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

by Francesco Paolo Conteduca*, Simona Giglioli**, Claire Giordano**, Michele Mancini* and Ludovic Panon*

Abstract

We examine recent changes in trade patterns amid rising geoeconomic fragmentation and present five key findings. First, a broad retreat from globalization is not taking place. Second, selective decoupling along geopolitical lines is ongoing, mostly driven by the weakening of specific trade relationships. Third, the US has been reducing its dependency on China since 2018, while the EU saw a decline only in 2023, driven mostly by a few advanced technology products (ATP). Fourth, not all dependencies on China are decreasing: the US and EU are increasingly importing Chinese goods critical for the green transition. Fifth, US supply chains from China are lengthening, with intermediate production stages shifting to third countries. Granular data for Italy show that an increasing share of ATP imported from other EU economies are of Chinese origin, suggesting that reductions in dependencies from China may be less significant than those emerging from aggregate data even for a large EU country.

JEL Classification: F01, F10, D57.

Keywords: globalization, trade decoupling, supply chains, advanced technology products.

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Introduction[1]

In recent years, world trade and global value chains (GVCs) have been affected by a succession of unprecedented events. First, the trade war between China and the US fuelled a reciprocal tariff escalation since 2018 (Fig. 1). Second, COVID-19 lockdowns and containment measures strained international production networks, while logistics and transportation snags and semiconductor and labour shortages during the post-pandemic recovery disrupted supply chains (Fig. 2). Third, the Russian invasion of Ukraine led to an energy crisis and an increase in geopolitical risk (Fig. 3), which negatively impacted 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).

This series of events has sparked a debate 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. In turn, such inward-looking policies have raised concerns about their potential negative effects on other countries and led to tensions even among partners.

In the face of high geopolitical risk, firms promptly acted to revise their internationalization strategies. Earning call transcripts of public companies show that mentions of terms such as 'reshoring', 'onshoring', and 'nearshoring', which were already on the rise after the pandemic, have grown manifold (Fig. 4). About half of the Italian, Spanish and German manufacturing firms relying on Chinese inputs deemed as critical have either implemented or planned de-risking strategies to reduce their exposure, mainly by turning to other EU partners (Balteanu et al., 2024).[2] Alongside these strategies, firms adopted higher inventory levels and dual-sourcing strategies to secure supply chains (Di Stefano et al., 2022; McKinsey, 2022).

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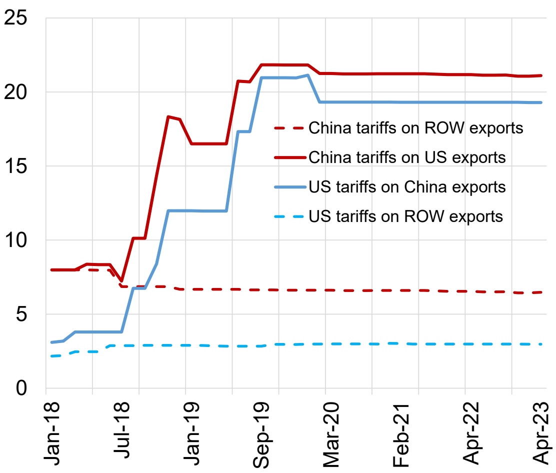
[1] The views expressed in this work are solely those of the authors and do not necessarily reflect those of Banca d'Italia. We thank Alessandro Borin, Stefano Federico and Alberto Felettigh, as well as participants of an internal seminar, for comments on an earlier draft.

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

Fig. 1 - US-China export tariffs

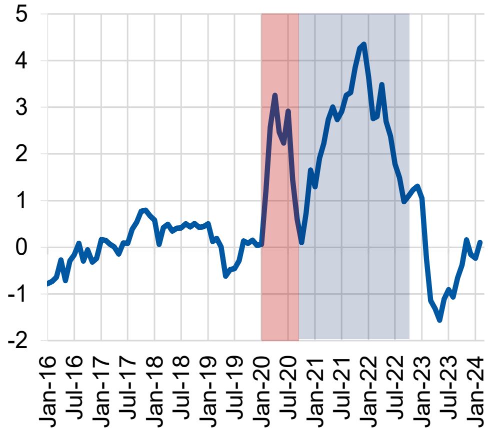
(tariff rates)



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. 2 - Global supply chain pressures

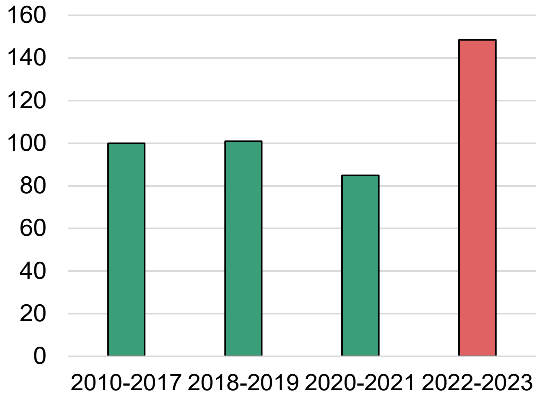
(Global Supply Chain Pressure Index; standard deviations from the index's historical average)



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. 3 - Geopolitical risk

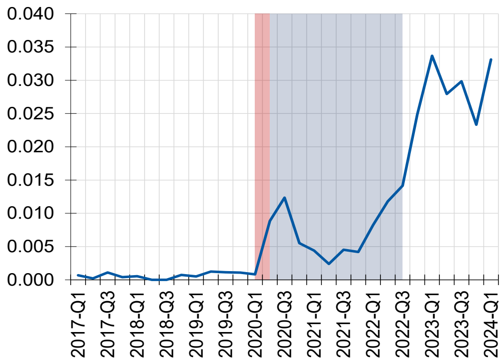
(2010-2017=100)



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. 4 - "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.

While policies and firm strategies are indeed impacting global trade to some degree (Alfaro and Chor, 2023; Dang, Krishna and Zhao, 2023; Freund et al., 2023), the extent to which the global trading system is fragmenting and whether signals of a more widespread deglobalization process are emerging remains uncertain. Analysing this process is, however, crucial to anticipate its real and inflationary consequences. 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; Felbermayr, Mahlkow and Sandkamp, 2023; Javorcik, 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 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).

