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Globalization Under Strain: Sanctions, Migration, and the Rewiring of World Trade

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Introduction

Over the past decades, the concept of globalization has profoundly reshaped economic thought and international relations. Defined by Gupta (2009) as the free movement of capital, goods, services, and people across national borders, globalization has been regarded as a transformative force capable of fostering economic growth, technological diffusion, and human mobility. Through trade liberalization, the expansion of global value chains, and financial integration, the world economy has become increasingly interdependent, with national borders seemingly less relevant to the flows of goods, capital, and information.

This process, however, has not been linear nor immune to shocks. In recent years, several events have tested the resilience of the globalized system. The 2008 financial crisis revealed the fragility of financial interconnectedness; the COVID-19 pandemic disrupted global supply chains and mobility; and the Russian invasion of Ukraine reignited geopolitical tensions on a scale unseen since the end of the Cold War. Meanwhile, the rise of protectionist measures, the re-shoring of production, and the intensification of the US–China trade rivalry have accelerated what many observers have described as "slowbalization"—a phase of stagnation and partial reversal of global integration.

These shocks have revived longstanding questions about the sustainability of globalization as an economic and political project. Is the global economy undergoing a process of deglobalization, or merely a structural reorganization? What happens when political conflicts, economic asymmetries, and environmental crises reshape the channels through which goods, people, and capital circulate? Addressing these questions requires a multidimensional approach that goes beyond the analysis of trade flows alone and considers the interplay between international economics, development, and geopolitics. In this context, this dissertation aims to contribute to the understanding of globalization under strain by examining three fundamental aspects of international economic interdependence: trade, migration, and geopolitical alignment. The common thread across these analyses is the idea that globalization is not vanishing, but evolving — reorganizing around new centers of gravity and new patterns of connectivity. Each empirical study captures a different manifestation of this transformation: the use of economic sanctions and their effects on trade, the domestic pressures driving migration from developing regions, and the growing fragmentation of world trade along

geopolitical lines.

The first part of the dissertation explores the use of sanctions as an economic instrument in the context of geopolitical conflict. Sanctions represent a particularly relevant phenomenon in the current international scenario, where economic interdependence is increasingly "weaponized." Focusing on the European Union's sanctions against the Russian Federation following the invasion of Ukraine, the analysis quantifies their impact on EU exports to Russia. By employing both standard and synthetic Difference-in-Differences methodologies, the study isolates the effect of restrictive measures on trade dynamics, while accounting for the role of macroeconomic conditions such as oil prices, GDP growth, and domestic consumption. The results confirm a statistically significant contraction in EU exports, suggesting that sanctions are effective in reshaping trade patterns, though at the cost of economic losses within the sanctioning bloc itself. This part of the thesis thus contributes to the growing literature on economic statecraft and on the complex intersection between political objectives achieved through economic tools.

The second part turns to human mobility as another key dimension of global interdependence. In the last decade, emigration from Africa toward the European Union has been central, prompting heated policy debates and public concern. While discussions often focus on border management or external pull factors, this research emphasizes the internal dynamics of the origin countries. Through a decomposition approach, it isolates the "origin component" of migration — the share of change in emigrant stocks attributable to domestic shocks in sending countries — from the "destination component," reflecting attractiveness abroad. The results show that African emigration is largely driven by internal socio-economic and environmental conditions: rapid population growth, labor market imbalances, economic fragility, and exposure to natural disasters significantly increase the propensity to emigrate. We find that in Africa, the origin component is generally higher than in most countries, positive and increasing over time. This is a policy-relevant information because when the origin component is predominant, higher migration barriers at destination could not significantly reduce the emigration phenomenon. The empirical findings suggest that existing migration networks, growing labor force, demographic pressures, higher unemployment and lower GDP per capita increase the incentive to emigrate, especially in low- and middle-income countries. Instead, natural disasters tend to reduce emigration in general, but they have a positive impact on emigration from Africa. This result is relevant because African countries are expected to be likely more exposed to global warming. the number of people emigrating.

The final part of the thesis addresses the structural evolution of the world trading system in the post-globalization era. Building on an atheoretical model of bilateral trade growth, the analysis investigates how both economic and geopolitical shocks have influenced global trade flows over the last decade. By extending the empirical framework proposed by Amiti and Weinstein

(2018) to capture multilateral resistance and geopolitical affiliations, the study identifies the growing importance of belonging to geopolitical blocs—particularly those centered around the United States and China—in explaining recent trade patterns. The results point to a clear fragmentation of global trade, with countries increasingly aligning their trade flows along geopolitical rather than purely economic lines. These findings suggest that global trade is being reorganized not through disengagement, but through selective integration within politically defined spheres of influence.

Taken together, the three empirical analyses illustrate different facets of globalization under pressure. Sanctions constrain and redirect the flow of goods; domestic economic and environmental shocks drive the movement of people; and trade networks fragment under the weight of geopolitical competition. Across these cases, the same underlying mechanism emerges: global interconnectedness persists, but its channels, incentives, and institutional foundations are being redefined.

The contribution of this thesis is therefore to shed light on the contemporary transformation of the world economy, providing evidence that the forces shaping globalization today are increasingly hybrid: economic in form, but political in essence. In doing so, the dissertation seeks to bridge the gap between international economics and development studies, showing that the strains currently observed in globalization are not symptoms of its demise, but signs of its profound reconfiguration. Understanding this transformation is essential not only for explaining the present, but also for anticipating the contours of the emerging global order.

Chapter 1

To Russia with (Less) Love: Sanctions and the decline of EU exports

Abstract

Sanctions have become a central topic in contemporary economic discourse, particularly in the context of geopolitical conflicts. This paper examines the impact of sanctions imposed by the European Union (EU) on the Russian Federation following its invasion of Ukraine. We specifically focus on how exports from Brussels to Moscow, in value, have changed after restrictive measures were implemented. By analyzing data at the commodity level, we estimate the impact of sanctions using both a standard difference-in-difference (Diff-in-Diff) model and a synthetic difference-in-difference (Synth-DiD) approach. Our findings reveal that sanctions imposed in 2022 had a statistically significant negative impact on EU exports to Russia. The decline in export values observed in 2022 is also influenced by several macroeconomic factors, including the GDP growth rates of both Russia and the EU, the total level of EU exports to the rest of the world, the oil prices, and Russian household consumption expenditure. Moreover, the results underscore a stark contrast between the effects of the 2014 and the 2022 sanctions regimes.

