0	TW	27.9	3.2	KR	12.2	5.7
DE	Laptops	86.5	-1.8	VN	5.8	1.3	JP	3.6	-0.5
	Mobile phones	49.6	2.9	VN	25.7	2.2	IN	6.6	-2.9
	Monitors	52.0	-9.2	JP	31.5	8.4	TW	4.4	-0.2
	Communication apparatus	32.3	-7.0	VN	11.4	-0.9	TW	11.0	0.2
	Chips	21.8	-4.7	TW	23.5	2.4	MY	15.9	1.1
IT	Laptops	90.1	-4.0	VN	8.6	3.9	TW	0.4	0.0
	Mobile phones	68.7	-2.0	IN	16.2	3.1	VN	12.7	0.7
	Monitors	75.0	-5.2	MX	10.3	0.9	KR	4.0	1.2
	Communication apparatus	51.9	-15.8	VN	16.7	5.6	TW	9.8	3.4
	Chips	58.0	3.1	SG	8.5	-0.2	TW	7.7	-1.2
ES	Laptops	62.5	-6.4	VN	29.0	5.7	KR	3.7	0.7
	Mobile phones	50.4	-8.4	VN	30.7	8.2	IN	10.5	1.4
	Monitors	72.8	-7.5	US	12.7	10.8	KR	5.3	-2.9
	Communication apparatus	41.3	-17.9	TW	16.5	5.9	VN	14.2	2.8
	Chips	86.4	-4.3	JP	3.4	0.6	US	2.6	0.8

Source: authors' calculations on TDM.

Notes: Imports shares are computed net of energy items and non-monetary gold, where relevant. ATP are defined in Annex A. The five key ATP HS6 product codes are: 847130 for laptops (Automatic data processing machines: portable, weighing not more than 10kg, consisting of at least a central processing unit, a keyboard and a display), 851712 for mobile phones (Telephones for cellular networks or for other wireless networks), 852852 for monitors (Monitors: other than cathode-ray tube: capable of directly connecting to and designed for use with an automatic data processing machine of heading 8471), 851762 for communication apparatus (Communication apparatus (excluding telephone sets or base stations): machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus), 8541 (Diodes, transistors, similar semiconductor devices; including photovoltaic cells assembled or not in modules or panels, light-emitting diodes - LED, mounted piezo-electric crystals) and 8542 (Electronic integrated circuits) for chips. Column 6 and 8 report the contribution of the selected products to the change in China's market shares in the respective category.

Table B2- Goods import dynamics for selected product categories

(*yearly percentage changes of import values, unless otherwise indicated*)

	IT					FR					DE				
	2020	**2021**	**2022**	**2023**	**2023 share**	**2020**	**2021**	**2022**	**2023**	**2023 share**	**2020**	**2021**	**2022**	**2023**	**2023 share**
ATP	2.4	15.5	8.6	7.0	17.8	-13.3	12.3	2.5	5.2	19.1	0.2	13.4	2.0	-0.7	22.3
Laptops	31.6	15.0	-15.5	-16.9	3.1	22.5	20.1	-14.9	-15.3	3.6	26.1	30.4	-17.6	-22.2	4.1
Monitors	-6.5	46.7	16.1	-18.6	0.6	2.6	30.7	3.6	-18.7	0.6	15.5	22.7	9.2	-20.3	0.8
Mobile phones	3.5	14.7	22.3	0.4	7.3	-2.3	7.5	-5.4	5.6	5.3	17.4	0.0	4.0	8.2	5.5
Communication apparatus	0.6	13.7	6.3	1.8	4.0	0.5	24.2	-1.0	3.3	4.4	5.2	6.6	15.0	1.6	4.4
Chips	-0.2	51.5	39.1	6.1	5.7	-11.1	29.1	26.9	-12.0	5.7	-17.7	30.1	38.8	2.4	12.7
Critical goods for energy transition	5.7	76.8	17.6	17.0	7.6	9.4	43.8	16.4	29.3	6.1	29.9	46.0	21.4	0.6	7.6
Lithium batteries	121.1	147.2	80.6	42.3	9.0	20.1	22.6	24.3	47.5	7.2	72.8	61.7	39.1	58.6	24.2
Electric auto vehicles	130.5	139.2	-23.0	130.8	8.0	119.2	81.8	27.2	84.1	25.4	195.6	87.2	23.4	38.2	16.2
Photovoltaic cells	-16.4	119.1	103.8	14.9	6.4	25.5	30.6	41.0	10.8	4.5	2.0	27.8	61.6	-13.8	5.9
Parts of electric accumulators	-5.5	46.2	-0.9	-3.7	0.2	-17.7	-8.4	-9.4	-11.2	0.2	-9.7	82.3	213.4	-34.6	1.7
Total	-7.3	27.1	9.6	1.0	100.0	-8.0	18.9	3.8	1.8	100.0	-2.0	17.7	6.8	-3.9	100.0