This work analyses the most recent shifts in import patterns amid increasing geoeconomic fragmentation. We rely on multiple data sources, including timely bilateral and product-level merchandise trade data, the most updated inter-country input-output tables, and detailed Italian granular customs data. Differently from the existing literature, which primarily analyses trade decoupling between the US and China at a relatively aggregate level (Alfaro and Chor, 2023; Dang and Zhao, 2023; Freund et al., 2023; Gopinath et al., 2024; Fajgelbaum et al., 2024), our focus is also on the EU.[3] In doing so, we focus only on fragmentation affecting trade flows, and not foreign direct investments (FDI; see Ahn et al., 2023; Casella, Bolwijn, and Casalena, 2024).[4] A complementary 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 key facts about the ongoing reconfiguration of global and EU merchandise trade. First, no evidence suggests 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 of 2018, signs of a reduction in the EU dependencies 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 confirmed by the stable or even growing dependencies on Chinese products

[3] Bosone et al. (2024) analyses the euro area, yet only until 2022, as a result focusing solely on the trade fragmentation induced by the Russian invasion of Ukraine.

[4] 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).

needed for the green transition (Fact 4). Lastly, supply chains between the US and China have noticeably lengthened as intermediate production stages are moved from China to third countries such as Mexico, Vietnam, and Taiwan, probably to circumvent trade barriers. Granular 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 less significant than those emerging from aggregate data (Fact 5).

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; this entailed an increase in global trade openness, measured by the trade-to-GDP ratio (Fig. 5, 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).[5] In recent years, despite the above-mentioned concerns about recent shocks triggering deglobalization, global trade openness remained stable.

Prior to the pandemic, differing trends were observed amongst the three global economies US, EU, and China (Fig. 5, right panel). The trade-to-GDP ratio did not vary substantially in the US, whereas it increased for the EU, which became the most open region of the three economies considered. After a strong hike until the mid-2000s, China experienced a decrease in its trade openness as it 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 increased the size of the domestic market relatively more than that of the foreign sector. In the most recent years, trade openness was however broadly stable in the three economies.

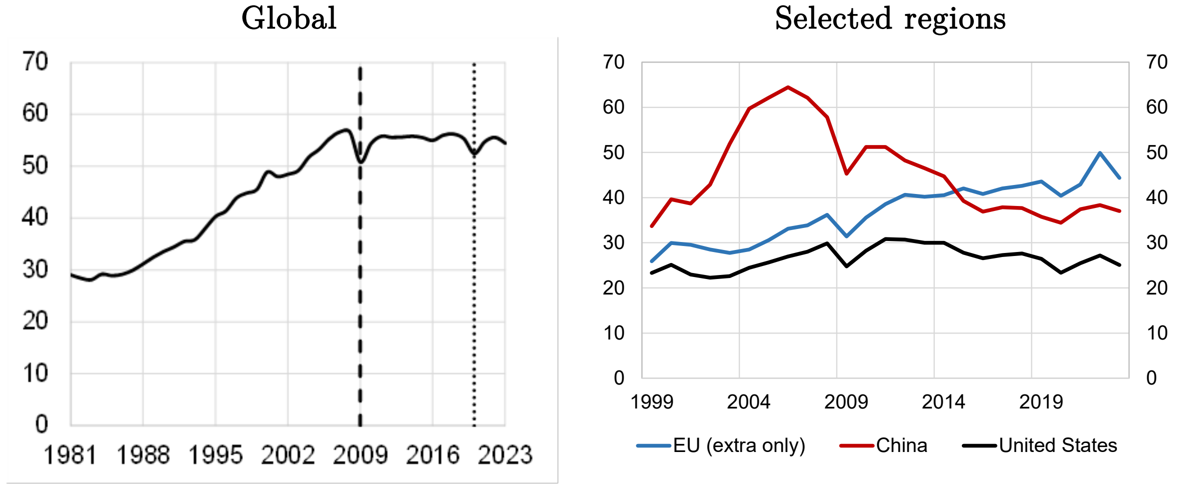
Measures of countries' and sectors' integration in GVCs based on inter-country input-output tables also exclude outright deglobalization. More specifically, we compute the GVC-related share of trade and output (Borin et al., 2021) and a measure of GVC complexity (Antràs and Chor, 2019; Mancini et al. 2024) relying on the Asian Development Bank Multi-Regional Input-Output tables (ADB MRIO), available between 2007 and 2022.[6]

[5] 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).

[6] GVC-related trade and output 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

Fig. 5 – Trade openness

(percentage shares)



Source: Authors' calculations on IMF WEO and Eurostat data.
Notes: Trade openness is computed as the sum of goods and services exports and imports, as a share of GDP. For EU, we exclude trade among its members. In the left panel, the dashed vertical line represents the GFC, the dotted vertical line represents the Covid-19 pandemic.

At the aggregate level, GVC-related trade, output, and complexity, if anything, have increased slightly since 2007 (Fig. 6).[7] The indicators registered only a temporary downturn in conjunction with the GFC and the COVID-19 pandemic. By 2022, about half of global trade and almost one-fifth of global output were GVC-related. As regards sectors, manufacturing is more intensively engaged in GVC activities than services, although the latter's integration in GVCs has been on the rise since 2017 and was relatively unscathed by the COVID-19 shock.[8] Across major trading blocs, EU and US participation in GVCs expanded over the overall period under consideration;[9] conversely, China's GVC integration has been broadly stable in trade terms and even declined in output terms amid a gradual shift of its growth model.

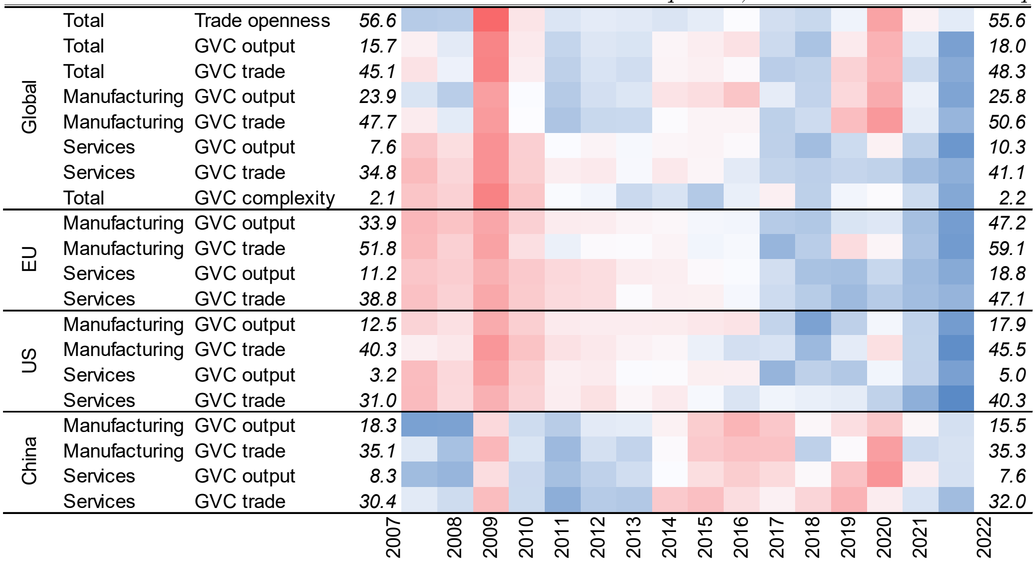
[7] The results shown in Fig. 6 are also robust to current-prices series, as well as to calculations based on the less updated OECD TIVA input-output tables.