Keywords: Sanctions, Russian Federation, EU, International trade.

1.1 Introduction

The Russian Federation's invasion of Ukraine on February 24, 2022, prompted many countries to impose an unprecedented regime of restrictive measures. Specifically, the European Union's new regime builds upon the regime imposed in 2014 after Moscow annexed the Crimean peninsula, introducing wider and more comprehensive measures. The new framework encompasses four main fields: trade, financial, individual, and energy sanctions (for more details, see Tab.1.1).

This paper aims at understanding the real impact of sanctions imposed by the European Union on the Russian Federation in 2022, by providing an empirical analysis based on the Difference in Difference and the Synthetic Difference in Difference (SDID) methodologies.

We contribute to the debate on the effectiveness of sanctions by providing empirical estimates of their actual impact on EU exports to Moscow. The treatment group is constructed based on the Council (2022), using the Harmonized System (HS) Code to identify affected commodities. The control group consists of goods selected as perfect substitutes for the treated items, defined as such because they share at least the first four digits of the HS Code. Looking at the difference between the export value of sanctioned and non-sanctioned commodities it is possible to investigate the European export losses deriving from the policy implementation. The paper also explores how other economic indicators have impacted exports to the Russian Federation, by controlling for the GDP growth rate of both countries, the total level of European exports, oil price levels, and the real households final consumption expenditure for Russia.

Secondly, the paper provides a comparison of the effectiveness of the current regime with the one imposed after the Russian annexation of Crimea in 2014.

The results suggest a strong negative, statistically significant, impact of the 2022 sanctions on exports to Russia from the European Union. The value of exports is also positively related with the oil prices level, while a negative relationship exists with the value of total exports from the EU to the rest of the world, the Russian GDP growth rate and the Russian households consumption expenditure.

We then compare the 2022 results with those concerning sanctions imposed after the annexation of Crimea in 2014. In line with previous studies, in particular Bělín and Hanousek (2019), we find no statistical effectiveness of the 2014 regime. Indeed, the literature studying 2014 sanctions concludes that in that case, the reduction of exports from Bruxelles to Moscow was not caused by the imposition of sanctions itself but by the strong economic crisis affecting the Russian economy in the same year (Bělín and Hanousek (2019), Ahn and Ludema (2020), Crozet and Hinz (2016)). World prices for oil and other natural resources fell dramatically in the autumn of 2014, reducing Moscow's revenues and causing a consequent depreciation of the ruble, which in turn increased Russians' cost of imports.

The debate on the efficacy of sanctions in the literature remains ongoing and leaves matters open. If the first studies on the topic concluded that sanctions' full effectiveness could be observed only in less than 30% of cases (Hufbauer et al. (2009)), recent studies based on new, more complete datasets reach different conclusions.

The dataset by Syropoulos et al. (2024), then updated in its last version in 2025, is employed to show that the percentage of sanctions success varies depending on the declared goal. The restoration

of democracy, political change, and the end of war exceed 40 percent effectiveness, with a peak of more than 60 percent for the goal linked to the restoration of democracy.

Studies, such as Bianchi and Sosa-Padilla (2023), focus on the impact of financial sanctions, in particular on their effect on the US dollar as a reserve currency. They argue that if the supply of dollar assets is very elastic the effects on the exchange rate will be modest while those on the reserves will be large. They then conclude that in shaping financial sanctions, countries must take into account the default risk of the sanctioned state because in such cases sanctions may affect the sanctioning country having a backfire effect. The risks of backfire are directly related to 'geopolitical externalities'.

Other studies focused on the difference between sanction effectiveness and sanction threat effectiveness (Weber and Schneider (2020)). The studies by Ahn and Ludema (2020) and Besedes (2020) were conducted by analyzing the impact of sanctions at the firm level. The former study emphasizes that in assessing the impact of sanctions, the resources used by the policymaker to protect certain firms or industrial sectors considered vital to the country subject to sanctions must be included. The study by Besedes (2020), instead, focuses on the impact of financial sanctions on a group of non-financial companies in Germany, concluding that the impact on these firms is minimal.

Moreover, a smaller part of the literature investigated the end of sanctioning regimes, differentiating between cases in which the sanctioned state decides to comply with the requirements and the opposite case, in which the sanctioning state decides to abolish the sanctioning measures.

Part of the literature is focusing specifically on the effects of sanctions imposed on Moscow, both in 2014 and 2022.

Concerning the most recent case, the imposition of restrictive measures contributes to the broader phenomenon of decoupling and deglobalization (Sturm (2023); Gros (2022)), which surged with the trade dispute between China and the USA and was exacerbated by the COVID-19 pandemic. The economic literature highlights a decrease in interdependence and interconnection among markets. Export and import bans are viewed as measures that destabilize and impose significant costs on international trade The paper by (Itskhoki and Mukhin, 2022) shows that exchange-rate movements are a poor indicator of sanction effectiveness, as welfare effects are not mechanically linked to currency depreciation. (Imbs and Pauwels, 2022), on the other hand, document limited aggregate trade exposure of the EU to Russia but strong cross-country asymmetries driven by input-output linkages and energy dependence.

The study by Mancini et al. (2024) uses a general equilibrium trade model to evaluate the economic consequences, in terms of welfare loss, of a large increase in non-tariff barriers (NTBs) between sanctioning countries and Russia. They find a decrease in Russian welfare by 4.8%, while sanctioning countries do not experience dramatic welfare losses.

Imbs and Pauwels (2022) propose a new, data-driven, approach to estimate the effects of sanctions. They apply this method in the context of the Russian invasion and conclude that the effects of sanctions are about fifteen times larger on Russia than on Europe. Moreover, the effects within Europe are enormously asymmetric, with much larger consequences on former satellite countries of the Soviet Union than on large western European economies.