	ES					EU					US				
	2020	**2021**	**2022**	**2023**	**2023 share**	**2020**	**2021**	**2022**	**2023**	**2023 share**	**2020**	**2021**	**2022**	**2023**	**2023 share**
ATP	1.7	25.8	4.0	0.4	16.2	-1.8	14.7	6.5	2.7	28.3	-0.7	13.6	11.2	-2.5	28.2
Laptops	26.8	22.4	-0.1	-21.0	3.5	23.9	18.6	-7.9	-21.9	5.0	26.2	17.6	-10.2	-14.7	6.0
Monitors	-2.4	19.4	9.7	-10.7	0.7	7.9	23.8	6.2	-23.7	1.0	-5.0	32.1	9.0	-27.2	0.8
Mobile phones	-0.1	11.2	1.8	16.0	8.1	5.6	2.2	18.2	0.7	8.7	-9.5	24.8	12.3	-8.7	8.2
Communication apparatus	15.3	13.3	8.5	-3.1	3.5	4.4	3.5	5.2	-3.7	5.6	-0.5	10.0	19.8	0.2	6.7
Chips	-10.9	41.2	82.7	-12.5	7.2	1.9	34.6	43.0	-8.3	12.8	2.7	21.1	10.9	1.6	7.8
Critical goods for energy transition	-3.7	46.0	40.9	7.8	6.3	8.7	43.6	31.5	-1.3	7.9	6.4	37.2	20.7	17.5	5.6
Lithium batteries	341.3	42.5	63.1	17.6	11.7	22.9	47.9	94.8	26.6	17.2	30.9	68.1	69.2	37.2	12.3
Electric auto vehicles	34.1	56.3	139.3	122.4	19.6	57.6	53.4	-1.5	65.0	13.3	8.0	207.6	102.1	79.7	12.5
Photovoltaic cells	-16.2	44.8	116.4	-17.8	13.0	8.1	44.4	100.6	-9.8	14.5	25.5	-10.0	36.4	71.4	14.2
Parts of electric accumulators	-17.4	73.5	-19.3	16.5	0.5	48.3	20.9	24.9	-5.2	1.1	3.0	110.4	73.1	27.2	4.8
Total	-8.1	23.8	9.6	0.6	100.0	-3.6	20.3	11.7	-6.2	100.0	-4.4	19.6	13.2	-4.2	100.0

Source: authors' calculations on TDM.

Table B3- Goods imports from China dynamics for selected product categories

(*yearly percentage changes of import values, unless otherwise indicated*)

	IT					FR					DE				
	2020	2021	2022	2023	2023 share	2020	2021	2022	2023	2023 share	2020	2021	2022	2023	2023 share
ATP	12.3	24.3	37.3	-2.4	24.2	-4.5	30.5	1.4	-12.8	18.0	8.3	24.3	-10.6	-11.1	25.7
Laptops	6.6	23.6	-4.0	-21.3	9.9	40.5	53.3	-21.7	-15.6	3.6	22.0	19.7	-19.4	-22.8	17.4
Monitors	2.8	58.3	57.0	-26.2	1.0	6.5	50.6	-2.0	-19.3	1.0	11.9	6.0	25.3	-34.2	1.1
Mobile phones	7.4	16.0	66.1	-8.8	26.3	-6.1	31.5	-25.1	-16.5	11.0	45.5	-15.7	-34.1	20.6	11.8
Communication apparatus	23.9	13.6	-2.1	-31.7	6.1	7.6	26.3	6.8	-2.5	12.0	4.5	-3.6	-6.5	-21.9	3.9
Chips	-25.5	88.1	83.6	15.6	7.0	68.9	67.0	53.0	-16.2	14.3	-5.2	44.7	51.7	-17.8	17.8
Critical goods for energy transition	5.4	54.4	61.3	13.6	7.4	15.5	72.1	66.0	17.8	8.7	6.2	65.1	55.4	15.0	13.5
Lithium batteries	28.6	125.4	180.3	72.6	39.7	14.6	123.8	111.2	36.2	30.1	14.9	68.1	90.1	52.9	54.8
Electric auto vehicles	110.9	2,657.5	-37.5	72.0	3.5	146.8	4,710.3	31.1	37.6	11.9	275.3	1,535.3	6.1	101.4	10.3
Photovoltaic cells	-37.6	60.4	145.7	38.2	18.7	163.2	53.8	133.6	25.3	27.2	12.4	17.3	66.2	-30.4	10.8
Parts of electric accumulators	46.5	120.5	130.3	-1.5	0.4	-27.0	190.2	-1.0	38.5	0.2	-13.6	1,185.0	138.7	-28.4	3.6
Total	4.0	23.6	32.2	-14.8	100.0	14.9	16.6	6.8	-12.5	100.0	8.9	23.9	18.1	-25.4	100.0