[8] As discussed in the notes to Fig. 6, we exclude tourism and transport (as well as other residual services categories) from this analysis.

[9] The EU is here considered as the sum of all EU economies, and hence the related indices are also capturing the rising regional within-EU integration.

Fig. 6 - Trade openness and GVC participation measures, by region

(colours are based on z-scores normalised over the 2007-2022 period; shares of trade and output)



Source: Authors' calculations based on IMF and ADB MRIO at constant prices. Indicators based on Borin et al. (2021) and Mancini et al. (2024).

Notes: The numbers are the percentage shares of trade or output or the trade-to-GDP ratio, according to the reported indicator. The heatmap colour range is from red for negative z-scores to blue for positive z-scores. For each series, z-scores are computed by subtracting the 2007-2022 average and dividing the result by 2007-2022 standard deviation. Data are available in the World Bank WITS GVC database. GVC-output measures the share of total output related to GVC activities, i.e. crossing more than one border during the production process. GVC-trade measures the share of total exports related to GVC activities, i.e. crossing more than one border. Openness is measured as export plus imports over GDP. 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, all the different metrics point to stable patterns in globalization and, hence, no sign of significant retrenchment from GVCs in the major world economies. Does this mean that global trade patterns have remained unchanged? To answer this question, we rely on timely data on global 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).[10]

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

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. 7, left 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 trade openness or GVC participation at the aggregate level, trade partnerships are shifting as trade appears to be realigning along geopolitical lines.[11]

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. 7, left hand-side panel).[12] On the other hand, the overall loss in the China-aligned bloc's import share from the rival 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),[13] 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. 7, right-hand side panel). With the direct decoupling between Russia and the West nearly complete due to sanctions and export controls imposed after the onset of the war in Ukraine, as extensively analysed in recent studies (Bosone et al., 2023; Chupilkin, Javorcik andPlekhanov, 2023; Mancini, Conteduca and Borin, 2024a; Borin et al., 2023a; Borin et al., 2023b; Di Comite & Pasimeni, 2023; Demertzis et al., 2022),[14] 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).

[11] 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.

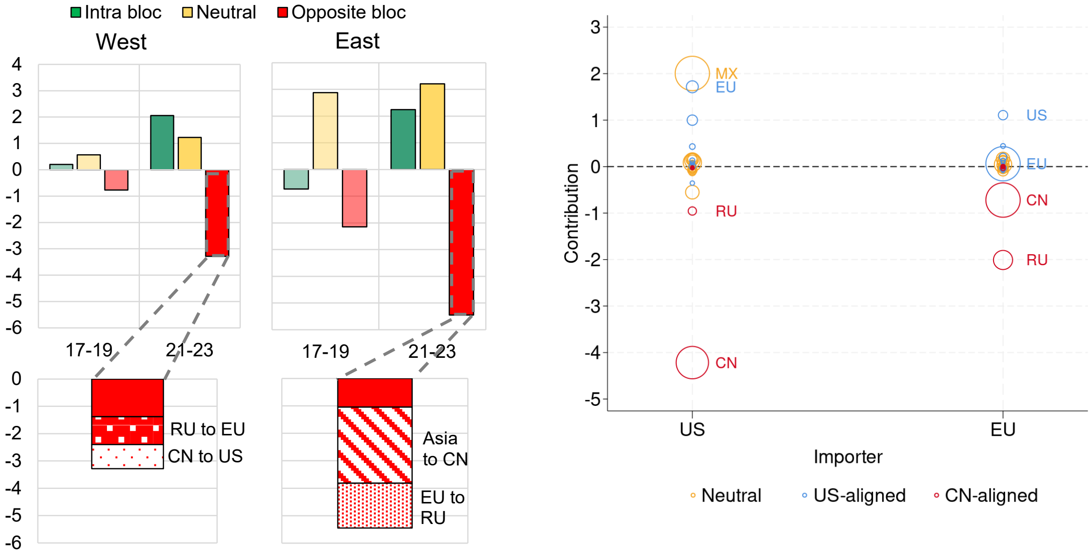
[12] In Fig. 7 energy flows are included, which explains most of the EU result vis-à-vis Russia.

[13] 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.

[14] 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. 7 – 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 also along the product dimension, with imports of advanced technology products driving the process.

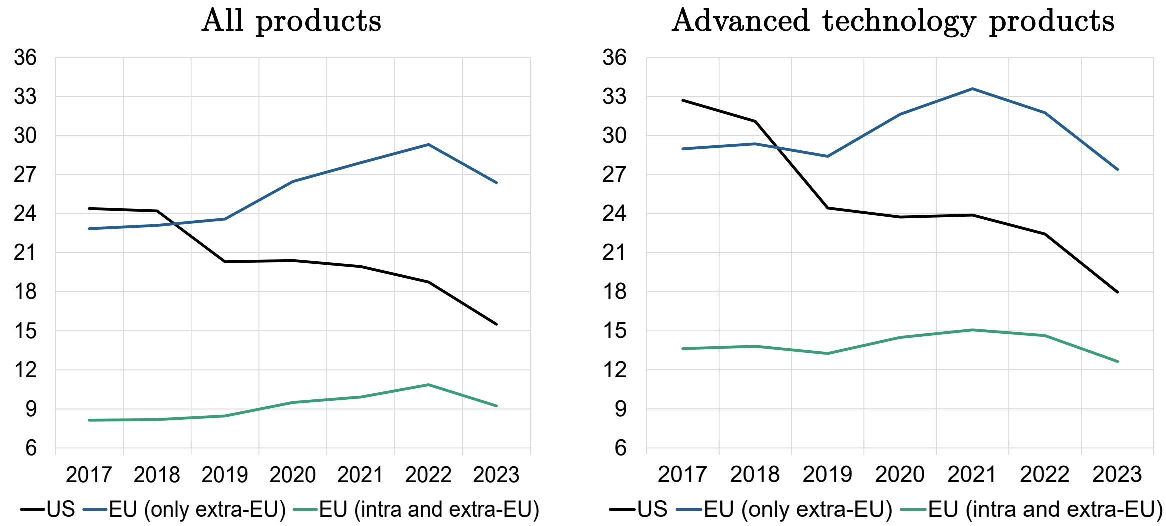
After the introduction of US-China tariffs in 2018, US goods import shares from China decreased dramatically, by 10 percentage points over five years, to 15 per cent (Fig. 8; left panel).[15] By contrast, until 2022, the weight of China for the EU, both net or gross of intra-EU trade, actually increased, boosted by the rotation of demand towards selected goods, such as medical equipment and electronics, induced by the COVID-19 pandemic. However, the Chinese import share for the EU declined in 2023, driven by the two man-

[15] 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).

ufacturing powerhouses, Italy and Germany, even if it remained slightly above pre-pandemic values.[16] Unlike the US, assessing whether a trend of decoupling from China is under way also for the EU is not trivial.