Other studies specifically focus on the consequences of an energy embargo from the Russian Federation. Bachmann et al. (2022) consider an embargo on Russian coal, oil, and gas. For low values of the elasticity of substitution between energy and other inputs, they find that the embargo lowers German GDP by 0.2 to 0.3 percent. Baqaee D. (2019) conducts a similar analysis with a focus on France. They simulate the response of the French GDP to a stop on Russian energy imports below 0.2 percent. Sturm (2023) investigates how to implement the optimal tariff, considering the position of bystanders. Lastly, the impact of sanctions on the oil and gas sector is also analyzed by Albrizio et al. (2023). The paper studies the impact of a complete shutdown on the EU liquefied natural gas (LNG) considering the current level of market integration with the case of zero integration. In the case of global market integration of the LNG sector, a complete shutdown by Moscow to the EU would significantly do less harm than the case without integration. Bachmann et al. (2022), recalling the theoretical model by Baqaee D. (2019), evaluate the consequences on Germany of a ban on the Russian energy sector.

Methodologically, many studies use causal inference to evaluate the impact of economic sanctions against Moscow. In a recent work, Mancini et al. (2024) apply the synthetic control method to assess the impact on trade of the war and the following sanctions imposed as a consequence of the invasion of Ukraine. They conclude that aggregate exports to Russia dropped by a third between March and December 2022, with the effects being stronger for sanctioning countries than for non-sanctioning ones, albeit with substantial country-level heterogeneity within each group. Nguyen and Do (2021) employ a gravity, and then a differences-in-differences model to conclude that economic sanctions imposed in 2014 against Moscow and the counter-sanctions from the them led to declines in both aggregate export and import values in Russia. Sanctions caused a decline of 25.25% of Moscow's export values to the sanctions-sending countries while the counter-sanctions caused a decrease of 25.92% of the Russian imports from the sanctions-sending countries.

Second, the effects of the sanctions and counter-sanctions are not homogeneous among exported and imported products. In their analysis they apply typical variables considered in gravity model analyses, such as GDP, both of the sanctioning countries and the sanctioned countries, the presence of Free Trade Agreements (FTA), general levels of export and import tariffs, and the openness of the Russian Federation economy and its partner countries.

Bělín and Hanousek (2019) analyze the effects of sanctions imposed on Russia after the annexation

of Crimea. They show that the Russian sanctions imposed on European and American food imports resulted in about an 8 times stronger decline in the value of trade flows than those imposed by the EU and the US on exports of extraction equipment. Studies on the 2014 episode of sanctions usually conclude that sanctions did not play a fundamental role in the reduction of exports from the EU to Russia, because other factors, such as the economic crisis that affected the Russian economy, were crucial in curtailing Russian import capacity (Dreger et al. (2016), Ahn and Ludema (2020) and Crozet and Hinz (2016)).

Sanction Type	Details	
	2014	**2022**
Trade Sanctions	• Export and import ban on firearms. • Export restriction on dual-use goods.	• Stop treating Russia as a most-favored-nation. • Export ban on cutting-edge technology, certain types of machinery and transportation equipment, aviation and space industry goods and technology, maritime navigation goods and radio communication technology, luxury goods, civilian firearms, their parts, and other army materials, and other goods which could enhance Russian industrial capacities. • Import ban on steel, steel products and iron, Gold, cement, asphalt, wood, paper, synthetic rubber and plastics, seafood and liquor (e.g. caviar, vodka), cigarettes, and cosmetics.
Financial Sanctions	• Limited access for some Russian banks to EU primary and secondary markets and companies.	• Freezing of financial reserves of the Russian National Bank, with a value of 300 billion dollars, by the EU and G7 countries. • SWIFT ban for Russian banks.
Individual Sanctions	• 164 individuals and 44 entities subject to asset freezing and travel bans.	• 1800 individuals and entities subject to asset freezing and travel bans.
Energy Sanctions	• Limiting access to certain technologies and services necessary in the oil sector.	• Limiting access to certain technologies and services necessary in the oil sector. • Export ban on specific goods and technology needed for oil refining, energy industry equipment, technology, and services. • Import ban on crude oil, coal, refined petroleum products.

Table 1.1: Evolution of EU Restrictive Measures Toward the Russian Federation (2014–2022)

1.2 Data and Methodology

The primary data source is the UN ComTrade dataset. Data from this source on exports in value (billion USD $) and quantities were downloaded for each considered commodity (in .2 the list

of considered commodities). Data were available at the monthly level, but in order to obtain a panel dataset and reduce the number of missing values, they were then aggregated into quarters. Commodities are identified following the EU Council Regulation n. 2022/328 of 25 February 2022 (Council (2022))at the 4th or 6th digit level of the Harmonized System codes (hereinafter referred to as HS). Following previous works (Bělín and Hanousek (2019)), the dependent variable is identified as the value of exports from the EU to Russia, because quantities vary by units, making the comparison impossible. Moreover, the dependent variable, meaning the value of exports from Bruxelles to Moscow, is adjusted for inflation.

The outcome of interest is a function of several predictors. Covariates were chosen in line with the literature on gravity models (Head and Mayer (2014)) and sanctions policy evaluation studies. These include (i) the lagged Russian GDP growth rate from 2012 to 2016 and from 2019 to 2023 (Nguyen and Do (2021)), (ii) the lagged European GDP growth rate over the same time spans, (iii) the total quantity of exports from the European Union to the rest of the world (Mancini et al. (2024)), (iv) the Crude Oil Urals Europe CFR Spot (URL-E), that is the benchmark price for Russian oil exports applied by Moscow to Europe, and (vi) the Real Households Final Consumption Expenditure for Russia: the total real (inflation-adjusted) households expenditure on goods and services in Russia.

To account for differences in trade exposure across sectors, we apply weights in the regression analysis. Using data from the Multi-Regional Input–Output (MRIO) tables, we compute sector-specific weights based on each European sector's contribution to total Russian production. These weights capture the relative economic importance of each commodity within Russia's production structure. By incorporating them into the empirical model, we ensure that sectors more integrated into international trade exert a proportionally greater influence on the estimation results, thereby improving the representativeness and comparability of the analysis across industries.

