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FRAGMENTATION AND THE FUTURE OF GVCS

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Abstract

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JEL Classification: F10, F40, F61, C62.

Keywords: trade disruptions, fragmentation, international trade, GVCs.

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Fragmentation and the future of GVCs*

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Recent shocks and policy trends – including the weaponization of supply chains and measures to enhance national security and protect strategic sectors – have triggered a deep reorganization of international trade, particularly along geopolitical fault lines. This paper assesses how escalating trade restrictions between a Western US-centric bloc and an Eastern China-centric bloc — particularly those targeting products with a high risk of weaponization — affect supply chains, trade dependencies, and economic activity. To capture *ex ante* the impact of these targeted trade restrictions within a general equilibrium framework, we construct customized input-output tables that reflect the selective nature of these interventions. We find that trade fragmentation would produce significant global welfare and trade losses, despite the targeted shock. We then provide a detailed analysis of how global value chains and trade dependencies would adjust across countries and sectors in response to such shocks. While overall trade integration would be broadly unaffected, global value chains would become more regionalized, complex, and harder to monitor. Neutral countries would play a growing role into GVCs, especially as connectors between rival blocs. Even if direct dependencies would decline, indirect dependencies would be stronger.

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1 Introduction

Geopolitical tensions and recent global shocks – such as the COVID-19 pandemic, Russia's invasion of Ukraine, and the Middle East conflicts – have accelerated a shift toward strategic trade policies. Countries are increasingly strengthening domestic production in critical sectors and reducing reliance on key imports fromgeopolitical rivals.[1]Beyond safeguarding national interests, economic interdependencies are being weaponized, as targeted trade and investment restrictions become geopolitical tools. This shift raises concerns about the potential fragmentation of global trade and the restructuring of global value chains (GVCs). While no outright deglobalization is occurring (e.g., Alfaro and Chor, 2023; Arjona, Connell-Garcia and Herghelegiu, 2024; Attinasi et al., 2024) and no significant drops in GVC complexity have been found in recent years (Mancini et al., 2024), there is evidence of uneven disruptions across sectors (Conteduca et al., 2025). At the same time, non-aligned countries are acting more extensively as "connectors" in value chains (Gopinath et al., 2024; Freund et al., 2024).

This study investigates how trade restrictions on specific goods affect GVCs and welfare. In particular, it focuses on the potential impact of escalating trade barriers along geopolitical lines on key strategic products. It examines the broader welfare implications of such targeted disruptions and considers their influence on the structure of GVCs, the organization of international production, and trade dependencies. For our analysis, we rely on Baqaee and Farhi (2024), a multi-country, multi-sector model with integrated supply-chain linkages. Specifically, we assume that countries exogenously belong to either a Western US-centric bloc or an Eastern China-centric bloc, while some remain non-aligned. In line with the recent evidence following the Russian invasion of Ukraine, disruptions target products such as advanced technologies, dual-use items, energy commodities, which are critical to production processes and likely to face restrictive measures. Since available input-output tables are too aggregated to capture such targeted shocks, we develop a methodology to disaggregate them, enabling the analysis in this paper. With this toolkit, we compute counterfactual welfare changes and supply chain adjustments under a scenario involving a significant increase in trade barriers that halt trade of affected products between opposing blocs.

[1]Examples include the CHIPS Act and the Inflation Reduction Act in the United States, the CHIPS Act and the Critical Raw Material Act in the European Union, and fiscal stimulus measures in China to support battery production and electric vehicle manufacturing.

Our findings highlight three key predictions following trade fragmentation: *i*) welfare losses would be larger for the East bloc than for the West, *ii*) trade would be more regionally concentrated, *iii*) despite restrictions, indirect dependencies would persist also thanks to neutral countries, which act as connectors between opposing blocs. In more detail, welfare losses following geopolitical fragmentation would be substantial due to the critical nature of the targeted products, with particularly pronounced impacts on China. Factors such as trade openness and strong integration within GVCs would amplify the negative effects of the shock. On the contrary, countries that maintain a neutral stance experience some gains by increasing their international integration.

Despite the reduction in trade between rival countries, a substantial retrenchment of global integration is unlikely, as these declines are largely offset by strengthened commercial relationships within blocs and with neutral countries. Supply chains are expected to become more regionalized, fostering the broader adoption of *friend-shoring*. Additionally, bystander countries would increase their participation in GVC activities, serving as connectors between opposing blocs. Notably, while trade barriers reduce direct dependence on geopolitical opponents, they are unlikely to eliminate it entirely, as indirect flows of restricted products through non-aligned economies would grow. Integration within blocs may intensify, even as it diminishes across blocs. For restricted products, trade barriers may also result in longer and more complex supply chains. These findings align with current trade patterns during war-related disruptions. Sanctions have significantly reduced bilateral trade between Western countries and Russia (Borin et al., 2023*b*; Babina et al., 2023) with expected long-lasting consequences on the Russian welfare (Borin et al., 2023*a*).

We make three main contributions. First, we construct granular input-output tables starting from aggregate ones. Second, we show how this tables can be used to assess the welfare effects of targeted rather than across-the-board trade restrictions, improving the realism of the analyzed scenarios. Third, we predict the effects of trade fragmentation on GVCs using state-of-the-art indicators. Despite the application considered in this paper, our setting is rather general and can be used, for example, to assess the impact on welfare and the organization of GVCs of tariffs.

More in detail, we construct granular input-output tables using available information on trade, product classifications, and sanctions. Integrating the different sources of information allows us to isolate within each bilateral flow the share of trade susceptible to the trade fragmentation shock. This allows us to analyze more realistic scenarios, in which the shock affects just a subset of goods, while much of the

existing literature focuses on broad-based restrictions. For example, Javorcik et al. (2024) simulate an across-the-board increase in tariffs; Eppinger et al. (2021) analyze decoupling scenarios involving intermediate products from all countries or specific ones; and Felbermayr, Mahlkow and Sandkamp (2023) and Bachmann et al. (2024) examine the effects of decoupling within the energy sector. Similarly, Bolhuis, Chen and Kett (2023) study a scenario in which trade fragmentation is restricted to the elimination of trade between Russia, on the one side, and the United States and the European Union, on the other. Moro and Landi (2024) analyze the impact of geoeconomic fragmentation in a New-Keynesian model focusing on the impact of tariffs on consumption, production, and inflation. [2] Our paper incorporates trade measures recently implemented by various countries. For instance, we account for EU sanctions on trade with Russia, the US export ban on semiconductors to China, and China's export restrictions on selected raw materials. These measures focus on specific products rather than broad-based trade restrictions, offering a more nuanced perspective on trade fragmentation. Moreover, we provide a detailed analysis of the structural transformation of global value chains and trade dependencies across countries and sectors resulting from a trade fragmentation shock, expanding beyond the typical focus on welfare and economic activity found in other studies.[3] Adapting the framework of Baqaee and Farhi (2024) to the context of trade fragmentation helps explain the adjustment in trade and GVC flows that follows a shock to trade barriers. More in general, our approach encompassing ad hoc input-output tables within structural model can be used to evaluate the deep effects on interdependencies and GVCs of any shock to trade restrictions.

The remainder of the paper is organized as follows. Section 2 describes the framework used in our analysis, including the model and the methodology for splitting the IO tables. Section 3 discusses the assumptions regarding geopolitical blocs and restricted goods. Section 4 presents the simulation results, focusing on welfare impacts and GVC adjustments. Section 5 concludes.

2 Theoretical framework

In this section, we present the model which underlies the results discussed in Section 4. We consider a nonlinear, multi-country, multi-sector economy *à la* Baqaee and

[2] For an extensive survey on papers about geoeconomics see Mohr and Trebesch (2024).

[3] Bekkers et al. (2024) use a recursive dynamic CGE model to project global trade patterns until 2050, incorporating GDP, population, and energy consumption forecasts from international agencies.

Farhi (2024).[4] Goods can be traded across countries, and they are subject to shocks to non-tariff trade barriers.[5] We extend their baseline model in two dimensions. First, we show how to obtain changes of the input-output network in *real terms*, to study how global value chains adjust following a trade fragmentation shock. Second, we extend the inter-country input-output (ICIO) tables to include a heterogenous degree of weaponization potential at the micro level.

2.1 The baseline economy

The economy consists of C countries, each with a representative consumer with CES preferences and S sectors. We denote with $N = C \times S$ the total number of producers in the economy. Sectors are characterized by their weaponization potential, which can be high or low, as discussed in detail in Section 2.3.[6] Each sector s in a country c is represented by a domestic producer n. Each country is endowed with F_c primitive factors of production and has the same set of primary factors, though in different quantities. We denote with $F = F_c \times C$ the total number of primary factors in the economy.

Household Each country c has a representative household with preferences described by the following utility function

$$U_c = \left(\sum_{s=1}^{S} {b_{cs}}^{\frac{1}{\sigma}} C_{cs}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}},$$

where C_{cs} is c's consumption of good produced in sector s, σ is the elasticity of substitution across the different final goods, b_{cs} is an exogenous preference parameter. The final consumer price in country c is given by

$$P_c = \left(\sum_{s=1}^{S} b_{cs} P_{cs}^{1-\sigma} \right)^{\frac{1}{\sigma-1}},$$

[4] The framework generalizes Caliendo and Parro (2015) and Antràs and Chor (2018) to more general CES production and utility functions.

[5] We abstract from tariffs as we want to evaluate the effects and welfare costs of embargoes of key products. However, our approach allows for introducing tariffs.

[6] It is important to note that this classification serves as a narrative device, and alternative conceptualizations are possible. For example, one can think of share of sectors output subject to tariffs.

where P_{cs} is the price of good from sector s in country c and is given by

$$P_{cs} = \left(\sum_{c'} \delta_{c' \to c,s} \left(\tau_{c' \to c,s} p_{c's} \right)^{1-\theta_s} \right)^{\frac{1}{1-\theta_s}},$$

where $\delta_{c' \to c,s}$ represents the share of consumer c on goods from country c' in sector s, $\tau_{c\prime \to c,s}$ is the iceberg trade cost of shipping the goods in sector s from c' to c, $p_{c's}$ is the marginal cost of producing s in country c', and θ_s is the trade elasticity of sector s.

Producers Producer s located in country c produces an output y_{cs} using a CES production function combining primitive factors available in the countries and other produced inputs. In particular, we have

$$y_{cs} = \left(\alpha_{cs}^{\frac{1}{\theta}} V_{cs}^{\frac{\theta-1}{\theta}} + (1-\alpha_{cs})^{\frac{1}{\theta}} \mathcal{C}_{cs}^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}},$$

where V_{cs} is the value-added bundle of capital and labor, $\mathcal{C}_{cs}$ is the bundle of intermediates, and θ is the elasticity of substitution between V_{cs} and $\mathcal{C}_{cs}$.

The value-added bundle of producer s in country c, V_{cs}, is given by

$$V_{cs} = \left(\sum_{f \in F_c} \alpha_{cs,f}^{\frac{1}{\gamma}} \ell_{cs,f}^{\frac{\gamma-1}{\gamma}} \right)^{\frac{\gamma}{\gamma-1}},$$

where $\ell_{cs,f}$ represents the amount of factor f of country c used in the production by s, $\alpha_{cs,f}$ is the share of factor f, and γ is the elasticity of substitution across primary factors.

The bundle of intermediates, $\mathcal{C}_{cs}$, is given by

$$\mathcal{C}_{cs} = \left(\sum_{s' \in S} \omega_{cs,s'}^{\frac{1}{\varepsilon}} y_{cs,s'}^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}},$$

where $y_{cs,s'}$ is the quantity of the s' used by sector s in country c, $\omega_{cs,s'}$ is the share of s' used by s in c, and ε is the elasticity of substitution across intermediates.

Given this definition, we have that the marginal cost of production of sector s in country c, p_{cs}, is given by

$$p_{cs} = \left(\alpha_{cs} P_{V_{cs}}^{1-\theta} + (1-\alpha_{cs}) P_{\mathcal{C}_{cs}}^{1-\theta} \right)^{\frac{\theta}{\theta-1}},$$

with

$$P_{V_{cs}} = \left(\sum_{f \in F_c} \alpha_{cs,f} w_{cf}^{1-\gamma} \right)^{\frac{1}{1-\gamma}} \text{ and } P_{\mathcal{C}_n} = \left(\sum_{n' \in N} \omega_{cs,s'} \tilde{p}_{cs,s'} \right)^{\frac{1}{1-\varepsilon}},$$

where w_{cf} represents the factor f wage in country c, and $\tilde{p}_{cs,s'}$ is the price of the good s' used by s in country c. In particular, $\tilde{p}_{cs,s'}$ is equal to

$$\tilde{p}_{cs,s'} = \left(\sum_{c' \in C} \delta_{c's' \to cs} \left(\tau_{c's' \to cs} p_{c's'} \right)^{1-\theta_s} \right)^{\frac{1}{1-\theta_s}},$$

where $\tau_{c's' \to cs}$ is the iceberg trade costs for shipping the goods from the producer s' in country c' to the producer s in country c, $\delta_{c's' \to cs}$ is the share of expenditure of sector s and country c on goods s' by country c'. This set of definitions is useful to detail the construction of the input-output matrix in real terms and the derivation of changes in welfare and GDP.

The HAIO matrix The Heterogeneous-Agent-Input-Output (HAIO) matrix, $\mathbf{\Omega}$, is a $(C + N + F) \times (C + N + F)$-dimensional matrix such that the ij-th element is the expenditure share of i on inputs from j as a share of total revenues/incomes of i.