Fig. 8 – 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 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. 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. 8, 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

[16] See Fig. B1 in Annex B.

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

[18] See Fig. B2 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.

phones; Vietnam, for laptops and monitors; Taiwan, for semiconductors and electric integrated circuits (Table 2). In the US case, also Mexico gained market shares (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), although relocation of Chinese productions to neighbouring Asian countries may also be part of the story (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)

		China		Other relevant partners					
	Product	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 $i = US, EU$:

$$\begin{aligned} \Delta impshare_{i,x,p,2023-22} \\ = \ \alpha_0 + \ \beta_1 \Delta impshare_{i,CN,p,2023-22} \\ + \ \beta_2 \Delta impshare_{i,CN,p,2023-22} \ ATP + \ \beta_3 \ ATP \\ + \ \beta_4 \Delta impshare_{i,x,p,2022-17} \ + \ FE + \ \varepsilon_{i,p} \end{aligned} \quad (1)$$

where the dependent variable is the change between 2022 and 2023 in the share of US or EU[20] imports of HS4 products $\boldsymbol{p}$ from selected supplier countries $\boldsymbol{x}$, 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. 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, namely Vietnam, Taiwan and Mexico (Table 3). In the first two cases, the reallocation is stronger for ATP products, 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 pattern of ATP substitution away from China significantly played out in favour of Taiwan and Malaysia, whereas that for non-ATP led to rising shares from India and Japan (Table 4).[22]

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[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] At the HS4 product-code level, systematic ATP reallocation in favour of Vietnam is not observable, although at a HS6 product-level it is, consistently with the descriptive evidence in Table 2. However, similarly to Alfaro and Chor (2023), we prefer to estimate our regressions at the more aggregated level, as HS6 results are very noisy.

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)	**-0.266*** **	0.047	-0.043	-0.026	**-0.360*** **
	(0.04)	(0.04)	(0.03)	(0.04)	(0.06)
Δ China (2022-2023)*ATP	**-0.627** **	**-0.138***	**0.073***	0.011	**0.746*** **
	(0.28)	(0.08)	(0.04)	(0.09)	(0.14)
ATP	-1.505***	0.656	1.383	0.038	0.674***
	(0.28)	(0.64)	(1.04)	(0.39)	(0.19)
Δ country x (2017-2022)	-0.268***	0.551***	0.036	-0.028	-0.071**
	(0.06)	(0.06)	(0.10)	(0.03)	(0.04)
HS2 product fixed effects	Y	Y	Y	Y	Y
Adjusted R-squared	0.75	0.849	0.481	0.077	0.602
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)	-0.017	**0.054** **	**-0.027***	**-0.107*** **	0.018
	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)
Δ China (2022-2023)*ATP	-0.182	**-0.411***	0.03	**0.086** **	**-0.047***
	(0.14)	(0.22)	(0.02)	(0.04)	(0.02)
ATP	-0.738	0.957***	0.363***	0.181	-0.311
	(0.64)	(0.25)	(0.10)	(0.24)	(0.30)
Δ country x (2017-2022)	-0.158***	0.125	0.156*	-0.109	0.032
	(0.02)	(0.12)	(0.08)	(0.12)	(0.04)
HS2 product fixed effects	Y	Y	Y	Y	Y
Adjusted R-squared	0.444	0.74	0.356	0.148	0.147
N	1'023	1'076	1'152	1'151	1'008

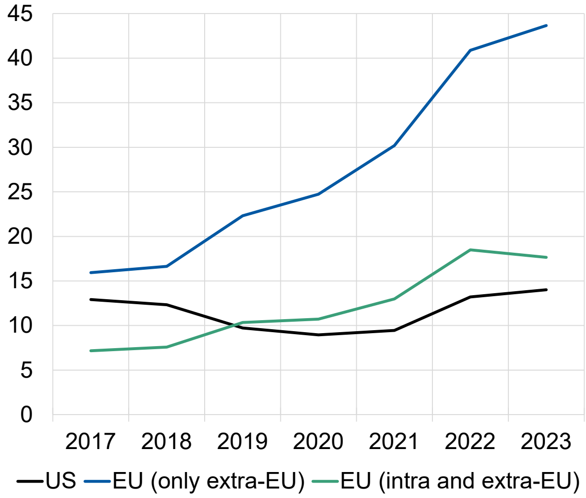
Notes: Estimations based on HS4 product-level imports from TDM. ATP is a dummy variable taking value 1 if at least one HS4 product code in the corresponding HS4 category is an ATP. Estimation is by weighted least squares, with the 2017 value of imports from China for each HS4 product as weights. Standard 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. 9; 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. 9 – 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 EU economies, whereas the share from China of electric auto vehicles is heterogeneous, albeit generally

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

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; granular data for Italy indicate that reductions in dependencies from China may be less significant 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 (i.e., carry-along trade; Bernard et al., 2019). Third, Chinese inputs might enter the production process in other countries at later stages.

[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 B3 in Annex B).

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. In what follows, we address the issues of lengthening and second-degree dependency on China empirically and test whether some degree of supply-chain lengthening is occurring by considering the following panel specification:

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

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. B5, 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 re-routing 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.

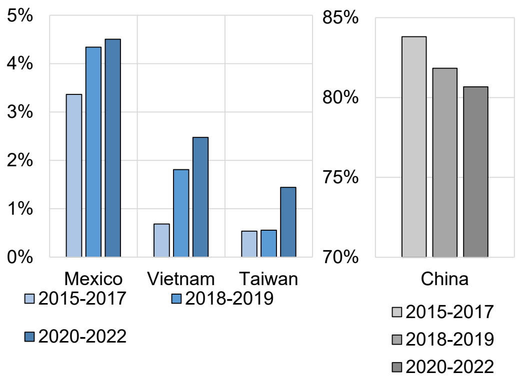
While these results might suggest that products are rerouted through potential hubs with minimal transformation, equation (2) cannot detect more profound reorganizations of supply chains, such as if Chinese inputs undergo significant transformations. In this case, products manufactured in third countries 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 10 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 10, 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.