Two separate analyses are conducted: one for the 2014 episode, examining the value of exports of 49 commodities from 2012 to 2016, and another for the more recent episode, analyzing data on 850 goods from 2019 to 2023. Using both the Diff-in-Diff and the Synth DID method, it is possible to assess the impact of sanctions on European exports to Russia by comparing the value of trade between two groups: a treatment group consisting of commodities subject to the sanctioning regime and a control group composed of commodities considered perfect substitutes for the sanctioned ones, sharing at least the first *four* digits of the HS Code.

In the 2022 case, the sample consists of 850 commodities, and we decided firstly to fit a standard Diff-in-Diff. The treatment period goes from the first quarter of 2022 to the end of 2023, while the pre-treatment period ranges from 2019 to the end of 2021. We are aware of the recent literature related to the limits of the difference in difference estimator, but we believe they are not affect-

ing the consistency of the estimates. Indeed, staggered adoption issues are not a concern because sanctions are applied almost simultaneously, while we account for heterogeneity by weighting each observation with a measure representing the exposition of its sector to international trade.

$$Y_{it} = \alpha_i + \delta(\text{Treated}_i \cdot \text{Post}_t) + \boldsymbol{\beta}\mathbf{X}_{it} + \epsilon_{it} \tag{1.1}$$

Our outcome variable, Y_{it}, is the the exports value from Bruxelles to Moscow; àò-.α_i is the commodity fixed effect. The treatment (the term in the brackets) is provided by the interaction of the two dummies that assess whether or not the commodity i was treated and the periods the sanction j is in place. The vector of variables $\mathbf{X}_{it}$ represents the covariates considered in the analysis and, finally, ϵ_{it} is the error term with zero mean.

Since sanctions were imposed almost simultaneously across all treated commodities, the post-treatment dummy already captures the common time shock, making separate time fixed effects redundant in this setting. In line with the assumptions of the Synthetic Difference in Difference (SDID), this model was preferred for the 2014 analysis, in particular, because the study is conducted on a control group that is more conspicuous than the treatment group. The Synth DID model has gained popularity in recent years due to its combination of the synthetic control method and the difference in difference method, allowing for more precise estimations (Clarke et al. (2023)). Specifically, the application of Synth DID enhances the likelihood that the parallel trend assumption holds, as the donor group is constructed to ensure that untreated units follow the same parallel trend to treated units the most (Arkhangelsky et al. (2021)). This is achieved by selecting unit weights that aim to ensure that comparisons are made between treated units and controls that are approximately following parallel trends prior to the adoption of treatment. The same procedure is applied to pre and post treatment periods: weights are computed in order to compare the most similar pre-post treatment times.

For the 2014 regime, the treatment is applied from the second quarter of 2014 to the fourth quarter of 2016, with the pre-treatment period spanning from 2012 to the first quarter of 2014. Equation 1 shows the specification of the model:

$$\hat{Y}_{it}^{\text{Synthetic}} = \alpha + \boldsymbol{\beta}\mathbf{X}_{it} + \sum_{j \in \text{Control}} \hat{w}_{ij}^{\text{sdid}} Y_{jt} \tag{1.2}$$

with $\hat{Y}_{it}$ representing the value of exports of commodity i at time t, $\mathbf{X}_{it}$ the set of considered covariates, such as the Real GDP growth rate of the EU and Russia, the level of exports from the EU to the Rest of the world, the oil price level and the Russian household consumption expenditure. $\hat{w}_{ij}$ represents the weights assigned by the model to each commodity in order to respect the parallel

trend assumption. The synthetic outcome $\hat{Y}_{it}^{\text{Synthetic}}$ constructed in 1.2 provides the unit weights $\hat{w}_j^{\text{sdid}}$ that are then carried forward into 1.3, where the treatment effect $\hat{\tau}^{\text{sdid}}$ is estimated via a weighted two-way fixed effects regression. In other words, 1.2 constructs the synthetic control and 1.3 uses it to recover the causal estimate. Moreover, unit fixed effects are implicitly accounted for through the synthetic control weights, which reweight donor units to reproduce the pre-treatment trajectory of treated units.

The SDID estimator $\hat{\tau}^{\text{sdid}}$ is the following:

$$\hat{\tau}^{\text{sdid}} = \arg\min_{\mu,\alpha,\beta,\tau} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} \left(Y_{it} - (\mu + \alpha_i + \beta_t + \tau D_{it})\right)^2 \hat{w}_i^{\text{sdid}} \hat{\lambda}_t^{\text{sdid}} \right\} \tag{1.3}$$

Besides the difference in difference component between the treatment and the donor group , the estimator depends on ω that represents the weights attributed to each unit, and λ i.e. the time weights. The time weights operate in the same way, but for the periods. That is, it minimizes the difference between the pre and post-treated periods for the controls.

Deeper quantitative analysis validates these assumptions. It is worth noting that selection into treatment represents a legitimate concern in this setting, as sanctioned goods were deliberately targeted rather than randomly assigned. This concern is partially mitigated by two features of our design. First, all sanctioned commodities belong to the dual-use category, meaning that selection operates within a well-defined and homogeneous universe of goods, making the specific commodities chosen within this group more likely to be quasi-random. Second, the MRIO-based weighting scheme accounts for each commodity's degree of integration into Russian production, implicitly controlling for the strategic importance dimension that likely drove selection into treatment. We acknowledge that these arguments do not fully resolve the selection concern, and a more formal quantitative analysis, for instance via a propensity score approach based on pre-treatment commodity characteristics, is left for future work. [1]

1.3 Results

The primary objective of this study is to examine the effect of sanctions imposed by the European Union on the Russian Federation after the Ukrainian invasion. Secondly, we want to address potential differences in the impact of sanctions between the 2014 and 2022 cases. Focusing on 2022, the regime's implementation was driven by a strong political determination to harm Moscow, resulting in a significant and immediate impact of sanctions on exports, as illustrated in Fig.1.1.