Let's consider the $N \times N$ submatrix of $\mathbf{\Omega}$ and producers s and s' located in country c and c' respectively. Assume that countries and producers combinations in the N-dimensional square matrix are ordered first by country index $c = 1, \ldots, C$ and then by sector index $s = 1, \ldots, S$. In this case, the corresponding element of the HAIO matrix is given by

$$\mathbf{\Omega}(C + (c-1) \cdot S + s, C + (c'-1) \cdot S + s') = \frac{p_{c's'} x_{c's' \to cs}}{p_{cs} y_{cs}}, \tag{1}$$

where $x_{c's' \to cs}$ is the amount of good from sector s' in country c' to producer s in country c.

Now, let's consider the $C \times N$ submatrix of $\mathbf{\Omega}$ and the representative household in country c and the producer s' located in c'. Assume that representative household in the submatrix are ordered by country index $c = 1, \ldots, C$, and that producers are ordered first by country index $c = 1, \ldots, C$ and then by sector index $s = 1, \ldots, S$. In this case, the corresponding element of the HAIO matrix is given by

$$\mathbf{\Omega}(c, C + (c'-1) \cdot S + s') = \frac{p_{c's'} c_{c's' \to c}}{GNE_c}. \tag{2}$$

Nominal Gross National Expenditure The nominal Gross National Expenditure, GNE_c, of country c is given by

$$GNE_c = \sum_{c'} \sum_{s'} p_{c's'} c_{c's' \to c}. \tag{3}$$

Nominal Gross Domestic Product The nominal Gross Domestic Product of country c, GDP_c, is given by

$$GDP_c = \sum_{c'} \sum_{s'} p_{cs} x_{cs \to c's'} - \sum_{c'} \sum_{s'} p_{c's'} x_{c's' \to cs}. \tag{4}$$

2.2 Recovering real GVCs and output

To understand the effects of the trade-fragmentation shock in real terms, we need to eliminate the price effects from the shocked input-output tables.

Change of IO in real terms As far as it concerns trade in intermediate inputs, we start from equation Equation (1). In log-terms, the change of the HAIO entry associated with the expenditure share of producer s in country c in the good of producer s' in country c' is given by

$$\begin{aligned} \mathrm{d}\log \mathbf{\Omega}\left(\cdot,\cdot\right) = {} & \mathrm{d}\log p_{c's'} + \mathrm{d}\log x_{c's' \to cs} \\ & - \mathrm{d}\log p_{cs} - \mathrm{d}\log y_{cs}, \end{aligned}$$

which implies that the real-terms change of imports of producer in s in country c from producer s' in country c' is given by

$$\mathrm{d}\log x_{c's' \to cs} = \mathrm{d}\log p_{cs} + \mathrm{d}\log_{y_{cs}} - \mathrm{d}\log p_{c's'} - \mathrm{d}\log \mathbf{\Omega}\left(\cdot,\cdot\right).$$

Similarly, the change of the HAIO entry associated with the expenditure share of consumer c in the good of producer s' in country c' is given by

$$\mathrm{d}\log \mathbf{\Omega}(\cdot,\cdot) = \mathrm{d}\log p_{c's'} + \mathrm{d}\log c_{c's' \to c} + \mathrm{d}\log GNE_c, \tag{5}$$

which implies that the real-terms change in imports of consumer in c from producer s' in country c' is given by

$$\mathrm{d}\log c_{c's' \to c} = \mathrm{d}\log GNE_c - \mathrm{d}\log p_{c's'} + \mathrm{d}\log \mathbf{\Omega}(\cdot,\cdot). \tag{6}$$

Equations (5) and (6) can then be used to obtain the shocked IO table in real terms, starting from the baseline table.

Change in real GNE Starting from equation Equation (3) the log-change of nominal GNE in country c following a (trade fragmentation) shock can be expressed as

$$\mathrm{d}\log GNE_c = \sum_{c'}\sum_{s'} \mathrm{d}\log c_{c's'\to c}\frac{p_{c's'}c_{c's'\to c}}{GNE_c} + \sum_{c'}\sum_{s'} \mathrm{d}\log p_{c's'\to c}\frac{p_{c's'}c_{c's'\to c}}{GNE_c}.$$

The first summand represents the change of GNE in real terms. Each change of household c's imports from sector s' in country c' is weighted by the importance of that import with respect to the total expenditure. By Shephard's lemma, change in real GNE represents also change in welfare for each country c. The second summand, instead, is the GNE deflator.

Change in real GDP Analogous expression to that of GNE can be provided for the change in real GDP. In particular, using equation Equation (4), the log-change in nominal GDP of country c is given by

$$\begin{aligned}\mathrm{d}\log GDP_c = &\sum_{c'}\sum_{s'} \mathrm{d}\log x_{cs\to c's'}\frac{p_{cs}x_{cs\to c's'}}{GDP_c} - \sum_{c'}\sum_{s'} \mathrm{d}\log x_{c's'\to cs}\frac{p_{c's'}x_{c's'\to cs}}{GDP_c}\\ &+ \sum_{c'}\sum_{s'} \mathrm{d}\log p_{cs}\frac{p_{cs}x_{cs\to c's'}}{GDP_c} - \sum_{c'}\sum_{s'} \mathrm{d}\log p_{c's'}\frac{p_{c's'}x_{c's'\to cs}}{GDP_c}.\end{aligned}$$

The terms on the first line represents the change in GDP in real terms, whereas the terms on the second line is the GDP deflator.

2.3 The split IO table

The extent of trade fragmentation can vary. In principle it may encompass all trade between blocs, including across-the-board bans on merchandise and service trade. However, the latest disruptive events – such as the US-China trade war and the sanctions on Russia following its invasion of Ukraine – show that countries tend to apply trade measures, such as tariffs or bans, on selected key products, while leaving others unaffected. In general, countries impose export restrictions on a subset of items, characterized by a high weaponization potential, striking a balance between the amount of damage caused to the affected country and the self-imposed economic costs (Ahn and Ludema, 2020; De Souza et al., 2024; Hausmann, Schetter and Yildirim, 2024).

Since input-output tables are available at an aggregate level, they are generally not perfectly suited to assess the impact of targeted measures. To overcome this limitation, we propose a methodology to isolate in each sector the share of products targeted by restrictions. In particular, we classify all products within each sector according to two levels of weaponization potential (low or high) and use this information to construct a finer split input-output table, given a set of underlying proportionality assumptions. However, the procedure highlighted in this section is fairly general and can be extended to any decomposition of the original IO table.[7]

Consider a standard ICIO with C countries and S sectors represented in Table 1. $\mathbf{X}_{c\to c'}$ is the $S \times S$ matrix of intermediate inputs produced in country c and used in country c', $\mathbf{C}_{c\to c'}$ is the $S \times 1$ vector of final goods and services produced in country c and absorbed in country c', and $\mathbf{Y}_c$ is the $S \times 1$ vector of gross output produced in country c. Finally, $\mathbf{VA}_c$ is the $1 \times S$ vector of value added generated in country c. The goal of this section is to show how to add another dimension to the ICIO structure, and obtain a new ICIO with C countries, S sectors, and 2 different degrees of weaponization potential. Therefore, after the split, the final dimension of $\mathbf{X}_{c\to c'}$, $\mathbf{C}_{c\to c'}$, $\mathbf{Y}_c$, and $\mathbf{VA}_c$, will be $2S \times 2S$, $2S \times 1$, $2S \times 1$, $1 \times 2S$, respectively.

Table 1: Initial input-output table

		Inputs use & value added			Final consumption			Total output
		1	...	C	1	...	C	
Output supplied	1	$\mathbf{X}_{1\to1}$	...	$\mathbf{X}_{1\to C}$	$\mathbf{C}_{1\to1}$	...	$\mathbf{C}_{1\to C}$	$\mathbf{Y}_1$
	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮
	C	$\mathbf{X}_{C\to1}$	...	$\mathbf{X}_{C\to C}$	$\mathbf{C}_{C\to1}$	...	$\mathbf{C}_{C\to C}$	$\mathbf{Y}_C$
Value added		$\mathbf{VA}_1$	...	$\mathbf{VA}_C$				
Total output		$(\mathbf{Y}_1)'$	...	$(\mathbf{Y}_C)'$				

Notes: inter-country input output table for a world economy with C countries and S sectors. $\mathbf{X}_{c\to c'}$ is a $S \times S$-dimensional matrix of intermediate inputs exports from c to c'. $\mathbf{C}_{c\to c'}$ is a $S \times 1$-dimensional vector of exports of final goods from c to c'. $\mathbf{VA}_c$ is the $1 \times S$-dimensional vector of c's value added, and $\mathbf{Y}_c$ is the $S \times 1$-dimensional vector of c's total output.

To account for the different potential of weaponization of goods in a given sector, we split each sector into two artificially constructed subsectors, one associated with goods with high-weaponization potential and another with goods with low-weaponization potential. The first one includes the products that are more likely

[7] For example, while we focus on two categories, a higher number of categories can be considered in this procedure.

subject to additional trade barriers by countries aiming to harm partners in the opposite blocs, while the other is constructed residually.[8]

For a given list of products with high weaponization potential and countries,we build a $CS \times CS$ matrix $\mathbf{\Gamma}^X$ of *split coefficients* for intermediates. Each element $\gamma^X_{cs\to c's'}$ indicates the share of intermediate inputs produced by country c in sector s that are sold to sector s' of country c' and that is likely to be subject to weaponization. Similarly, the element $\gamma^C_{cs\to c'}$ of the $CS \times S$ matrix $\mathbf{\Gamma}^C$ measures the share of sales in final goods sold by sector s of country c to country c' subject to weaponization.

Operationally, $\mathbf{\Gamma}^X$ is computed using bilateral trade flows data on the sales of intermediate and final products according to the Broad Economic Categories classification, as well as two simplifying assumptions. First, since trade data do not provide information on the importing sector s', we assume that $\gamma^X_{cs\to c's'} = \gamma^X_{cs\to c's''} = \gamma^Z_{cs\to c'}\ \forall s', s''$.[9] Second, for domestic transactions, we assume that the share of high-weaponization potential products in each sector equals the weighted average of the coefficients observed for exports towards other countries, i.e. $\gamma^X_{cs\to cs} = \sum_{c'} \omega_{cs\to c'} \gamma^X_{cs\to c's}$ where $\omega_{cs\to c'}$ is the share of exports to country c' on total exports of sector s of country c.

We identify the transactions in intermediate products with high-weaponization potential by multiplying the matrix $\mathbf{\Gamma}^X$ and $\mathbf{X}$ element by element, :

$$\mathbf{X}^\Gamma = \mathbf{\Gamma}^X \circ \mathbf{X}. \tag{7}$$

The flows of products with low-weaponization pontential are computed residually:

$$\mathbf{X}^\Delta = \mathbf{X} - \mathbf{X}^\Gamma. \tag{8}$$

Similarly, it is possible to split the transactions of final goods ($\mathbf{C}^\Gamma$, high weaponization potential, and $\mathbf{C}^\Delta$, low weaponization potential). After the manipulations described above, the ICIO framework is modified as in Table 2 where the original IO accounting relationships can be derived as $x^\Gamma_{cs\to c's'} + x^\Delta_{cs\to c's'} = x_{cs\to c's'}$ and $c^\Gamma_{cs\to c'} + c^\Delta_{cs\to c'} = c_{cs\to c'}$.

[8] Note that the split of the input-output table also affects those countries that do not impose trade barriers.

[9] The same assumption is used to construct ICIO tables from domestic IO and trade data.

Table 2: Input-output table with split rows

		Inputs use & value added			**Final consumption**			**Total output**
		1	...	C	1	...	C	
Output supplied: high potential	1	$\mathbf{X}^{\Gamma}_{1\to1}$	...	$\mathbf{X}^{\Gamma}_{1\to C}$	$\mathbf{C}^{\Gamma}_{1\to1}$	...	$\mathbf{C}^{\Gamma}_{1\to C}$	$\mathbf{Y}^{\Gamma}_{1}$
	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮
	C	$\mathbf{X}^{\Gamma}_{C\to1}$	...	$\mathbf{X}^{\Gamma}_{C\to C}$	$\mathbf{C}^{\Gamma}_{C\to1}$	...	$\mathbf{C}^{\Gamma}_{C\to C}$	$\mathbf{Y}^{\Gamma}_{C}$
Output supplied: low potential	1	$\mathbf{X}^{\Delta}_{1\to1}$	...	$\mathbf{X}^{\Delta}_{1\to C}$	$\mathbf{C}^{\Delta}_{1\to1}$	...	$\mathbf{C}^{\Delta}_{1\to C}$	$\mathbf{Y}^{\Delta}_{1}$
	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮
	C	$\mathbf{X}^{\Delta}_{C\to1}$	...	$\mathbf{X}^{\Delta}_{C\to C}$	$\mathbf{C}^{\Delta}_{C\to1}$	...	$\mathbf{C}^{\Delta}_{C\to C}$	$\mathbf{Y}^{\Delta}_{C}$
Value added		$\mathbf{VA}_1$	...	$\mathbf{VA}_C$				
Total output		$(\mathbf{Y}_1)\prime$	...	$(\mathbf{Y}_C)\prime$				

Notes: Multi-country, multi-sector input output table for a world economy with C countries and $\tilde{S}$ sectors. Each initial sector of output supplied is split in two subsector based on its weaponization potential (*high* vs. *low*). Γ denotes high-weaponization potential sectors, Δ denotes low-weaponization potential sectors.