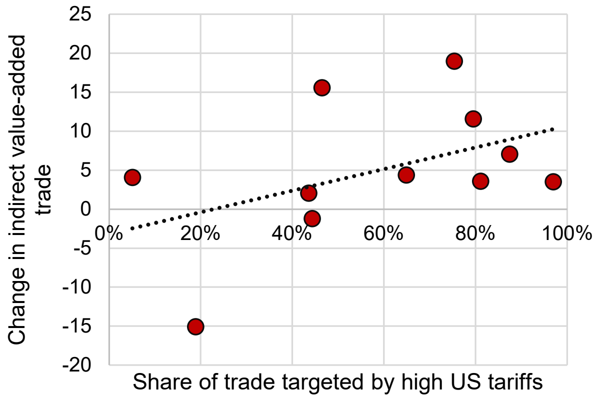
[25] The Inter-Country Input-Output tables used in this analysis do not differentiate between production by domestic firms and foreign affiliates of Chinese entities. Therefore, the increase in indirect trade we observed likely represents a lower bound, as it does not account for the rise in production 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 Appendix Fig. B4.

Fig. 10 – 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.

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.

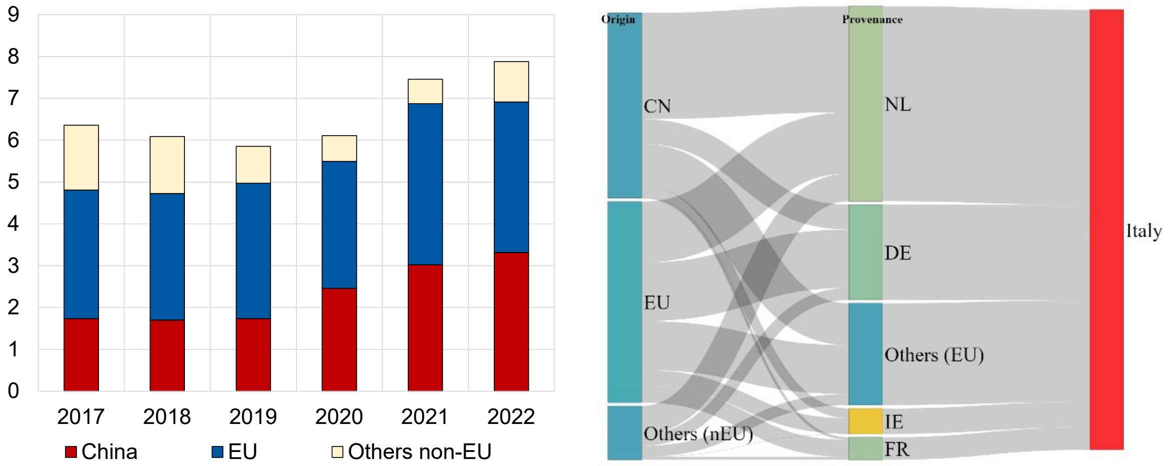
To show that the reduction in EU dependencies on China recorded in 2023 in traditional trade statistics might partially conceal an increase in indirect dependencies, we employ detailed foreign transaction data for Italy. We focus on Italian firms importing flagship ATP from other EU countries, which 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]

[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

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. 11, 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. B6). These products often transit through the Netherlands, Germany, Ireland, and France, where local affiliates and branches of Chinese multinational enterprises are typically located (Fig. 11, right panel).

Fig. 11 – Italy's imports of selected ATP by country of origin

Origin of imports (*values in EUR billion*) | **Trade routes** (*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]

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 non-member country."

[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.

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 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.

[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.

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.

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. However, based on transaction-level customs data available for Italy until 2022, the increase in the share of some EU partners in 2023 plausibly masks heightened trade of products with a Chinese origin.

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 of selected European countries, reported in Balteanu et al. (2024), although pointing to significant shares of firms de-risking from this partner by resorting to alternative suppliers for critical products, 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.

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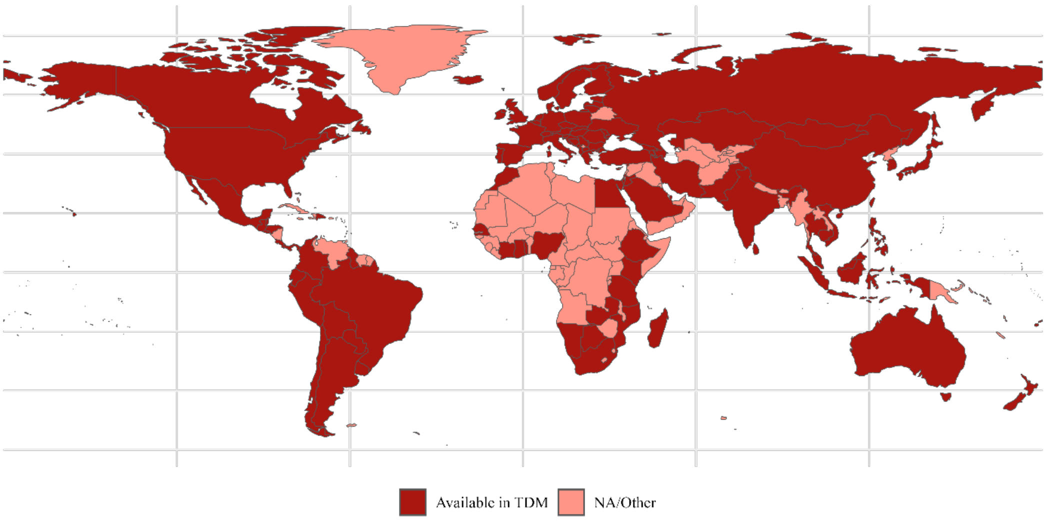
Annex A – Data and bloc methodology

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.