[1] The problem of spill-over effects is partially addressed in this work by controlling for the contribution of each EU sector to the production in Russia. We know that the issue may further be analyzed, it is a concern that will be investigated in the future.

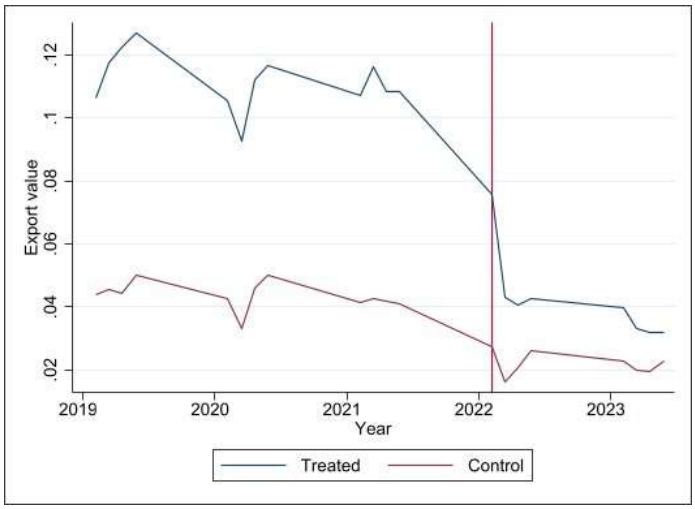


Figure 1.1: Difference-in-Differences estimation of EU exports to Russia. The figure compares the average export value of sanctioned (blue line) and non-sanctioned (red line) commodities over time. The vertical line indicates the onset of the 2022 sanctions regime.

A decline in exports to Moscow already started at the end of 2021, however, both curves experienced a steeper decline after new sanctions's imposition. The decline in exports for the treatment group is not just a reaction to the beginning of the war, and exports continue to decrease even in the following years. The effects do not become less incisive over time: exports tended to stabilize afterwards, with a subsequent drop in 2023. In contrast, the trajectory followed by the control group is not marked by a constant decline. Exports of untreated units experience an initial decline, but then recover almost coming back to pre-sanctions levels by the end of 2023. This is a major evidence of the effect of sanctions: Since we are assuming commodities to be perfect substitutes, demand for non-sanctioned commodities from Moscow increased as a consequence of the imposition of the regime. In Tab. 1.2 estimations for 2022 are presented. Sanctions effects have a substantial and statistically significant negative impact on exports.

Hence, the average treatment effect of sanctions imposition on exports is negative and it is possible to conclude that the decline in exports was driven by sanctions imposition.
Two main factors are determinants of the level of exports: the total level of European exports to the rest of the world and the oil prices applied by the Russian Federation to the EU. An increase in the total amount of exports to the rest of the world corresponds to a decrease in exports to the Russian Federation. This can be seen as a consequence of the diversion process begun with the imposition of sanctions. As the EU had to decrease its exports to Russia, it found new partners in Russian allies that could then export products to Moscow. Oil revenues are of fundamental importance to the Russian economy. We find a positive correlation between oil prices and exports from the EU.

Table 1.2: Difference in difference regression analysis

	(1)	(2)	(3)	(4)
ATET				
sanctions effect	-0.054^{*}	-0.054^{*}	-0.054^{*}	-0.055^{*}
	(-2.09)	(-2.09)	(-2.09)	(-2.09)
Controls				
EU Total exports	-0.002^{*}	-0.002^{*}	-0.001^{*}	-0.002^{*}
	(-2.27)	(-2.28)	(-2.14)	(-2.15)
Oil price		0.0002^{*}	0.0003^{*}	0.0002^{*}
		(2.09)	(2.29)	(2.06)
Russian households consumption			$-3.79e-09^{*}$	
			(-2.37)	
EU GDP growth rate				0.0001
				(0.12)
Russian GDP growth rate				-0.0006^{*}
				(-2.27)
Observations	11546	11546	11546	11546

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Additionally, the value of trade is negatively correlated with the Russian GDP growth rate and the Russian household expenditure consumption. If the Russian economy picks up, the economic literature suggests that this means higher productivity, higher competitiveness. This may reflect a shift in consumer preferences, prompting Russian households to favor domestically produced goods over imported ones. As a result, demand for foreign products would decline, leading to a reduction in imports. Additionally, a general decrease in household consumption expenditure would further contribute to the drop in imports. In Appendix .1, 5 We present the same regression using the Synth Diff-in-Diff. We find also in this case a negative, statistically significant, effect of the treatment on the dependent variable.

Figure 1.2 presents the dynamic treatment effects of the imposition of sanctions against Russia on the value of exports from the European Union to Moscow. The vertical dashed line marks the onset of sanctions at the end of the first quarter of 2022. In the pre-sanctions period, the estimated coefficients are close to zero and statistically insignificant, indicating no evidence of differential trends between treated and control periods prior to the intervention. Following the implementation of sanctions, the estimates show a decline in export values. This pattern suggests a persistent and growing negative impact of the sanctions on EU exports to Moscow over time.

In Fig.1.3 and Fig.1.4 we confirm that two of the main assumptions of the Diff in Diff - the parallel trend and no anticipatory effect assumptions- hold. As shown graphically, in both cases the assumptions are respected.

Fig. 1.3 provides a graphical diagnostic to assess the validity of the parallel trends assumption in a difference-in-differences (DiD) framework. The left panel displays the observed means of export

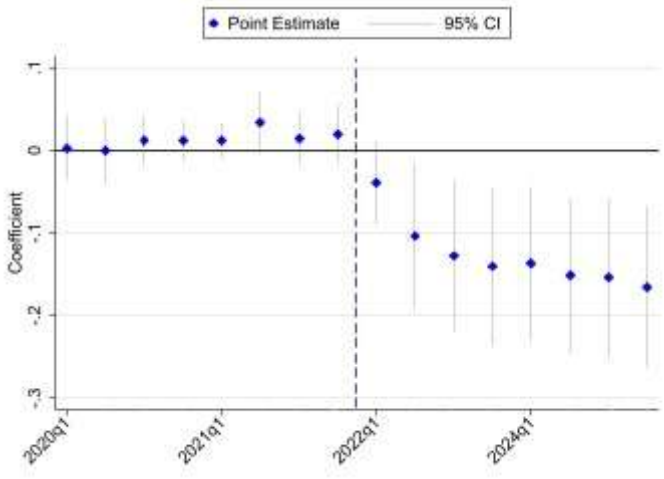


Figure 1.2: Event-study estimates of the effect of EU sanctions on exports to Russia. The vertical dashed line marks the introduction of sanctions (Q1 2022). Post-treatment coefficients show a persistent negative impact on export values.