The sum of the row elements of $\mathbf{X}^{\Gamma}$ and $\mathbf{C}^{\Gamma}$ provides the total output of *high-weaponization potential* products and services ($\mathbf{Y}^{\Gamma}$). Analgously, the row sum of $\mathbf{X}^{\Delta}$ and $\mathbf{C}^{\Delta}$ represents the total output of *low-weaponization potential* goods and services ($\mathbf{Y}^{\Delta}$)

Then, assuming that high-weaponization potential inputs are used in the same proportion to produce output for both high- and low-weaponization potential goods and services, we split the intermediate inputs and value added according to their uses (i.e., splitting the columns of $\mathbf{X}^{\Gamma}$, $\mathbf{X}^{\Delta}$, and $\mathbf{VA}$). Using the information on the last column of the IO Table 2, we obtain the shares of high-weaponization potential output using the element-wise division between $\mathbf{Y}^{\Gamma}$ and $\mathbf{Y}$:

$$\mathbf{\Gamma}^{Y} = \mathbf{Y}^{\Gamma} \oslash \mathbf{Y}, \tag{9}$$

with the complement equal to $\mathbf{\Delta}^{Y} = \mathbf{Y}^{\Delta} \oslash \mathbf{Y}$. The complete ICIO table looks as fol-

lows:

$$\mathbf{X}^{\Gamma\Gamma} = \mathbf{X}^{\Gamma} \circ \left(\mathbf{u} \otimes (\mathbf{\Gamma}^{X})'\right), \tag{10}$$

$$\mathbf{X}^{\Delta\Gamma} = \mathbf{X}^{\Delta} \circ \left(\mathbf{u} \otimes (\mathbf{\Gamma}^{X})'\right), \tag{11}$$

$$\mathbf{X}^{\Gamma\Delta} = \mathbf{X}^{\Gamma} \circ \left(\mathbf{u} \otimes (\mathbf{\Delta}^{X})'\right), \tag{12}$$

$$\mathbf{X}^{\Delta\Delta} = \mathbf{X}^{\Delta} \circ \left(\mathbf{u} \otimes (\mathbf{\Delta}^{X})'\right), \tag{13}$$

$$\mathbf{VA}^{\Gamma} = \mathbf{VA} \circ (\mathbf{\Gamma}^{Y})', \tag{14}$$

$$\mathbf{VA}^{\Delta} = \mathbf{VA} \circ (\mathbf{\Delta}^{Y})', \tag{15}$$

where $\mathbf{u}$ is the $CS \times 1$ unit vector. The splitted ICIO table is depicted in Table 3.

Table 3: Split input-output table

		Inputs use & value added: high potential			**Inputs use & value added: low potential**			**Final consumption**			**Total output**
		1	…	C	1	…	C	1	…	C	
Output supplied: high potential	1	$\mathbf{X}^{\Gamma\Gamma}_{1\to1}$	…	$\mathbf{X}^{\Gamma\Gamma}_{1\to C}$	$\mathbf{X}^{\Gamma\Delta}_{1\to1}$	…	$\mathbf{X}^{\Gamma\Delta}_{1\to C}$	$\mathbf{C}^{\Gamma}_{1\to1}$	…	$\mathbf{C}^{\Gamma}_{1\to C}$	$\mathbf{Y}^{\Gamma}_{1}$
	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮
	C	$\mathbf{X}^{\Gamma\Gamma}_{C\to1}$	…	$\mathbf{X}^{\Gamma\Gamma}_{C\to C}$	$\mathbf{X}^{\Gamma\Delta}_{C\to1}$	…	$\mathbf{X}^{\Gamma\Delta}_{C\to C}$	$\mathbf{C}^{\Gamma}_{C\to1}$	…	$\mathbf{C}^{\Gamma}_{C\to C}$	$\mathbf{Y}^{\Gamma}_{C}$
Output supplied: low potential	1	$\mathbf{X}^{\Delta\Gamma}_{1\to1}$	…	$\mathbf{X}^{\Delta\Gamma}_{1\to C}$	$\mathbf{X}^{\Delta\Delta}_{1\to1}$	…	$\mathbf{X}^{\Delta\Delta}_{1\to C}$	$\mathbf{C}^{\Delta}_{1\to1}$	…	$\mathbf{C}^{\Delta}_{1\to C}$	$\mathbf{Y}^{\Delta}_{1}$
	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮
	C	$\mathbf{X}^{\Delta\Gamma}_{C\to1}$	…	$\mathbf{X}^{\Delta\Gamma}_{C\to C}$	$\mathbf{X}^{\Delta\Delta}_{C\to1}$	…	$\mathbf{X}^{\Delta\Delta}_{C\to C}$	$\mathbf{C}^{\Delta}_{C\to1}$	…	$\mathbf{C}^{\Delta}_{C\to C}$	$\mathbf{Y}^{\Delta}_{C}$
Value added		$\mathbf{VA}^{\Gamma}_{1}$	…	$\mathbf{VA}^{\Gamma}_{C}$	$\mathbf{VA}^{\Delta}_{1}$	…	$\mathbf{VA}^{\Delta}_{C}$				
Total output		$(\mathbf{Y}^{\Gamma}_{1})\prime$	…	$(\mathbf{Y}^{\Gamma}_{C})\prime$	$(\mathbf{Y}^{\Delta}_{1})\prime$	…	$(\mathbf{Y}^{\Delta}_{C})\prime$				

Notes: Multi-country, multi-sector input output table for a world economy with C countries and S sectors. Each initial sector of output supplied and input use is split in two subsector based on its weaponization potential (*high* vs. *low*). Γ denotes high-weaponization potential sectors, Δ denotes low-weaponization potential sectors.

The split matrices for input coefficients and value added coefficients are calculated similarly. In particular, the $2CN \times 2CN$ matrix A of technical coefficients has this structure:

$$A = \begin{bmatrix} \mathbf{A}^{\Gamma\Gamma} & \mathbf{A}^{\Gamma\Delta} \\ \mathbf{A}^{\Delta\Gamma} & \mathbf{A}^{\Delta\Delta} \end{bmatrix} \tag{16}$$

where each block is a matrix of dimension $CS \times CS$.[10] The specific parametrization for

[10]Notably, due to proportionality assumptions, it hods that $a^{\Gamma\Gamma}_{ij,st} = a^{\Gamma\Delta}_{ij,st}$ and $a^{\Delta\Gamma}_{ij,st} = a^{\Delta\Delta}_{ij,st}$; it is also

the splitting procedure used in our simulation exercises are described in Section 3.

3 Empirical framework and data

In the following sections, we first show how we divide the global economy into three distinct blocs. Then, we classify products based on their weaponization potential to split the IO table and design our fragmentation scenario.

3.1 Geopolitical blocs

We classify countries into three exogenously defined blocs: West, East, and Neutral. The West bloc consists of the US and its allies, the East bloc includes China and its allies, and the Neutral bloc comprises non-aligned countries. To assign countries to these blocs, we rely on the geopolitical index developed by den Besten, Di Casola and Habib (2023). This index picks two geopolitical poles (in our case, the US and China) and measures a country's proximity to each. It extends the approaches purely based on United Nations voting patterns to assess geopolitical alignment, as those recently used in the literature (Campos et al., 2023; Gopinath et al., 2024; Javorcik et al., 2024) by including additional measures of political alignment between countries. These measures are the frequency of sanctions, military import disparities, China's official lending, and voting behavior on UN resolutions. The final index ranges from zero to one, indicating the degree of geopolitical alignment with the United States (closer to zero) compared to China and Russia (closer to one). We assign countries with an index below 0.25 to the West and those with an index above 0.75 to the East. The rest of the countries are classified as Neutral.[11] The presence of a bloc of neutral countries appears consistent with the role of potential *connectors* played by some non-aligned countries, which has been documented in some previous works (e.g., Qiu, Shin and Zhang, 2023; Conteduca et al., 2025; Borin et al., 2023*b*) and is explored in Section 4.2.

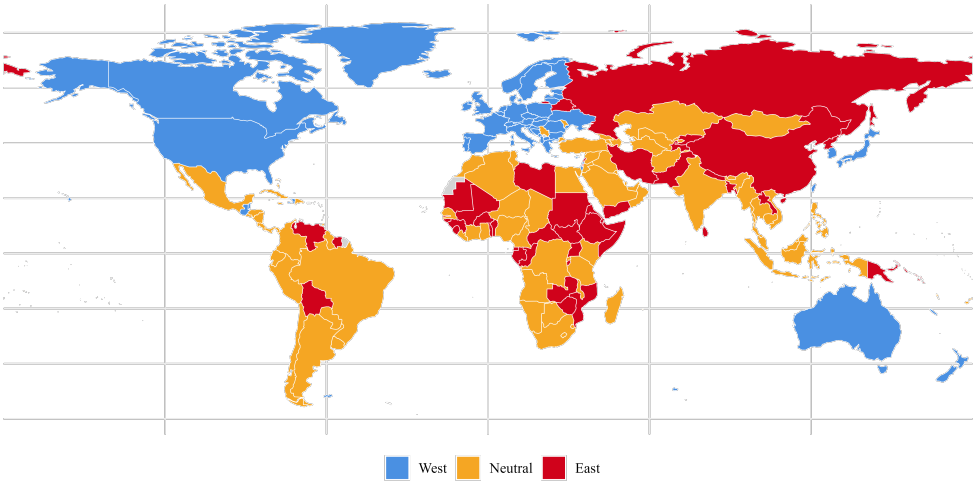
One limitation of the index is that it is not available for all countries due to missing data. To circumvent this issue, we rely on the allocation provided by Capital Economics (2023), which considers political and economic alignments and represents a close match to the index of den Besten, Di Casola and Habib (2023).[12] For the coun-

true that $a^{\Gamma\Gamma}_{ij,st} + a^{\Delta\Gamma}_{ij,st} = a^{\Gamma\Delta}_{ij,st} + a^{\Delta\Delta}_{ij,st} = a_{ij,st}$, where $a_{ij,st}$ represents the correspondent coefficient in the original ICIO setup.

[11] See Appendix A for more details.

[12] Regarding the classification of Capital Economics (2023), we consider economies classified as "US allies" ("China allies") as West (East) while the rest ("Leans US", "Unaligned", and "Leans China" as

Figure 1: Countries allocation in blocs



Notes: Allocation of countries and territories to the three blocs (West, Neutral, and East) based on den Besten, Di Casola and Habib (2023) and Capital Economics (2023). Countries and territories for which no allocation is available are filled in gray.

tries for which both the index of den Besten, Di Casola and Habib (2023) and the classification of Capital Economics (2023) are available, the implied assignments are highly correlated.[13] The results of the allocation are reported in Figure 1.

West is by far the largest group, comprising almost two-thirds of the World GDP (Table 4). East accounts for about one-fifth of world value-added and one-fourth of world trade. Neutral countries represent the smallest group. Regarding trade flows between the blocs, Figure 2 shows that West is the only group whose share of intra-group trade exceeds 50% (65.2% for the export share, 64.6% for the import share). On the contrary, East has the smallest share of intra-group trade, around 10% for both export and imports. Moreover, there is a strong asymmetry in terms of bilateral dependencies: while East's share in West's export share (resp., import) is 14.8% (15.4%), West's share in East's trade is much larger: 59.0% for exports, 57.7% for imports. Concerning the neutral countries, they seem to be much more dependent

Neutral. In terms of variables, Capital Economics (2023) 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 and 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 and non-concessional development funding. For more information see Table A3 in the Appendix A.

[13]The assignment is not consistent only for three countries out of 63.

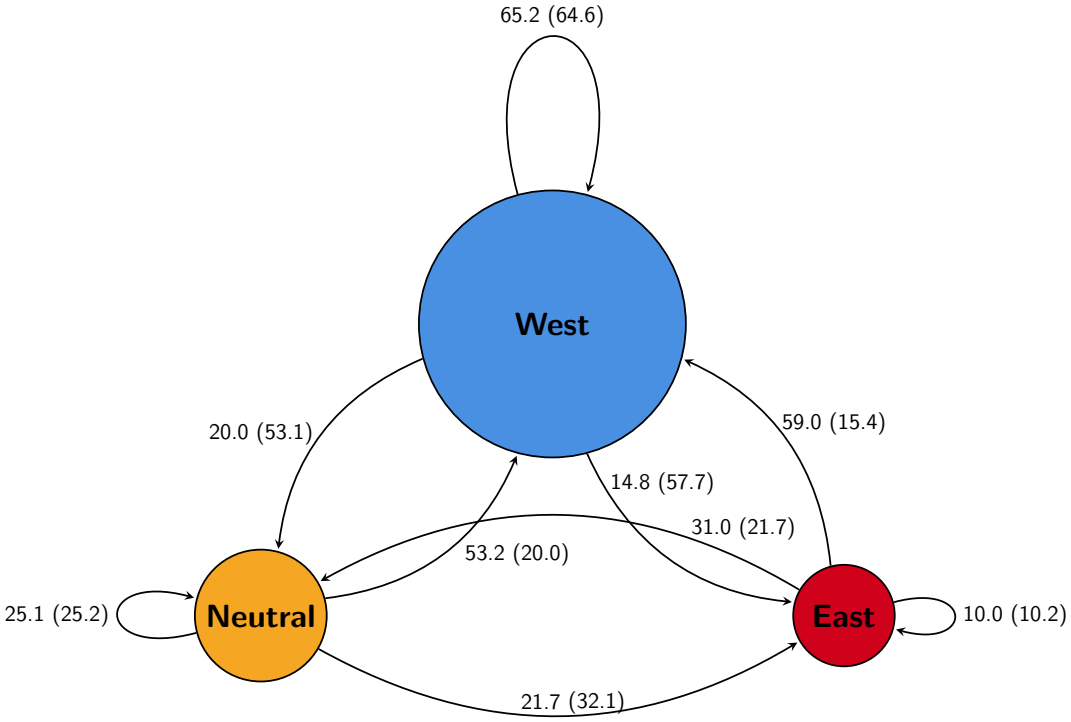
on the West, which represents 53.2% of their total exports and 53.1% of their imports. These patterns are important for the interpretation of the results in Section 4.1 and, in particular, why East bloc is posed to suffer from trade decoupling.