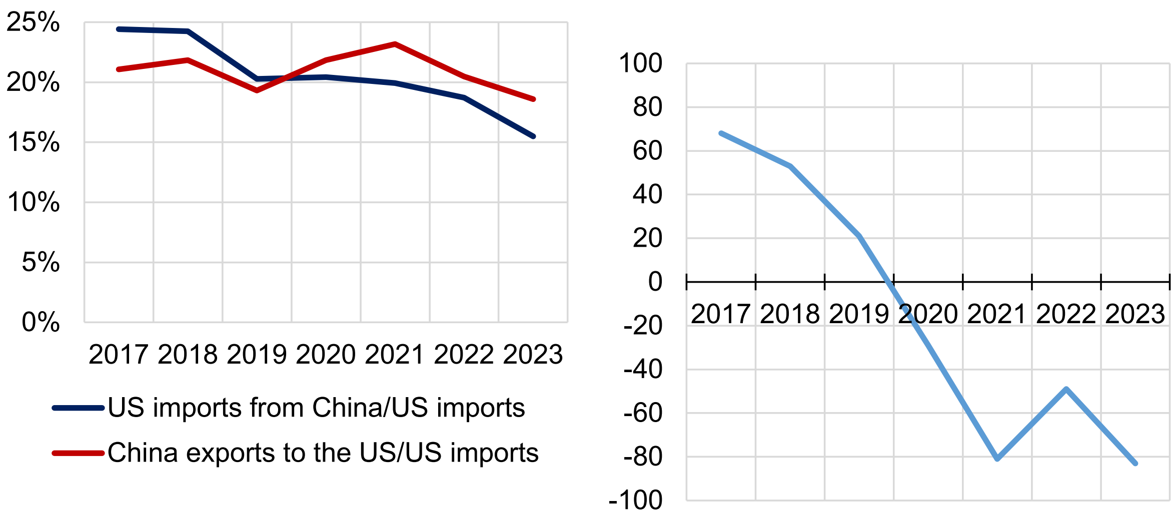
In this paper we employ customs data of the reporting country. According to Chinese export data, the fall in bilateral trade with the US after 2018 was significantly more muted (Fig. A2), since discrepancies between the value of Chinese imports in the US and of Chinese exports to the US according to 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

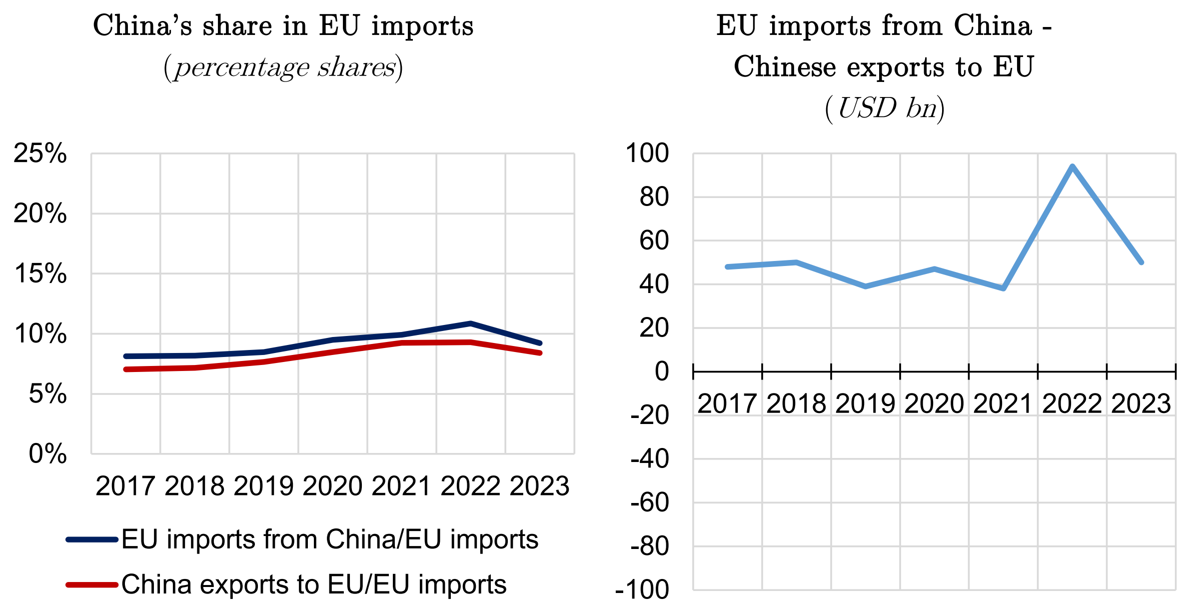
China's share in US imports (*percentage shares*)

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



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

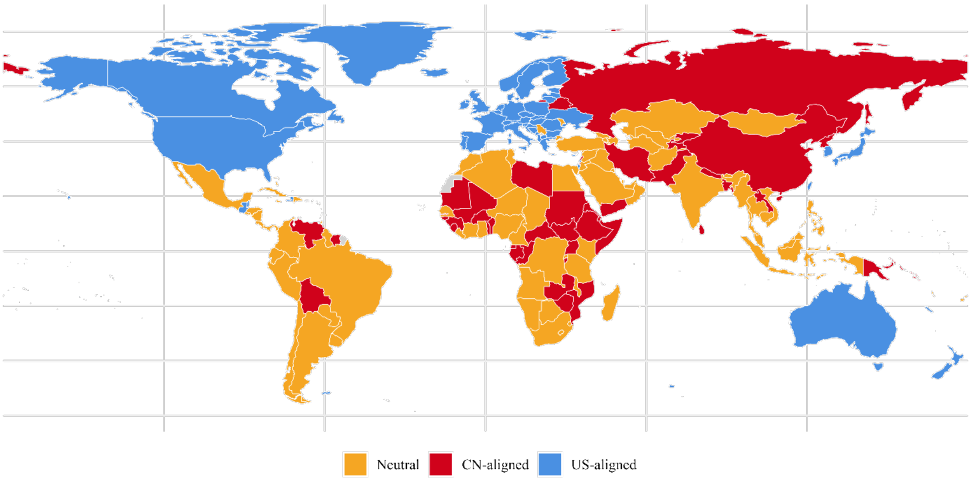
Economics (2023) are assigned to the US-aligned bloc (resp., CN-aligned). Other countries are assigned to a neutral bloc. The resulting blocs are shown in Fig. A2. Clearly, the assignment of individual countries to these three blocs, although based on pre-existing classifications, discounts some degree 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.