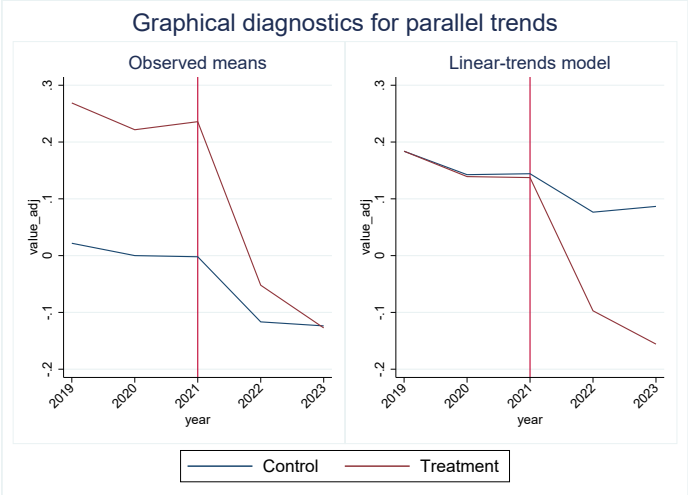


Figure 1.3: Graphical assessment of the parallel trend assumption in the difference-in-differences (DiD) framework. The plot compares the pre-treatment evolution of export values for sanctioned (treated) and non-sanctioned (control) commodities, showing that both series follow a similar pattern prior to the imposition of sanctions, thereby supporting the validity of the parallel trend assumption.

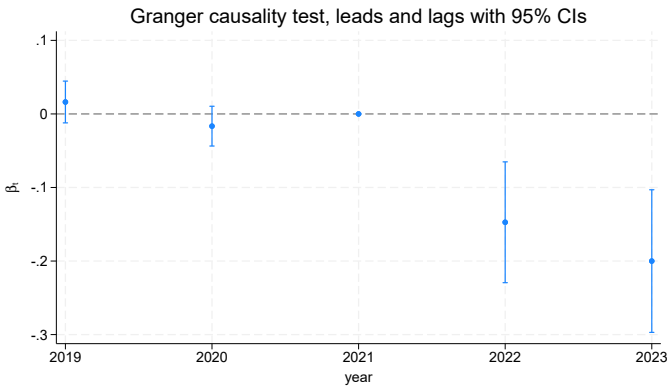


Figure 1.4: Granger causality test results confirming the absence of anticipatory behavior. No evidence of pre-treatment causality from sanctions to export dynamics is detected, validating the no-anticipatory-effects assumption of the DiD model.

values for both the treatment and control groups over time. Prior to the intervention, both groups exhibit similar trends, suggesting that the parallel trends assumption may hold. The right panel shows predicted trends based on a linear model. Again, pre-treatment trajectories appear roughly parallel, further supporting the assumption. However, any divergence post-treatment indicates the potential effect of the treatment. Fig. 1.4 presents the results of a Granger causality test used to detect any anticipatory effects prior to the intervention. The coefficients β_t and their confidence intervals are shown for each year from 2019 to 2023. Importantly, the estimates for the pre-treatment period (2019–2021) are not statistically different from zero, indicating no significant anticipatory behavior before the policy or event in 2021. The significant negative values observed from 2022 onward suggest that the effect only materialized after the treatment, supporting the identification strategy.

1.3.1 Robustness Checks

To ensure the reliability and consistency of our main findings, we conduct a series of robustness checks addressing potential concerns related to model specification, sample composition, and identifying assumptions.

First, we conduct a placebo-in-time test by artificially assigning the treatment to a pre-treatment period to verify that our results are not driven by spurious pre-trends. We decided to conduct it on 2019 because the COVID-19 pandemic strongly hit trade making it more difficult to identify its effect. Results are reported in 1.3. In this case, we apply the synthetic diff in diff model in order to see whether or not the two models lead to different conclusions.

Second, we redefine the control group to assess the sensitivity of the estimated effects to the composition of untreated units.

Table 1.3: Placebo-in-time test (2019 pre-treatment): SDID estimates on export values

	(1) Export value
ATET	
Treatment effect	-0.0812
	(-1.30)
Controls	
EU total exports	-0.0818**
	(-3.02)
Russian GDP growth	0.00681
	(1.67)
EU GDP growth	-0.00850
	(-0.73)
Exchange rate	-0.00177**
	(-2.84)
Constant	0.220***
	(4.57)
Observations	10,440

t-statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The treatment is artificially assigned to 2019 to test for spurious pre-trends; no significant treatment effect is detected.

1.3.2 Déjà Vu? Revisiting the 2014 Sanctions

Previous research on the 2014 sanctions suggested that the decline in exports from the EU to Russia was not primarily caused by the imposition of sanctions (Bělín and Hanousek (2019), and Ahn and Ludema (2020)). Our analysis aligns with this literature, indicating a negative impact of sanctions on the value of commodities exported, although not statistically significant. In Fig.1.5 it is possible to see the graphical representation of the synthetic diff-in-diff estimation. First, the graph shows a sharp decline in the treated exports after the imposition of sanctions. However, exports have already begun to rebound within a few quarters in 2014, reaching a significant peak in early 2016. In contrast, the control group does not exhibit the same decline as it follows a brief contraction after the imposition of sanctions, but it experiences a positive growth trend. The green triangles on the horizontal axis show the time weights (λ) chosen by the algorithm to minimize differences between the donor group and the control group in the pre-treatment period to make the parallel trend assumption more likely to hold.