Table 4: Share of value added and trade by bloc

Bloc	Share	
	Value Added (%)	Trade (%)
West	60.3%	60.9%
Neutral	18.6%	16.0%
East	21.1%	23.1%

Notes: Value added and trade share of the geopolitical blocs based on the OECD input-output table for the year 2018. For the definition of the blocs see Figure 1.

Figure 2: Trade shares between blocs



Notes: Export and import shares of each bloc to the other blocs (including itself) based on the OECD input-output table for the year 2018. Export shares are reported outside the parentheses, import shares in parentheses. The size of each node is proportional to the share of world trade (see Table 4). For the definition of the blocs see Figure 1.

3.2 Products hit by restrictions: a selective decoupling scenario

In our analysis, we focus on a selective decoupling scenario where Western and Eastern countries impose trade barriers on goods with a higher weaponization potential. In particular, trade restrictions target a specific set of products, namely goods critical to the opposing bloc, effectively weaponizing supply chains. This approach is motivated by the recognition that an all-out ban would be unlikely as some trade between blocs was preserved even during the Cold war (Gopinath, 2023; Gopinath et al., 2024). Moreover, early signs of fragmentation suggest a trend toward selective decoupling rather than full-scale decoupling (e.g., Alfaro and Chor, 2023; Freund et al., 2024; Arjona, Connell-Garcia and Herghelegiu, 2024; Conteduca et al., 2025).

To assess the weaponization potential of each product, we examine past instances of trade restrictions within the broader context of geoeconomic trade fragmentation. Specifically, we assume that products with high weaponization potential include those subject to export and import bans following the Russian invasion of Ukraine, advanced technology products and dual-use items, as well as products critical to the green transition.

First, we consider as high-weaponization potential those products targeted by trade restrictions imposed after the Russian invasion of Ukraine. These restrictions were coordinated among Western economies and carefully designed to both prevent Russia from accessing key resources and advanced military technologies and limit Russia's ability to generate substantial revenues through commodity exports (Borin et al., 2023*b*; Babina et al., 2023; Itskhoki and Ribakova, 2024; International Working Group on Russian Sanctions, 2024).[14] Second, advanced technology products and dual-use items are those that have already faced significant restrictions, especially in the context of US-China Decoupling (e.g., Zhang, 2023; Garcia-Herrero, 2022; Cao et al., 2024). On the one hand, the US tightened its control over technology transfer, for instance through the Export Control Reform Act, which governs the export

[14] The list of sanctioned goods is from Borin et al. (2023*b*) and considers the sanction packages implemented by the EU in 2022. The EU has imposed and tightened export restrictions on several dual-use items, including drones and software for drones, software for encryption devices, semiconductors and advanced electronics, engines for drones, chemicals that could be used for chemical weapons, law enforcement items, special materials and industrial machinery, camouflage gear and riot control agents, rare earths, thermostats, thermographic cameras, machine tools, machinery parts, DC motors and servomotors for unmanned aerial vehicles, electronic components identified in weapon systems such as helicopters, missiles, drones, and wheeled vehicles (see https://eu-solidarity-ukraine.ec.europa.eu/eu-sanctions-against-russia-following-invasion-ukraine/sanctions-dual-use-goods_en). For a timeline of the EU sanctions on Russia, refer to https://www.consilium.europa.eu/en/policies/sanctions-against-russia/timeline-sanctions-against-russia/.

of technologies with dual-use capabilities. On the other hand, China has restricted exports of drones and raw materials key for AI-related products. We consider as high-weaponization potential the list of advanced technology products (ATPs) issued by the US Census Bureau.This list includes critical goods and technologies related to biotechnologies, life sciences, opto-electronics, information and communications, electronics, flexible manufacturing, advanced materials, aerospace, weapons, and nuclear technology.[15] Lastly, export restrictions on key products for the green transition –i.e., critical raw materials, lithium batteries, solar panels and electric vehicles – have been on the rise (Kowalski and Legendre, 2023).[16] The list of products needed for the green transition includes natural resources such as ores and minerals (e.g., aluminum, copper, and rare earths), industrial raw materials (e.g., graphite, silicon, and precious metals like platinum and gold), chemical compounds, lithium batteries, solar panels, photovoltaic cells, and electric vehicles.

Overall, our list of products with high weaponization potential represents an upper bound of the full range of goods that could potentially face severe trade restrictions in the context of geoeconomic trade fragmentation. These products account for about two thirds of global non-services trade. Products with high weaponization potential in four key sectors—computers and electronics, energy, motor vehicles, and chemicals—constitute more than half of all goods classified as having high weaponization potential (Table 5). Approximately 90% of products in the computer, electronics, and optical equipment sector possess high weaponization potential. This share is significantly lower in other sectors, with textiles at 24% and food at just 7%.

Products with high weaponization potential that are subject to trade restrictions–specifically flows between West and East–account for approximately 13% of global non-services trade (see Figure 3). This share is nearly three times higher for global trade in computer and electronic products.

[15] See https://www.census.gov/foreign-trade/reference/codes/atp/index.html.

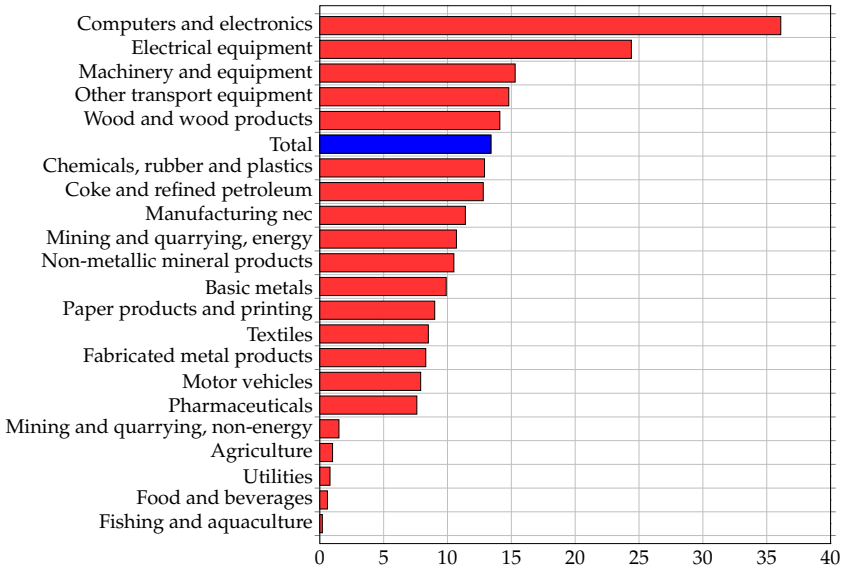
[16] See https://www.whitehouse.gov/briefing-room/statements-releases/2024/05/14/fact-sheet-president-biden-takes-action-to-protect-american-workers-and-businesses-from-chinas-unfair-trade-practices/.

Table 5: Products with high weaponization potential, by sector

	Share in non-restricted	Share in restricted	Share of restricted
Computers and electronics	3.0%	16.3%	92%
Motor vehicles	2.5%	13.1%	92%
Coke and refined petroleum	1.4%	7.2%	92%
Other transport equipment	1.1%	4.6%	90%
Wood and wood products	0.3%	1.1%	89%
Electrical equipment	1.7%	5.7%	88%
Mining and quarrying, energy	4.1%	13.5%	88%
Machinery and equipment	5.8%	8.7%	76%
Paper products and printing	1.2%	1.6%	75%
Pharmaceuticals	2.6%	3.4%	74%
Chemicals, rubber and plastics	9.5%	10.5%	70%
Basic metals	6.6%	5.4%	64%
Manufacturing nec	5.7%	3.1%	54%
Non-metallic mineral products	2.0%	0.9%	49%
Utilities	0.7%	0.2%	41%
Fabricated metal products	6.1%	1.6%	36%
Textiles	12.1%	1.8%	24%
Mining and quarrying, non-energy	5.4%	0.6%	20%
Food and beverages	18.1%	0.6%	7%
Agriculture	9.2%	0.3%	7%
Fishing and aquaculture	0.8%	0.0%	1%
Total	100.0%	100.0%	
Total ($ bn)	*4408.19*	*9463.66*	

Notes: : The first column ('Share in non-restricted') represents the ratio of the value of the unrestricted component of the sector to the total value of unrestricted goods. The second column ('Share in restricted') represents the ratio of the value of the restricted component of the sector to the total value of restricted goods. The last column ('Share of restricted') represents the relative size of the restricted component within each sector.

Figure 3: Global non-services trade hit by restrictions, by sector



Notes: Each bar represents the share of trade targeted by restrictions over total trade, by sector.

3.3 Calibration

ICIO table. Our source of data for the ICIO table is the 2021 edition of the OECD Inter-Country Input-Output Tables for the year 2018. OECD harmonizes the country Input-Output Tables and provides matrices of inter-industrial flows of goods and services produced domestically and imported in current USD million. The original OECD IO table for 2018 includes 66 countries plus Rest of the World and 45 sectors. To reduce the computational burden associated with our simulations, we aggregate some countries to end up with 38 geographic areas (countries and regions, see Figure A1).[17] Given our focus on goods trade restrictions, we aggregate up all services sectors. UN Comtrade product-level trade data are matched with the OECD IO country and sector aggregation to split the overall IO structure by applying the methodology outlined in section 2.3. Thus, we end up with a split version of OECD IO where each non-services sector is further broken down by weaponization potential.

[17] Information on the original countries and sectors and their aggregation are in Table A1 and Table A2, respectively. Regarding countries, aggregates include Baltics, the BeNeLux, the Northern Europe, Southern Europe, Latin America, and China (which includes Hong Kong). Compared to the original OECD ICIO table, we separate the Rest of the World into a neutral and two aligned components to reflect the geopolitical alignments within this residual group.

Other data and parameters. Aggregate elasticities of substitution and sector trade elasticies are reported in Table 6. Our calibration features the same aggregate elasticities of substitution as in Baqaee and Farhi (2024).[18] In our baseline, sector-specific elasticities are sourced from Fontagné, Guimbard and Orefice (2022). Their median value is about 5, a value commonly used in the literature. In an alternative calibration (rigid), we scale down by a fixed factor the baseline elasticities so that their new median value match the weighted median in Boehm, Levchenko and Pandalai-Nayar (2023) for the 7-10 years horizon (approximately 1.3). The lower trade elasticities observed in the rigid setup are not expected to significantly alter trade reallocation patterns, given the prohibitive nature of trade barriers assumed in both setups. However, as we will clarify in Section 4.1, the two setups have markedly different implications for welfare.

We consider that the primary factors are the same across countries (capital, low-skilled, medium-skilled and high-skilled labor), and we update the factors shares used in Baqaee and Farhi (2024).[19] Finally, the rigid setup features also nominal wage rigidities, which binds the adjustment of the change in the employment of the different types of labor.

We assume an increase of non-tariff trade barriers almost shutting down trade flows in products hit by restrictions between the two opposite blocs.[20] To generate this similar drop, NTBs increase has to be equal to 150% in the baseline and 2000% in the rigid setup, given the different calibration of trade elasticities.

4 Results

In the following sections, we examine the impact of selective trade disruptions on welfare and trade flows (Section 4.1) and the restructuring of supply chains (Section 4.2). In Section 4.1, we display results for both the baseline and rigid setup, whereas in Section 4.2, we show results on GVC reconfiguration only for the baseline.

[18] Baqaee et al. (2024) shows that the other elasticities play a minor role in determining the aggregate loss.

[19] Further details on the construction of the factor shares are in Appendix A.3.

[20] Non-tariff trade barriers are more likely to emerge as trade frictions between opposite geopolitical blocs. Other trade barriers, as tariffs, which are currently under discussion in the ongoing policy debate aim to targets different objectives set by policymakers (e.g., reduction of trade imbalances and protect domestic industries).

Table 6: Summary of Parameters and Elasticities

Description		**Value**
Aggregate elasticities of substitution		
across consumption, σ		0.9
across composite value added and intermediates, θ		0.5
across primary factors, γ		1.0
across intermediate inputs, ε		0.2
Sector trade Elasticities		
	Rigid	Baseline
D01T02, D03	0.728	2.911
D05T06, D07T08	0.851	3.405
D10T12	1.043	4.174
D13T15	1.178	4.712
D16	2.199	8.798
D17T18	2.054	8.215
D19	0.918	3.672
D20D22	2.164	8.657
D21	2.641	10.562
D23	1.197	4.787
D24	1.849	7.394
D25	1.054	4.217
D26	1.285	5.141
D27	1.027	4.108
D28	1.252	5.008
D29	2.229	8.916
D30	2.248	8.991
D31T33	1.015	4.062
D35T39, D41T43, Services	0.819	3.274
NTBs increase (only on affected trade flows)		
$\Delta\tau$	2000%	150%

Notes: description of the sectors can be found in Table A2. Trade elasticities in the baseline setup are adapted from Fontagné, Guimbard and Orefice (2022). Trade elasticities in the rigid setup are 25% of the elasticities in the flexible scenario and in line with the median weighted elasticity in Boehm, Levchenko and Pandalai-Nayar (2023). Other parameters are from Baqaee and Farhi (2024).