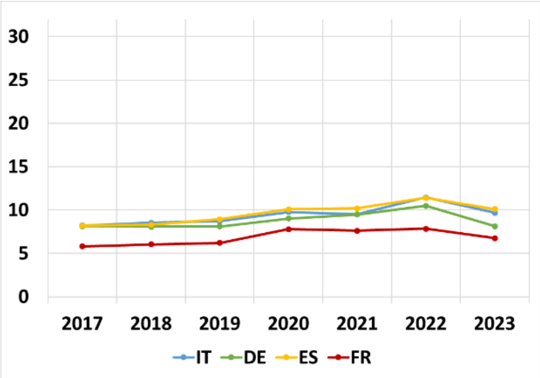
The classification of critical goods for the energy transition employed in this paper is taken from IRC Trade Expert Network (2024). It considers the products included in the Inflation Reduction Act by the US Administration (e.g., electric vehicles, electric batteries, and rare earth elements), as well 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

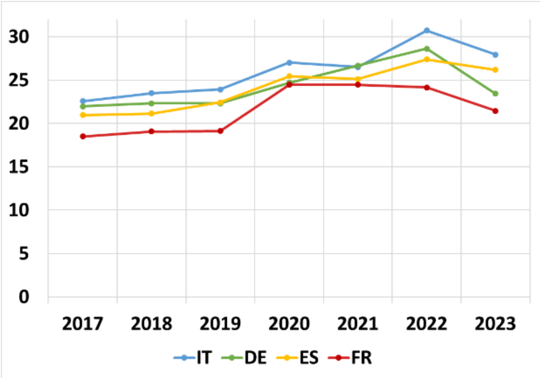
Fig. B1 – Share of total goods imports from China of the four main EU economies

(*percentage shares*)

Intra and extra-EU flows



Only extra-EU flows



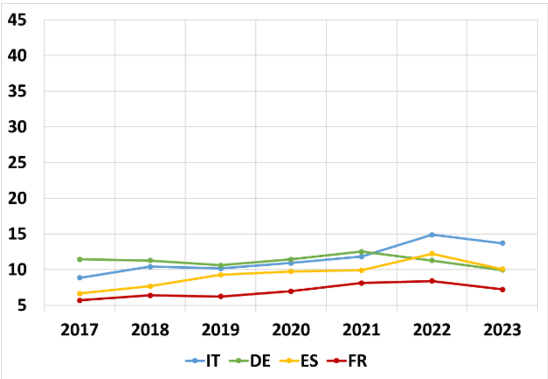
Source: authors' calculations on TDM.

Fig. B2 – Share of ATP imports from China

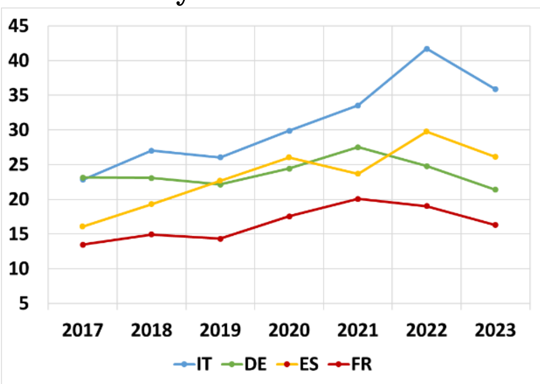
of the four main EU economies

(*percentage shares*)

Intra and extra-EU flows



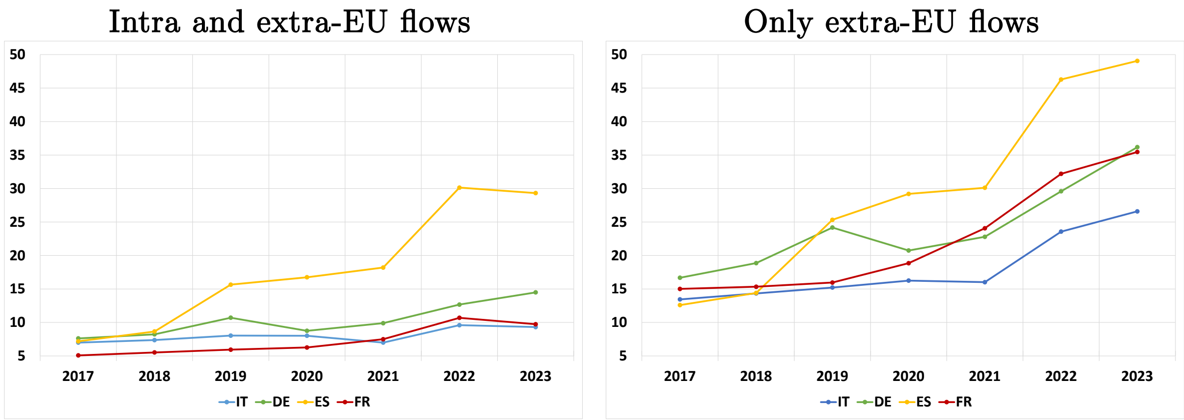
Only extra-EU flows



Source: authors' calculations on TDM.

Fig. B3 – Share of critical goods for the energy transition imports from China of the four main EU economies

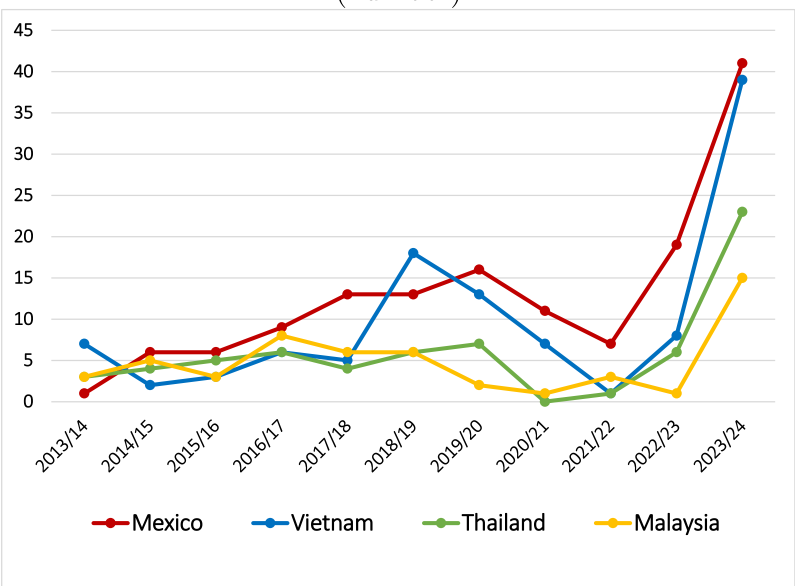
(*percentage shares*)



Source: authors' calculations on TDM.