Tab. 1.4 reports the results of the econometric estimation for 2014. We find no evidence of a correlation between the imposition of sanctions by the European Union on the Russian Federation and the simultaneous reduction in exports between the two. The dependent variable is the value of EU exports to Russia. The treatment dummy equals one for the post-sanction period in the

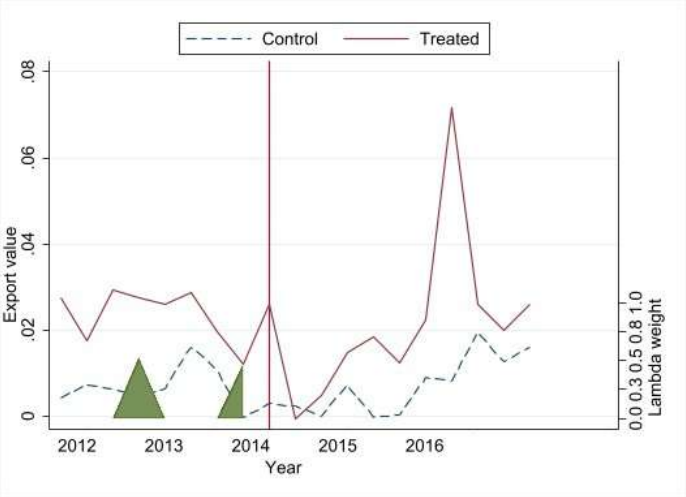


Figure 1.5: Synthetic Difference-in-Differences estimation for the 2014 EU sanctions on Russia. The figure plots the average export values from the EU to Russia for the treated and synthetic control groups, showing their evolution before and after the imposition of sanctions. The vertical line indicates the start of the treatment period.

treated group. Control variables include macroeconomic indicators capturing demand, exchange rate dynamics, and commodity prices. The estimated treatment effect is negative but statistically insignificant, suggesting that the 2014 sanctions did not exert a measurable impact on EU exports. We find a positive relationship of our dependent variable with the euro-ruble exhange rate: If the ruble experiences a depreciation, it becomes less valuable vis-a-vis the euro. This makes Russian imports more expensive and exports more competitive, leading to a decrease in imports and an increase in exports. The Russian economy was undergoing a tough economic crisis during 2014, with a strong decline in oil prices, eventually causing the Ruble to depreciate. We also find a positive relationship between exports to Russia and the oil prices as Moscow is strongly dependent on the revenues coming from the oil and gas sector. In 2014, in contrast to what happened in 2022, the price of oil drop significantly caused a sharp cut in the revenues of Moscow. As reported by many studies, the contraction of the Russian economy is the main cause of the reduction in exports we see graphically in Fig.(1.5).

The substantial increase in exports for both groups indicates that, although sanctions initially had an impact in the first few months, improving economic conditions and a loosening of controls eventually facilitated export growth. One possible explanation is the lack of genuine political commitment among EU countries to enforce the sanctions fully. It is important to note that while

Table 1.4: Synthetic Difference-in-Differences (SDID) estimation results for the 2014 sanctions episode.

	(1) (Export value)
treatment	-0.003 (-0.28)
Covariates	
EU GDP growth rate	-0.001 (-0.84)
Russian GDP growth rate	0.001 (1.33)
EU Total exports	-2.38e-08 (-1.06)
exchange rate	0.0002* (2.47)
Oil Price	0.0003* (2.38)
Russian households consumption	-3.03e-09 (-1.75)
Constant	0.063* (2.57)
Observations	741

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

sanctions are enacted at the European level, their enforcement and supervision remain the responsibility of individual member states.

1.4 Conclusions and Future research

The imposition of sanctions on the Russian Federation provides a unique opportunity to concretely assess the impact of two different sanction regimes on the same economy. By applying both a Synthetic Difference-in-Differences and a standard Difference-in-Differences approach, we can compare the effects of the European Union's sanctions on Moscow in 2014 and 2022 in terms of export values, yielding a more precise estimate.

Our findings indicate that the sanctions imposed in 2022 had a statistically significant negative effect on EU exports to Russia. The decline in export values observed in 2022 was also influenced by various macroeconomic factors, including the GDP growth rates of both Russia and the EU, the overall level of EU exports to the rest of the world, oil prices, and Russian household consumption expenditure.

In contrast, no significant sanction effects were estimated in 2014. At that time, Russia was already experiencing a severe economic downturn, driven by a sharp decline in oil prices, which ultimately led to the depreciation of the Ruble. The differing impacts of the two sanction regimes may be attributed to varying degrees of political willingness to enforce them effectively. The quantification of this export decline carries important implications for both the academic literature and economic policy. From a policy perspective, the results highlight that sanctions impose a concrete and measurable economic cost on the sanctioning bloc itself, and that their effect strongly depends on the willingness of member states. Moreover, the positive trajectory observed for non-sanctioned goods indicates that Russian demand partially shifted toward substitute commodities, implying that the welfare cost for Russia may be mitigated by substitution effects and that the overall effectiveness of sanctions depends critically on their scope, coverage, and the political commitment to enforce them uniformly across member states. Further research is needed on this topic. In particular, this analysis does not account for spillover effects or the triangulation mechanisms that emerged following the imposition of sanctions. Future studies will aim to address these gaps.

Chapter 2

Pushed to Move: The Forces Behind Africa's Emigration Flows

Abstract

In recent years, emigration from Africa increased significantly, especially to the European Union, where it received increasing media and political attention. This paper contributes to the debate by exploring the drivers of this phenomenon. Using a decomposition methodology, we first isolate the change in the stock of emigrants that can be ascribed to shocks in the origin countries, *i.e.* how much their domestic conditions incentivize emigration, regardless the destination. We also isolate the role of the EU in attracting African migrants. We find that in Africa, the origin component is generally higher than in most countries, positive and increasing over time. On the contrary, the attraction exerted by the EU is positive but relatively small. Then, we explore the role of several types of domestic shocks in driving the origin component. An econometric analysis over a set of 148 countries worldwide suggests that growing labor force, higher per capita GDP and worsening labor market conditions, as well as a higher exposure to natural disasters in the country of origin are associated with higher propensity to emigrate. The sensitivity of African countries to these factors is in line with the rest of the sample, and most of their higher propensity to emigrate is explained by their relatively unfavorable conditions along those dimensions.