4.1 Aggregate impact of fragmentation

Table 7 presents the changes in welfare and GDP by bloc due to the selective decoupling for the baseline and rigid setup.

Trade fragmentation is expected to have a significant impact on the welfare of blocs, particularly when the ability to replace restricted products is limited (i.e., in the rigid setup), even if trade restrictions affect only a subset of goods.

Losses for the world, West, and East are lower in the baseline scenario: the higher trade elasticities allow countries to find more cost-effective replacements to their original sources on top of the fact that the labor markets adjust (7). In this context, the drop in world's welfare is around 0.5%. East's losses are larger than elsewhere, in particular than those recorded in West, and reaches 1.3%. The difference in the losses across the two blocs is explained by their different respective sizes, which allows the West to substitute away from East in a less costly way.[21] Countries belonging to the neutral bloc increase their welfare, as they still take advantage of the trade barriers between the two blocs and the lower contraction in their economies. Interestingly, GDP falls in all areas, including neutral countries, reflecting a depressed demand and the increased trade tension.

In the rigid scenario, losses are more severe. Welfare and real GDP decrease by 4.6% globally, with substantial heterogeneity across blocs. East is the most affected bloc, with a welfare and real GDP loss close to 10%. While the West suffers relatively less from the fragmentation, its welfare and real GDP drop by more than 4%, close to the overall loss at the world level.[22] On the other hand, the neutral bloc still exhibits moderate welfare gains, especially when the possibilities to diversify away are larger.

[21] This result resonates with some of the findings of Di Giovanni et al. (2024), with larger negative effect of trade fragmentation on China compared to the US.

[22] Losses for the West are greatly amplified if mild trade barriers are raised within the bloc. In particular, even relatively small universal NTBs increase from large Western economies (such as the US and the EU) may substantially increase the loss borne by them (results available upon request).

Table 7: Welfare and real GDP changes after selective decoupling by bloc

	Welfare		GDP	
Aggregates	Rigid	Baseline	Rigid	Baseline
World	-4.6	-0.6	-4.6	-0.6
East	-9.9	-1.3	-9.8	-1.2
West	-4.2	-0.5	-4.1	-0.5
Neutral	0.1	0.2	-0.4	-0.1

Notes: Bloc's welfare and real GDP changes following selective decoupling. Selective decoupling involves the weaponization of mutual dependencies and relies on a split IO table. NTB increases by 2000% in the rigid setup and by 150% in the baseline. Table A1 details the country aggregates.

Russia represents the hardest-hit country (Table B1). In the East bloc, also China is heavily affected, due to the loss of access to important sourcing and destination markets. Among the West bloc, losses are generally larger for countries that are more connected or closer to the East bloc, such as South Korea, Taiwan, the Baltic countries, and the Central and Eastern Europe. Large EU economies and the US exhibit sizable losses, albeit these being smaller than observed in countries within the same bloc more expose to the East. Losses are more limited in the baseline setup. Neutral countries report limited losses in the baseline setup, while countries such as Vietnam, Singapore, and Mexico even experience moderate gains. Such gains are larger and more concentrated in the rigid setup than in the baseline. Finally, it is worth noting that Saudi Arabia, an oil exporting country, shows large welfare gains, especially in the rigid setup, thanks to increased relative prices of the energy commodities.

After the shock, global trade shrinks by approximately 10%. The East bloc experiences significant losses, with about one-third of its trade flows wiped out, while the West suffers comparatively smaller declines. In contrast, neutral countries see an increase in their trade flows. The trade reallocation mitigates the overall reduction in global trade flows, with the net decline being less severe than the contraction in trade directly affected by prohibitive restrictions. Trade in products targeted by restrictions across opposite blocs nearly ceases (Table 8).[23] These restricted products are increasingly diverted to allies and neutral countries. Intra-bloc trade rises sharply–by

[23]Results for the rigid setup are reported in the Appendix Table B2.

7.5% in the West and 33.6% in the East relative to the baseline. Exports from Neutral countries to both the West and East also increase by approximately 10%. In contrast, changes in non-restricted trade flows are much milder, reflecting substitution patterns and supply chain adjustments.

Table 8: Changes in trade flows, restricted and non-restricted products

Exporter	Importer	Restricted	Non-Restricted
Neutral	Neutral	0.1%	-0.3%
	West	9.7%	-3.6%
	East	9.8%	-5.2%
West	Neutral	3.2%	3.4%
	West	7.5%	-0.6%
	East	**-97.5%**	-0.8%
East	Neutral	2.3%	4.5%
	West	**-96.5%**	3.1%
	East	33.6%	-0.5%

Notes: Changes in trade flows for restricted and unrestricted goods based on the scenario presented in Section 3.3.

4.2 The impact of fragmentation on GVCs structure

In this subsection, we focus on the structural transformation of supply chains following the trade shock. We summarize our findings in four predictions, pointing out that some are already consistent with the latest evidence emerging on international trade at the global level.[24]

Prediction #1: GVCs integration at the global level is almost unaffected. As a starting point, we evaluate the change compared to the baseline of a set of standard measures that are commonly used in the literature to characterize GVC participation and value-added trade, surveyed in Antràs and Chor (2022). After the shock, the share of trade crossing more than one border (GVC-related trade, see Borin, Mancini

[24]The baseline and rigid scenarios yield similar predictions. However, for the sake of simplicity, we focus on the baseline setting in this section.

and Taglioni, 2021), drops only marginally–in line with other shifts observed in the past–and remain in line with the recent trend (Figure 4). This modest decline is found because both GVC and non-GVC trade in restricted products are similarly affected by the restrictions. However, trade in non-restricted products that crosses more borders is indirectly affected by barriers on restricted products (Figure A1). In fact, non-restricted products might serve as inputs for restricted goods, which are subsequently re-exported and subject to trade barriers.

No significant changes are found also in the Vertical Specialization index (Hummels, Ishii and Yi, 2001), measuring the relative import content of exports. Similarly, Value-Added Exports (Johnson and Noguera, 2012) and Domestic Value-Added in Exports (Koopman, Wang and Wei, 2014), both commonly used as inverse measures of GVC integration, remain largely unaffected.

The mild results in terms of GVC trade and integration is due to the fact that the shock affects only specific products traded between countries in opposing blocs. Broader tensions leading to more extreme decoupling scenarios would produce a much higher impact on globalization and GVC integration. This evidence supports the view that plausible fragmentation scenarios do not necessarily entail deglobalization, as integration in GVCs is only marginally affected by selective decoupling.

Prediction #2: Neutral countries GVC trade boosts, as they both step up domestic productions for GVCs and re-exports. In terms of the effects of trade restrictions on GVC-related flows across countries, we find that economies in the East substantially reduces their GVC exports, as well as their domestic-value added in exports and import content of exports. In other terms, their ability to contribute to GVCs and to re-export other countries' products is impaired (see Table B3 for the full list of countries). Results are qualitatively similar for the West bloc, but with a smaller magnitude.

Conversely, neutral countries become more engaged in GVC activities (Figure 6). Overall, their GVC exports in products hit by restrictions surge. Trade restrictions enhance their role as connectors, as seen by the rise in the import content of exports. Most of this result is driven by their ability to re-exports other countries' electronic products (Figure A2). At the same time, domestic production that contributes to GVCs in products hit by West-East trade bans is also boosted. More than one third of this increase is due to the surge in the extraction of raw materials and commodities.

Vietnam, Philippines, Mexico, and Singapore are the economies that benefit the most from increased GVC flows, especially in their ability to export other countries' inputs (Figure 7). In particular, the sectors in which the four countries increase their

Figure 4: GVC-related trade, historical data and post-shock value

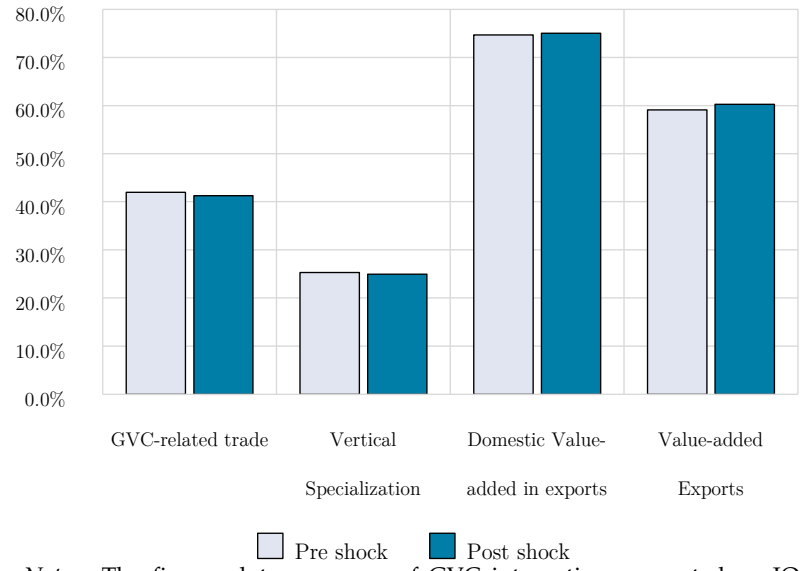
Notes: The figure plots the historial GVC-related trade computed on OECD IO data (blue dots), its trend (black solid line), and the level observed post-shock (blue diamond). GVC-related trade is computed following Borin, Mancini and Taglioni (2021), and is defined as trade flows crossing at least two borders.

GVC participation in trade of restricted products, i.e., textiles, computer and electronics, and electrical equipment, are among the sectors in which the East bloc had the highest share of global trade before the shock. For these four countries, in these specific sectors, we observe an increase in value added produced but also a sharper growth in the import content of exports, suggesting that these economies intensified their their role of connectors after the shock (Figure A3).

This prediction is consistent with currently available evidence concerning the increased importance of "connectors" documented in international trade (Freund et al., 2024; Gopinath et al., 2024), especially for specific supply chains (Conteduca et al., 2025).

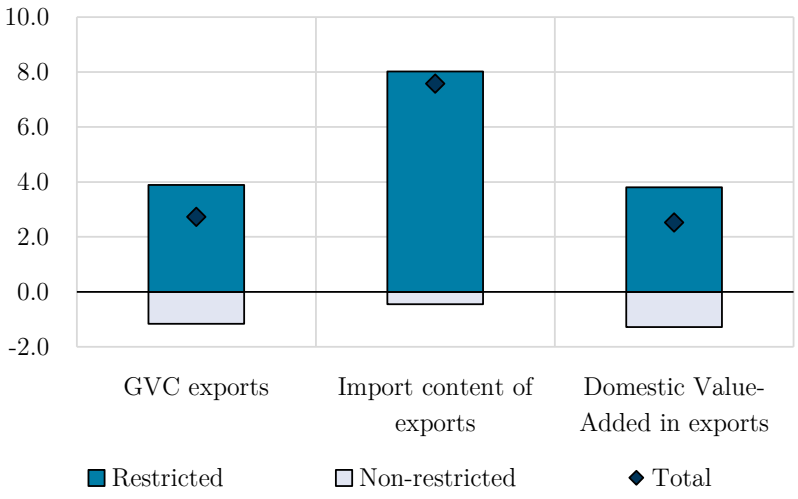
Prediction #3: Supply chains become more regional. Following the shock, products from the East are replaced by both domestic and foreign production. In Figure 8, we analyze these reallocation patterns by examining changes in the share of value added in the EU and US final demand by region of origin before and after the shock. In the EU, approximately one-fourth of the East's lost market share is reallocated to

Figure 5: Measures of GVC integration, pre and post shock



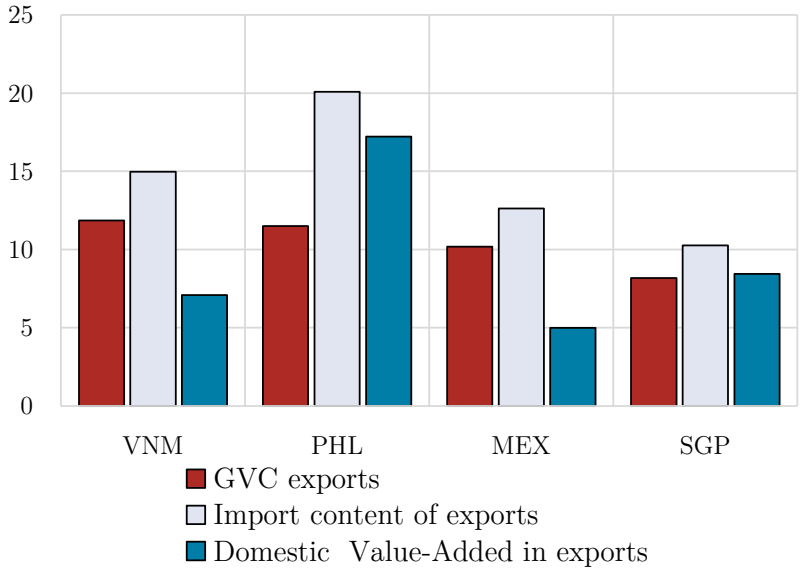
Notes: The figure plots measures of GVC integration computed on IO tables pre and post shock. Vertical Specialization from (Hummels, Ishii and Yi, 2001), defined as the relative import content of exports; Value-Added Exports from (Johnson and Noguera, 2012), defined as domestic value-added of a country absorbed abroad; Domestic Value-Added in Exports (Koopman, Wang and Wei, 2014), defined as domestic value-added embedded in its exports; GVC-related trade is in line with Figure 4.