Fig. B4 – Chinese FDI announcements in the manufacturing and logistics sectors, by destination

(*number*)

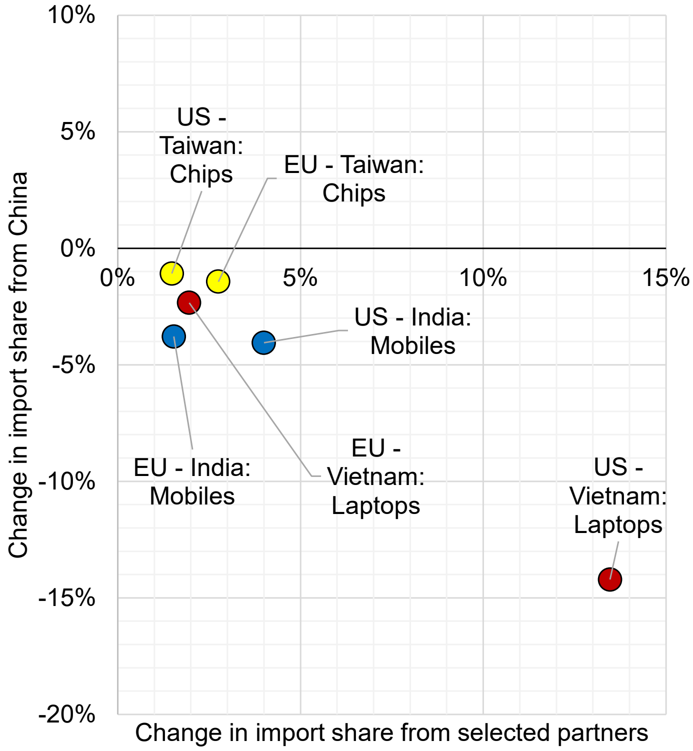


Source: Telling, Langley, Lin and Ho-Him (2024), FT and FDI Intelligence.

Notes: New projects and expansion of existing projects.

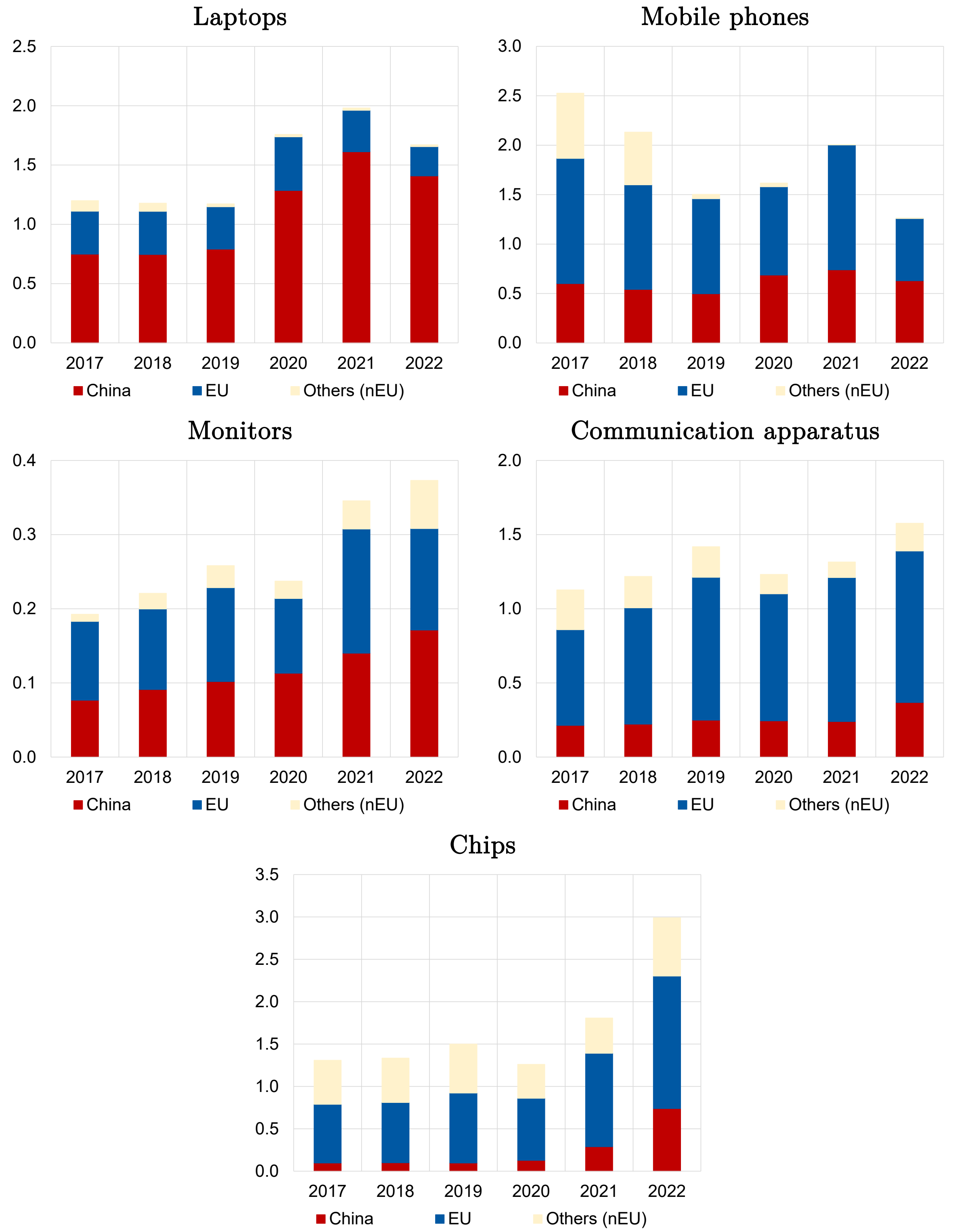
Fig. B5 – Change in import share from China vs. China in import share from selected partners for US and EU, selected products

(*percentage points change*)



Source: authors' calculations on TDM.

Fig. B6 - Italy’s imports of selected ATP by country of origin



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 2023	China 23-22	Other Partner	2023	23-22	Other Partner	2023	23-22
				Other relevant partners					
FR	Laptops	64.6	-2.6	VN	19.2	-0.5	US	5.1	0.8
FR	Mobile phones	37.7	-4.8	VN	33.4	2.6	IN	12.0	-0.3
FR	Monitors	60.0	-3.5	KR	12.6	5.2	US	7.7	-2.4
FR	Communication apparatus	41.2	-1.4	TN	12.3	-3.7	TW	8.6	0.7
FR	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
DE	Mobile phones	49.6	2.9	VN	25.7	2.2	IN	6.6	-2.9
DE	Monitors	52.0	-9.2	JP	31.5	8.4	TW	4.4	-0.2
DE	Communication apparatus	32.3	-7.0	VN	11.4	-0.9	TW	11.0	0.2
DE	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
IT	Mobile phones	68.7	-2.0	IN	16.2	3.1	VN	12.7	0.7
IT	Monitors	75.0	-5.2	MX	10.3	0.9	KR	4.0	1.2
IT	Communication apparatus	51.9	-15.8	VN	16.7	5.6	TW	9.8	3.4
IT	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
ES	Mobile phones	50.4	-8.4	VN	30.7	8.2	IN	10.5	1.4
ES	Monitors	72.8	-7.5	US	12.7	10.8	KR	5.3	-2.9
ES	Communication apparatus	41.3	-17.9	TW	16.5	5.9	VN	14.2	2.8
ES	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 transitior	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 transitior	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.