	ES					EU					US				
	2020	2021	2022	2023	2023 share	2020	2021	2022	2023	2023 share	2020	2021	2022	2023	2023 share
ATP	11.6	22.1	3.1	-8.0	11.4	9.4	21.8	0.6	-11.3	29.4	-3.5	14.3	4.4	-21.9	32.7
Laptops	98.0	-10.0	-1.9	-17.2	4.1	25.0	22.4	-7.0	-23.9	16.7	25.9	18.6	-11.6	-27.9	26.1
Monitors	-0.2	45.7	20.6	-17.6	2.3	13.7	26.8	4.0	-31.0	2.7	-6.4	32.7	9.2	-31.6	3.5
Mobile phones	2.3	21.9	-9.0	-27.4	19.4	11.7	4.7	13.2	-2.2	21.0	-1.2	25.2	7.5	-11.4	33.5
Communication apparatus	28.8	19.5	-4.4	-41.5	6.6	8.8	5.8	-0.7	-16.0	9.8	-27.6	-13.9	-6.0	-18.1	5.7
Chips	-10.7	56.9	141.4	-34.6	33.1	14.7	58.8	78.7	-12.7	15.9	13.7	12.8	19.5	-30.3	1.8
Critical goods for energy transition	3.1	58.6	133.2	4.9	18.3	20.5	75.3	78.0	5.4	13.0	-2.2	44.8	68.6	24.7	5.0
Lithium batteries	472.1	69.0	111.9	22.4	28.4	38.4	83.3	139.1	35.2	34.4	14.2	109.1	108.8	44.5	62.1
Electric auto vehicles	-12.3	599.3	7,694.1	112.8	33.8	1,358.2	502.3	26.8	45.6	14.6	1,685.5	84.2	71.2	11.3	1.7
Photovoltaic cells	-10.4	56.1	144.3	-34.6	28.3	23.2	58.6	119.4	-8.9	30.4	51.2	-34.9	-13.8	-32.1	0.9
Parts of electric accumulators	70.6	200.2	40.4	-26.9	0.1	232.1	175.4	98.0	-13.2	1.2	2.2	453.8	94.8	78.3	10.9
Total	3.6	25.1	22.5	-10.8	100.0	8.2	26.9	17.3	-15.5	100.0	-4.0	16.9	6.5	-20.8	100.0

Source: authors' calculations on TDM.

Table B4 – Indirect imports from China in the US and the EU (trimmed sample)

		Potential hubs							
		Mexico		Vietnam		India		Taiwan	
	Coef.	2019 vs 2017	2023 vs 2021	2019 vs 2017	2023 vs 2021	2019 vs 2017	2023 vs 2021	2019 vs 2017	2023 vs 2021
US	β_1	-0.316	0.191	-0.013	0.054	0.182**	0.040	0.284	0.524
		(0.299)	(0.394)	(0.056)	(0.165)	(0.078)	(0.081)	(0.272)	(0.481)
	Obs.	422	391	374	273	419	416	345	203
EU	β_1	0.016	0.024**	-0.015	0.190*	0.007	-0.038	-0.002	0.498*
		(0.021)	(0.010)	(0.025)	(0.099)	(0.035)	(0.044)	(0.035)	(0.296)
	Obs.	413	391	462	354	447	454	379	226

Sources: TDM and authors' calculations.

Notes: Estimation of coefficient β_1 of equation (2). Robust standard errors in parentheses. Base years are 2017 and 2019. Observations are weighted by the US and EU imports from China in 2017. Bottom and top 10% are trimmed. Trade flows aggregated at the HS4 level. ***, **, and * denote statistical significance at the 1%, 5% and 10% confidence levels, respectively.