Figure 6: Percentage change compared to the pre-shock period, neutral bloc



Notes: The figure plots the percentage change in GVC-related exports, import content of exports, and domestic value-added in exports, compared to the pre-shock period, for products affected and unaffected by restrictions.

Figure 7: Percentage change compared to the pre-shock period, top 4 neutral countries



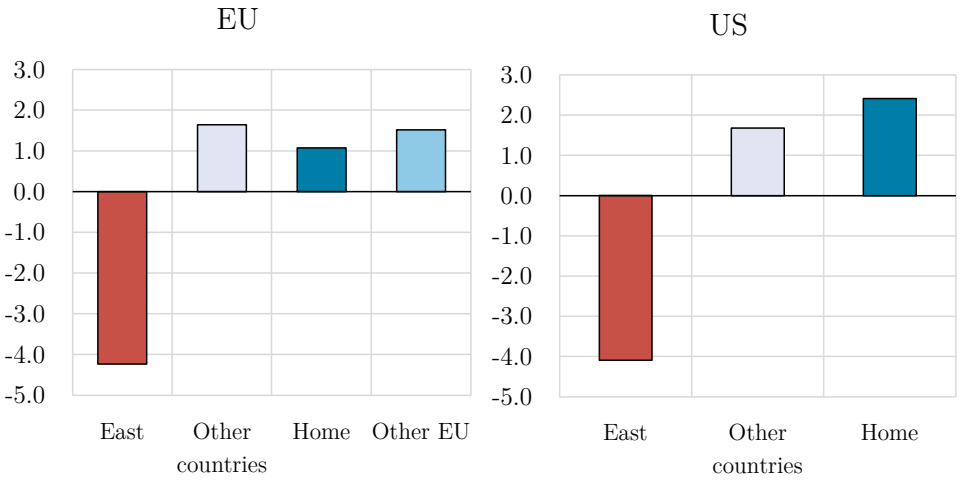
Notes: The figure plots the percentage change in GVC-related exports, import content of exports, and domestic value-added in exports, compared to the pre-shock period, for the four neutral countries with the largest increase in GVC exports and import content of exports.

domestic production, while more than one-third is replaced by production from other EU countries. The remaining share is substituted by production from neutral and allied foreign countries. In the US, over half of the East's lost market share is replaced by domestic production.

To see whether trade fragmentation implies a regionalization of trade flows, we analyze the reorientation of the EU and US supply chains. We find that the reconfiguration of supply chains entails a considerable regionalization, again guided by trade flows in restricted products (Figure 9). In the EU, about half of the supply chains from the opposite bloc– measured as GVC-related imports, i.e., imports crossing at least two borders–are substituted with intra-EU supply chains. Neutral economies are able to attract a much larger share of relocated supply chains compared to countries within the West bloc, such as US and Japan. In the US, about one third of the supply chains from the opposite bloc are relocated to Canada and Mexico. Neutral countries, and to a lesser extent the EU, gain substantial shares as well. More in general, after the shock and following the decrease in trade with the East bloc, countries with pre-existing stronger ties with the EU and US benefit from the most from the reallocation.

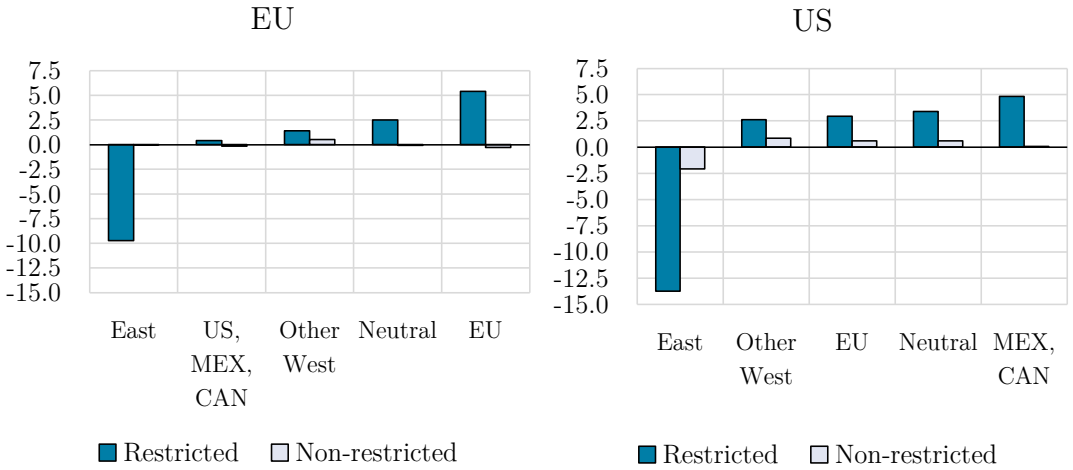
Supply chains reallocations are highly heterogeneous across sectors (Figure A4). For the EU, electronics and electrical equipment supply chains are mostly shifted to the intra-EU market, while mining products are mostly sourced from neutral countries. For the US, Mexico and Canada become top suppliers in electronics, while neutral gains sizable shares in the supply of textile products.

Figure 8: Percentage points change in the share of value-added in EU and US final demand, by origin of the value-added



Notes: The figure shows the percentage points changes in the share of value added in final demand by region of origin before and after the shock, for the EU (left panel) and the US (right panel).

Figure 9: Percentage points change in the share of EU and US supply chains, by origin



Notes: The figure shows the percentage points change in the share of GVC imports by region of origin before and after the shock, for the EU (left panel) and the US (right panel).

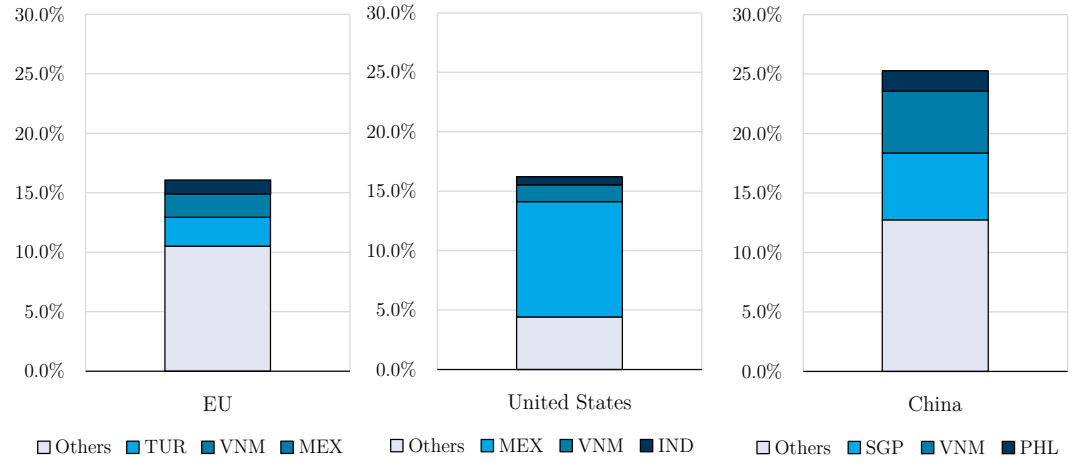
Prediction #4: Some supply chains become more complex and less visible: indirect dependencies rise We now focus on exports of products targeted by trade restrictions and track these products from their origin to their final destination through third countries. More specifically, we follow restricted products in direct flows, i.e., domestic value-added directly exported by the opposite bloc, and indirect ones, i.e., exports of restricted products coming from the opposite bloc that are embedded in other products exported by any country.[25]

Neutral countries substantially increase re-exports of restricted products. Restricted products from East indirectly reaching the EU and US via neutral countries increase after the shock by more than 15%. Chinese imports from neutral countries of restricted inputs from West increase even more, by about 25%. To investigate the role of the neutral bloc in more detail, Figure 10 decomposes the overall increase in neutral countries exports of restricted products from the opposite bloc to the EU, the US and China. Turkey, Vietnam, and, to a lesser extent, Mexico, are key neutral hubs for exporting East bloc's restricted inputs to the EU. For the US, Mexico plays a leading role in re-exporting restricted products, while Vietnam and Singapore are the top hubs for China. For all three economies, computer and electronics products are, by far, the most frequently re-routed restricted goods (Figure 11).

As a consequence of the increase of indirect trade flows, trade dependencies drop but not as much as simple aggregate trade data would suggest, as they miss the crucial role of neutral countries in re-exporting restricted products. This hints at the fact that standard trade restrictions are not effective in eliminating dependencies completely, since products find their way through the complex structure of value chains. Re-exports of restricted products are not easy to detect. Monitoring the imports of products targeted by restrictions from neutral countries would not be enough, as often such products are embedded in non-restricted productions. Overall, in parallel to a regionalization of trade flows, as showed in the previous paragraph, some supply chains become more complex and less visible, making the monitoring of interdependencies much more challenging.

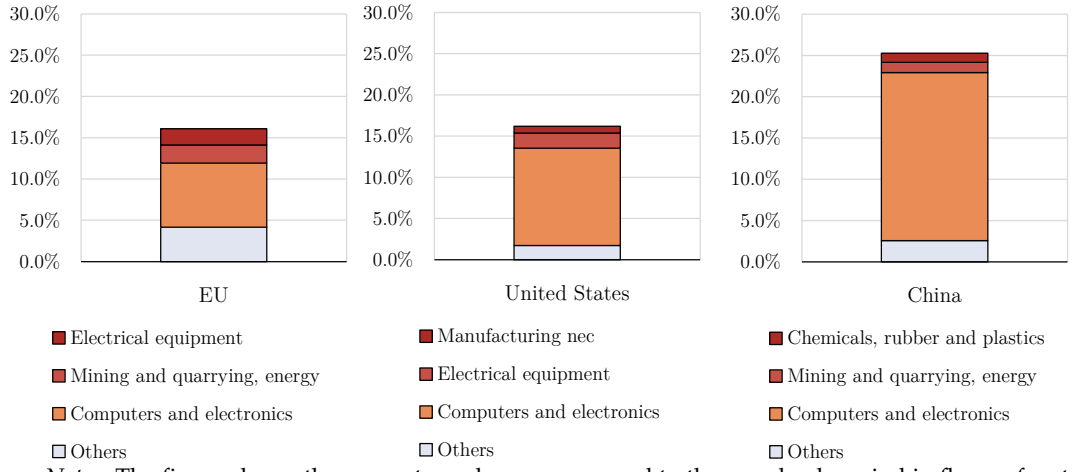
[25] We follow the accounting framework based on inter-country input-output data developed in Borin and Mancini (2023), section 3.1.

Figure 10: Percentage change in restricted products from the opposite blocs re-exported by neutral countries, by re-exporter



Notes: The figure shows the percentage change compared to the pre-shock period in flows of restricted products coming from the opposite bloc, re-exported by neutral countries, and imported by the countries listed in the x-axis.

Figure 11: Percentage change in restricted products from the opposite blocs re-exported by neutral countries, by sector



Notes: The figure shows the percentage change compared to the pre-shock period in flows of restricted products coming from the opposite bloc, re-exported by neutral countries, and imported by the countries listed in the x-axis.

5 Conclusions

Recent global shocks have prompted nations to intensify efforts to secure strategic sectors and reduce dependence on foreign suppliers from geopolitical rivals. This has

led to an increase in targeted trade restrictions, export controls, and other measures aimed at reshaping global supply chains and trade relationships.

This paper has examined the potential impact of severe trade restrictions between a Western US-centric bloc and an Eastern China-centric bloc, focusing on products with high potential for weaponization. The analysis, based on a quantitative multi-country, multi-sector model and a novel global input-output dataset, offers several important insights:

While trade fragmentation is poised to have a significant impact on the welfare of the involved blocs, the overall level of global economic integration is unlikely to unravel dramatically. Our simulations show only a modest drop in various measures of GVC integration, closely matching recent empirical evidence.

However, the impact is highly heterogeneous across blocs. The Eastern bloc substantially reduces its participation in global production networks, with exports becoming less oriented towards complex GVC trade and more towards traditional trade. The Western bloc exhibits similar trends, albeit to a lesser degree. In contrast, openness increases for the neutral bloc, as these countries attract diverted trade between the two opposing blocs, particularly in the products affected by trade restrictions.

Supply chains regionalize, as the drop in trade flows from the opposite bloc is compensated with domestic productions and imports from close allies.

While direct trade flows of targeted products from the opposing bloc are severely curtailed, indirect flows embedded in other exported goods continue to reach the restricted markets through neutral third-country hubs. This suggests that standard trade restrictions may not be fully successful in eliminating dependencies, as products find alternative pathways through the intricate structure of global value chains.

Overall, these findings contribute to the ongoing debate on the impacts of geoeconomic fragmentation and protectionist trade policies. By examining the granular, product-level consequences of trade disruptions, this study offers a more nuanced understanding of how global value chains may reorganize in response to heightened geopolitical tensions. As nations continue to prioritize economic security, further research will be needed to explore the long-term resilience and distributional impacts of these emerging trade patterns.

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Online Appendices

Fragmentation and the future of GVCs

These Online Appendices contain details on data for the calibration of the model (Appendix A) and additional results (Appendix B).

A Data

A.1 Countries and sectors in the ICIO tables

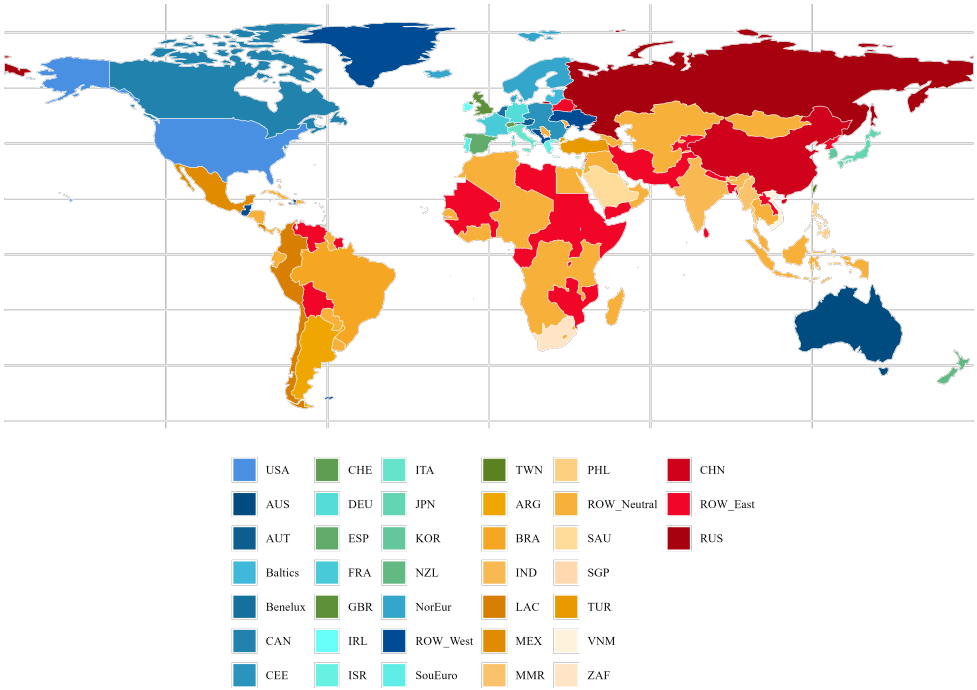
The 2021 version of the ICIO Tables comprises the following 66 countries (plus a Rest of the World aggregate) and 45 sectors. Further details are available at http://oe.cd/icio.

Table A1: Countries in OECD ICIO and aggregation

Country	ISO3	Country Name	Group	Bloc	Country	ISO3	Country Name	Group	Bloc
1	AUS	Australia	AUS	West	36	TUR	Turkey	TUR	Neutral
2	AUT	Austria	AUT	West	37	GBR	United Kingdom	GBR	West
3	BEL	Belgium	Benelux	West	38	USA	United States	USA	West
4	CAN	Canada	CAN	West	39	ARG	Argentina	ARG	Neutral
5	CHL	Chile	LAC	Neutral	40	BRA	Brazil	BRA	Neutral
6	COL	Colombia	LAC	Neutral	41	BRN	Brunei Darussalam	RoW Neutral	Neutral
7	CRI	Costa Rica	LAC	Neutral	42	BGR	Bulgaria	CEE	West
8	CZE	Czech Republic - Czechia	CEE	West	43	KHM	Cambodia	RoW Neutral	Neutral
9	DNK	Denmark	NorEur	West	44	CHN	China (People's Republic of)	CHN	East
10	EST	Estonia	Baltics	West	45	HRV	Croatia	CEE	West
11	FIN	Finland	NorEur	West	46	CYP	Cyprus2	SouEuro	West
12	FRA	France	FRA	West	47	IND	India	IND	Neutral
13	DEU	Germany	DEU	West	48	IDN	Indonesia	RoW Neutral	Neutral
14	GRC	Greece	SouEuro	West	49	HKG	Hong Kong, China	CHN	East
15	HUN	Hungary	CEE	West	50	KAZ	Kazakhstan	RoW Neutral	Neutral
16	ISL	Iceland	NorEur	West	51	LAO	Lao People's Democratic Republic	RoW East	East
17	IRL	Ireland	IRL	West	52	MYS	Malaysia	RoW Neutral	Neutral
18	ISR	Israel1	ISR	West	53	MLT	Malta	SouEuro	West
19	ITA	Italy	ITA	West	54	MAR	Morocco	RoW Neutral	Neutral
20	JPN	Japan	JPN	West	55	MMR	Myanmar	MMR	Neutral
21	KOR	Korea	KOR	West	56	PER	Peru	LAC	Neutral
22	LVA	Latvia	Baltics	West	57	PHL	Philippines	PHL	Neutral
23	LTU	Lithuania	Baltics	West	58	ROU	Romania	CEE	West
24	LUX	Luxembourg	Benelux	West	59	RUS	Russian Federation	RUS	East
25	MEX	Mexico	MEX	Neutral	60	SAU	Saudi Arabia	SAU	Neutral
26	NLD	Netherlands	Benelux	West	61	SGP	Singapore	SGP	Neutral
27	NZL	New Zealand	NZL	West	62	ZAF	South Africa	ZAF	Neutral
28	NOR	Norway	NorEur	West	63	TWN	Chinese Taipei	TWN	West
29	POL	Poland	CEE	West	64	THA	Thailand	RoW Neutral	Neutral
30	PRT	Portugal	SouEuro	West	65	TUN	Tunisia	RoW Neutral	Neutral
31	SVK	Slovak Republic	CEE	West	66	VNM	Viet Nam	VNM	Neutral
32	SVN	Slovenia	CEE	West	67	RoW Neutral	Rest of the World	RoW Neutral	Neutral
33	ESP	Spain	ESP	West	68	RoW West	Rest of the World	RoW West	West
34	SWE	Sweden	NorEur	West	69	RoW East	Rest of the World	RoW East	East
35	CHE	Switzerland	CHE	West					

Note: original countries are aggregated according to the column *Group*. See also Figure 1 and Figure A1.

Figure A1: Countries allocation to regions



Notes: Group assignment of countries in the OECD ICIO.

Table A2: Industries in OECD ICIO and aggregation

NACE Division number	NACE Division aggregation	Description	Group
1	D01T02	Agriculture, hunting, forestry	D01T02
2	D03	Fishing and aquaculture	D03
3	D05T06	Mining and quarrying, energy producing products	D05T06
4	D07T08	Mining and quarrying, non-energy producing products	D07T08
5	D09	Mining support service activities	Services
6	D10T12	Food products, beverages and tobacco	D10T12
7	D13T15	Textiles, textile products, leather and footwear	D13T15
8	D16	Wood and products of wood and cork	D16
9	D17T18	Paper products and printing	D17T18
10	D19	Coke and refined petroleum products	D19
11	D20	Chemical and chemical products	D20D22
12	D21	Pharmaceuticals, medicinal chemical and botanical products	D21
13	D22	Rubber and plastics products	D20D22
14	D23	Other non-metallic mineral products	D23
15	D24	Basic metals	D24
16	D25	Fabricated metal products	D25
17	D26	Computer, electronic and optical equipment	D26
18	D27	Electrical equipment	D27
19	D28	Machinery and equipment, nec	D28
20	D29	Motor vehicles, trailers and semi-trailers	D29
21	D30	Other transport equipment	D30
22	D31T33	Manufacturing nec; repair and installation of machinery and equipment	D31T33
23	D35	Electricity, gas, steam and air conditioning supply	D35T39
24	D36T39	Water supply; sewerage, waste management and remediation activities	D35T39
25	D41T43	Construction	D41T43
26	D45T47	Wholesale and retail trade; repair of motor vehicles	Services
27	D49	Land transport and transport via pipelines	Services
28	D50	Water transport	Services
29	D51	Air transport	Services
30	D52	Warehousing and support activities for transportation	Services
31	D53	Postal and courier activities	Services
32	D55T56	Accommodation and food service activities	Services
33	D58T60	Publishing, audiovisual and broadcasting activities	Services
34	D61	Telecommunications	Services
35	D62T63	IT and other information services	Services
36	D64T66	Financial and insurance activities	Services
37	D68	Real estate activities	Services
38	D69T75	Professional, scientific and technical activities	Services
39	D77T82	Administrative and support services	Services
40	D84	Public administration and defence; compulsory social security	Services
41	D85	Education	Services
42	D86T88	Human health and social work activities	Services
43	D90T93	Arts, entertainment and recreation	Services
44	D94T96	Other service activities	Services
45	D97T98	HHs' activities as employers; HHs' undifferentiated goods-and services-producing activities for own use	Services

Notes: original sectors are aggregated according to the column *Group*. In Scenario *Soft WMD* and *Hard WMD* each sector is split in two parts, a restricted and unrestricted part.

A.2 Alignment in Capital Economics (2023)

Table A3: Indicators of Country Alignment in 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
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.
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.

Notes: Indicators underlying country alignment developed by Capital Economics (2023)

A.3 Factor shares

This subsection describes the procedure and data used to compute the share of labor income (divided into low-, medium- and high-skill) and capital income on total income for the year 2018 and the countries used in the paper.

Labor income shares Labor income shares are computed for low-, medium-, and high-skill occupations. A specific skill-type labor share in a certain sector measures what share of the total income paid to production factors in that sector is paid to workers with that type of skill. In each sector, the labor shares by skill sum to the labor share in that sector. The latter is complement to 1 with the capital share in the same sector. Two sources of data are combined to get an estimate of the income labor shares in 2018:

1. The ILO Labour Force Statistics (LFS) Database provides the number employees by skill and sector of economic activity. The latest year of observation is 2021. Sectors are defined consistently with the ISIC Classification; workers are proxied by employees, i.e. workers who hold paid employment jobs, which are those where the incumbents hold employment contracts with a basic remuneration not directly dependent upon the revenue of the unit for which they work. This numbers underestimate the total number of workers because they do not include self-employed, but the distortion on the shares is limited as long as the distribution of workers by skill among employees and self-employed does not differ too much.

2. The July 2014 release of the WIOD Socio Economic Accounts provides the income paid to workers by skill level and sector of economic activity in 2009.

In order to estimate the labor income shares by sector and skill in 2018, we use the following procedure. For each country we compute from the ILO the number of workers by skill and sector of activity. Then, we use the WIOD data to compute the remuneration per worker by skill and sector of activity. Further, we compute the 2018 figures by multiplying the income per worker times the number of workers in 2018. Finally, the levels of income by skill and sectors are then used to compute the respective income shares. Several subjective choices were made in order to manage missing observations for some countries and/or years. In particular:

- The share are assumed to be constant in agriculture (2 sectors), industry (20 sectors) and services (23 sectors).

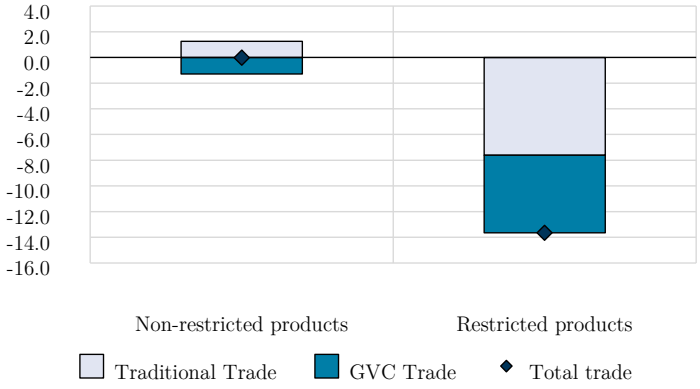
- The number of workers by skill and sector from the ILO data for both 2009 and 2018 were computed as an average over the 2007-2011 and 2016-2020 years, respectively. This allowed us to fill the gaps for most countries in an acceptable way, provided that the year-by-year changes in the figures are limited.
- Despite the procedure described above, data for 2018 remained missing for Brazil, Canada, China, India, Indonesia, Netherlands, Russia, and Taiwan. For these countries we imputed to 2018 the 2009 shares. This choice seemed acceptable because the correlation between the 2009 and 2018 figures is quite high (around 0.9).
- For 26 countries, we had no data for neither 2009 nor 2018. In those cases we proxied the income shares with the average of the countries with the closest level of per capita GDP measured at purchasing power parity (PPP) according to the IMF data. In particular: Russia and Mexico for Argentina; Bulgaria and Mexico for Chile; China and Brazil for Colombia; Bulgaria and Mexico for Costa Rica; Austria and Sweden for Iceland; Italy and Korea for Israel; Italy and Slovenia for New Zealand; Sweden for Norway; Luxembourg for Switzerland; USA and Denmark for Brunei and Hong Kong; Romania for Croatia; Russia and Bulgaria for Kazakhstan; Greece and Russia for Malaysia; India for Cambodia, Lao, Morocco, Myanmar, and Philippines; Indonesia for Peru, Tunisia, and Viet Nam; UK and Korea for Saudi Arabia and South Africa; Luxembourg and Ireland for Singapore; China for Thailand.
- The share of the ROW aggregate were proxied with the average shares of the available countries.

Capital shares The capital share in a certain sector measures what share of the total income paid to production factors in that sector is used to remunerate capital. It is complement to 1 with the labor share in the same sector. Three sources of data are combined to get an estimate of the capital shares, due to different data availability for the sectors: 1. For agriculture and services the source used is the 2016 release of the WIOD Socio Economic Accounts, which provides information on the capital and labor compensation by sector of economic activity in 2014. The capital share is computed as the capital compensation divided by the sum of labor and capital compensation. Some subjective choices were made in order to manage missing or anomalous observations for some countries and/or years. As we did for the labor

shares, 30 missing countries we proxied the income shares with the average of the two countries with the closest level of per capita GDP measured at purchasing power parity according to the IMF data. We also had negative or missing values for some country-sector pairs: in such cases we took the average of the capital shares of the two most similar countries (using the GDP PPP per capita criterion as above) for the specific sector. 2. For mining the source used is the 2018 release of the United Nations Industrial Development Organization (UNIDO) Minstat, which provides information on wages and salaries and value added in 2018 for the mining sectors. The capital share is computed as the complement to 1 of the ratio of wages and salaries on value added. For countries that are missing in the UNIDO database, we used the WIOD 2014 data. For those missing in both UNIDO and WIOD, we again used the average of the share of the two most similar countries based on GDP PPP per capita. Anomalous values were found in the original database for Norway and Malta: the average of the two most similar countries was used also in this case. 3. For manufacturing the source used is the 2018 release of the United Nations Industrial Development Organization (UNIDO) Indstat, which provides information on wages and salaries and value added in 2018 for the manufacturing sectors. The capital share is computed as the complement to 1 of the ratio of wages and salaries on value added. When a country was indeed in the UNIDO Indstat database but the 2018 data was missing, we replaced it using the 2019, the 2017 or the 2016 data. For missing countries in the UNIDO database we used the WIOD 2014 data. As above, for those missing in both UNIDO and WIOD, we again used the average of the share of the two most similar countries based on GDP PPP per capita. Anomalous values were found in the original database for 16 country-sector pairs: the average of the sector-specific capital shares of two most similar countries was used as a proxy. Finally, given that the available countries in the database were mainly developed ones, the share of the ROW aggregate were proxied with the average shares of the emerging countries.

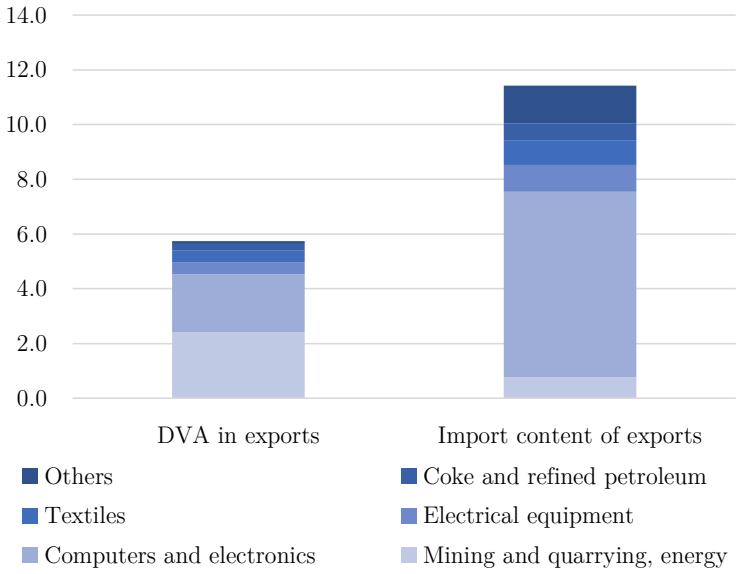
B Additional Results

Figure A1: GVC and traditional trade, by class of products



Notes: The figure illustrates GVC-related trade (flows crossing more than one border) and its complement (flows crossing only one border) for products affected and unaffected by restrictions.

Figure A2: Percentage change compared to the pre-shock period for restricted products, industry-level contribution



Notes: The figure shows the industry-level contribution of aggregate percentage changes compared to the pre-shock period for products affected by trade restrictions.

Table B1: Welfare and real GDP changes after selective decoupling by country

Bloc	West				East					Neutral				
	Welfare		GDP			Welfare		GDP			Welfare		GDP	
Country/Group	Rigid	Baseline	Rigid	Baseline	*Country/Group*	Rigid	Baseline	Rigid	Baseline	*Country/Group*	Rigid	Baseline	Rigid	Baseline
KOR	-14.9	-1.9	-12.9	-1.3	RUS	-28.7	-3.1	-21.5	-1.3	MMR	-1.3	0.0	-1.3	-0.1
Baltics	-14.1	-1.5	-15.1	-1.3	CHN	-9.6	-1.2	-9.8	-1.3	IND	-0.8	0.0	-0.5	-0.1
TWN	-12.7	-2.9	-8.8	-1.8	ROW East	-0.9	0.0	-0.5	0.0	LAC	-0.8	0.0	-0.7	-0.1
CEE	-12.6	-1.4	-12.6	-1.0						PHL	-0.7	0.1	-0.7	0.0
ISR	-11.0	-1.1	-10.8	-0.6						TUR	-0.7	0.1	-0.7	-0.1
AUS	-9.6	-1.2	-8.1	-0.5						ARG	-0.6	0.0	-0.4	0.0
JPN	-5.4	-0.5	-5.2	-0.5						ZAF	-0.6	0.0	-0.5	-0.1
SouEuro	-5.0	-0.5	-5.2	-0.6						BRA	-0.3	0.0	-0.3	0.0
CAN	-4.9	-0.5	-4.8	-0.4						ROW Neutral	0.6	0.3	-0.4	-0.2
NZL	-4.4	-0.6	-3.7	-0.6						MEX	0.6	0.2	0.1	-0.1
Benelux	-4.0	-0.4	-4.4	-0.5						VNM	1.8	0.8	-0.7	-0.7
DEU	-3.8	-0.6	-3.3	-0.5						SGP	2.1	0.8	-0.5	-0.1
ITA	-3.6	-0.4	-3.8	-0.5						SAU	2.9	0.6	0.4	-0.2
FRA	-3.5	-0.5	-3.1	-0.4										
AUT	-3.4	-0.3	-3.4	-0.3										
NorEur	-3.1	-0.2	-4.1	-0.6										
GBR	-2.7	-0.3	-2.6	-0.3										
USA	-2.6	-0.3	-2.6	-0.4										
ESP	-2.3	-0.3	-2.1	-0.3										
IRL	-2.0	-0.1	-2.8	-0.3										
CHE	-1.9	-0.2	-2.2	-0.3										
ROW West	-1.6	0.1	-1.0	0.0										

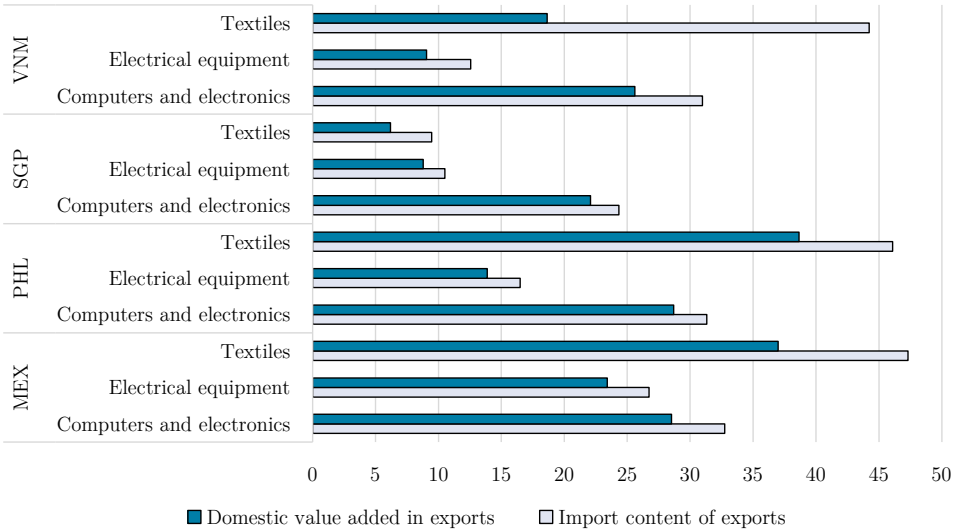
Notes: Country's welfare and real GDP changes following selective decoupling. Selective decoupling involves the weaponization of mutual dependencies and relies on a split IO table. NTB increases by 2000% in the rigid setup and by 150% in the baseline one. Table A1 details the country aggregates.

Table B2: Changes in trade flows, restricted and non-restricted products, rigid setup

Exporter	Importer	Restricted	Non-Restricted
Neutral	Neutral	1.0%	0.3%
	West	10.8%	-6.5%
	East	11.8%	-9.6%
West	Neutral	3.2%	3.4%
	West	6.0%	-4.0%
	East	**-95.6%**	-6.6%
East	Neutral	-2.2%	3.3%
	West	**-94.9%**	-2.7%
	East	23.9%	-8.2%

Notes: Changes in trade flows by product status.

Figure A3: Percentage change compared to the pre-shock period for restricted products, by country-sector



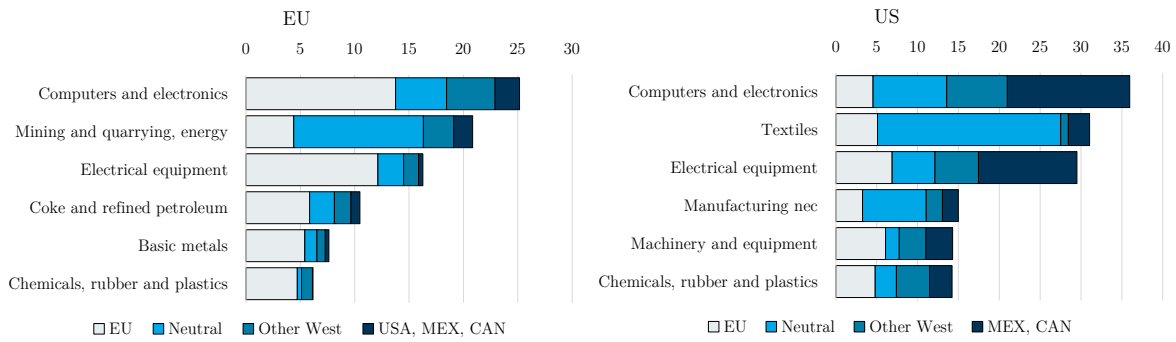
Notes: The figure shows the percentage changes compared to the pre-shock period for products affected by trade restrictions, for the four neutral countries and sectors with the largest increase in GVC exports and import content of exports.

Table B3: Percentage change compared to the pre-shock period, by country

		Exports	Traditional trade	GVC exports	Vertical Specialization	DVA in exports
Neutral	PHL	18.2	25.1	11.5	20.1	17.2
	VNM	11.5	10.7	11.9	15.0	7.1
	SGP	9.5	12.1	8.2	10.3	8.4
	MEX	8.1	6.1	10.2	12.6	5.0
	ROW_Neutral	7.9	10.2	4.8	13.3	6.8
	MMR	7.3	10.1	3.1	8.8	6.8
	TUR	7.1	7.4	6.9	9.0	6.4
	IND	6.6	7.7	5.1	6.5	6.6
	BRA	4.9	6.8	1.4	5.5	4.7
	LAC	4.5	9.2	-2.7	5.1	4.4
	ZAF	3.6	6.7	-0.1	4.2	3.5
	ARG	3.2	3.8	1.8	3.0	3.2
	SAU	1.6	4.9	-4.9	2.7	1.5
West	Benelux	0.3	-1.1	1.2	1.9	-1.1
	IRL	-0.3	1.0	-1.6	-1.1	0.3
	AUT	-0.3	-1.0	0.2	0.1	-0.6
	ESP	-0.9	-1.0	-0.8	-0.5	-1.1
	SouEuro	-1.3	-1.3	-1.2	-1.1	-1.5
	CHE	-1.5	-0.8	-2.3	-2.3	-1.1
	NorEur	-1.8	-1.7	-1.9	-10.6	0.5
	CAN	-2.2	-0.3	-4.6	-3.8	-1.4
	ITA	-3.0	-2.8	-3.2	-3.3	-2.8
	GBR	-4.1	-5.7	-2.1	-3.9	-4.1
	ROW_West	-5.4	-51.7	-4.8	-4.3	-50.9
	DEU	-5.5	-5.7	-5.3	-6.8	-5.0
	Baltics	-6.4	-2.6	-10.1	-11.9	-3.0
	CEE	-6.5	-5.6	-7.1	-7.9	-5.4
	FRA	-6.9	-7.0	-6.8	-8.7	-5.9
	ISR	-9.0	-3.7	-16.1	-15.9	-6.0
	USA	-10.6	-11.2	-9.6	-13.2	-10.1
	NZL	-17.2	-17.6	-16.6	-14.1	-18.1
	JPN	-19.1	-17.6	-21.6	-25.2	-17.5
	KOR	-26.1	-21.5	-30.5	-32.1	-22.9
	AUS	-30.2	-34.1	-23.1	-34.2	-29.7
	TWN	-33.1	-28.5	-36.2	-37.0	-29.9
East	ROW_East	-2.5	-2.0	-3.2	-3.7	-2.2
	RUS	-44.2	-36.4	-58.8	-54.5	-43.3
	CHN	-61.7	-60.5	-63.9	-73.6	-58.7

Notes: Changes in trade indicators after trade fragmentation.

Figure A4: Percentage points change in the share of EU and US sectoral supply chains, by sourcing country



Notes: The figure shows the percentage points change in the share of sectoral GVC imports by region of origin before and after the shock, for the EU (left panel) and the US (right panel).