Keywords: Migration; Africa; EU; Migration drivers.

2.1 Introduction

The number of migrants born in Africa and residing in the European Union (EU) has more than doubled from 1990 to 2020, as well as their share relative to the EU population, although with significant differences across member countries. These trends have fueled a debate in the EU on

what drives the African immigration and how to manage the challenges it poses.

In this paper, we contribute to this debate along several dimensions. First, we apply the decomposition method proposed by Amiti and Weinstein (2018) to migration stocks and isolate the increase in the stock of emigrants from Africa due to shocks in the countries of origin versus shocks in the countries of destination, particularly the EU, or due to global shocks, common to both origin and destination countries. As far as we know, this methodology has been applied to migration data only in another work by Beltran and Hadzi-Vaskov (2023) that investigates the effect of climate change on cross-border migration of emerging economies. In here, we focus on emigration from Africa and on the role exerted by the EU in attracting those migrants. Our second contribution is to explore the drivers of the origin component arising from the decomposition, i.e. of the incentive to emigrate, regardless the destination. We rely on the existing empirical literature to select the potential drivers (Czaika and Reinprecht, 2022). In particular, population at origin, especially working-age, is typically found to push emigration, and its role may increase in the future. Population in emerging economies is growing, leading excess supply of workers, especially in South Asia and Sub-Saharan Africa. Simultaneously, advanced economies will continue aging, therefore increasing the demand for working-age migrants. The two forces together may likely increase the migration from poor to rich countries in the coming decades. Among economic drivers, income levels and income gaps – that persist between high-income and low-income countries in both low- and high-skill occupations – are found to be important in shaping migration (Vanderkamp, 1971; Bertoli and Fernández-Huertas, 2013; Ortega and Peri, 2013). Income inequality and poverty in origin countries, especially low-income, is a powerful push factor as moving to a richer country offers an opportunity to escape poverty. However, several studies suggest a nonlinear, inverted U-shaped relationship, between GDP per capita and emigration rates (Adams and Page, 2003; Letouzé et al., 2009; De Haas, 2010; Djajic et al., 2016; Clemens, 2014). At low per capita income levels, an increase in the latter allows people to afford the migration costs. However, if income increases enough, people's living standards improve and the incentive to leave their country of birth reduces until the relation turns negative. The poorest of the poor, however, tend to migrate internally, as they are unable to afford the costs associated with moving abroad. Indeed, migration costs are another key element that affect the decision to leave a country. They tend to increase with geographic distance and with the restrictiveness of migration policies, while previously-established diaspora networks may lower them. In more recent years, the role of environmental drivers has also received increasing attention (IMF, 2020). Other aspects that may lead to forced displacement include individual motives, political and institutional aspects such as legal barriers, and security issues including conflict and violence. The remainder of the paper is organized as follows. The next session proposes an overview of the main patterns of the emigration from Africa to the EU over the period 1990-2020.

Section 2.3 describes the decomposition method. Section 2.4 shows the results of the decomposition for the emigration from Africa and the econometric analysis. The last session concludes.

2.2 Main patterns of the emigration from Africa to the European Union

According to the International Migration Statistics of the United Nations (IMS, 2022) between 1990 and 2020, the number of Africans residing outside of their country of birth doubled, from almost 21 million to more than 40 (Tab. 2.1, last column). Over the same period, the number of those residing in the EU more than doubled from 4.1 to 9.2 million, concentrated in few EU countries.

Table 2.1: African emigration by destination area

Year	Africa	Asia	Europe	EU	Latam	N. America	Oceania	World
Thousands of people:								
1990	13,431	1,778	566	4,117	19	549	162	20,621
2000	12,753	2,165	909	4,888	20	1,116	229	22,080
2010	14,571	3,427	1,421	7,328	28	1,984	435	29,194
2020	20,918	4,720	1,844	9,181	49	3,269	588	40,567
% of world total:								
1990	65.1	8.6	2.7	20.0	0.1	2.7	0.8	100.0
2000	57.8	9.8	4.1	22.1	0.1	5.1	1.0	100.0
2010	49.9	11.7	4.9	25.1	0.1	6.8	1.5	100.0
2020	51.6	11.6	4.5	22.6	0.1	8.1	1.4	100.0
1990-2020 change (pp)	-13.6	+3.0	+1.8	+2.7	+0.0	+5.4	+0.7	
% of population at destination:								
1990	2.1	0.1	0.2	1.0	0.0	0.2	0.6	0.4
2000	1.6	0.1	0.3	1.1	0.0	0.4	0.7	0.4
2010	1.4	0.1	0.5	1.7	0.0	0.6	1.2	0.4
2020	1.6	0.1	0.6	2.1	0.0	0.9	1.4	0.5
1990-2020 change (pp)	-0.6	+0.0	+0.4	+1.1	+0.0	+0.7	+0.8	+0.1

Source: IMS (2022), selected years. Europe excludes the European Union members

In 1990, the 5 largest recipients (France, Belgium, Italy, Portugal, and Germany) were hosting 88 percent of the 4 million African-born residing in the EU, with more than half of them staying in France. By 2020, the African communities had increased everywhere, but the distribution of migrants remained very uneven (Fig. 2.1). In terms of composition, most of those migrants came from northern Africa, although the share from western Africa increased (Fig. 2.2).[1]

Despite the size of these numbers, from a broader perspective, the wave of African immigration in the EU is not as exceptional as it may seems. To begin with, over the same period African communities in other areas of the world increased at a higher rate than in the EU (Tab. 2.1). By almost 6 times in Northern America, by 3.2 times in non-EU European countries, by 2.7 times in Asia, compared to a doubling in the EU. Moreover, the percentage of people emigrating from Africa

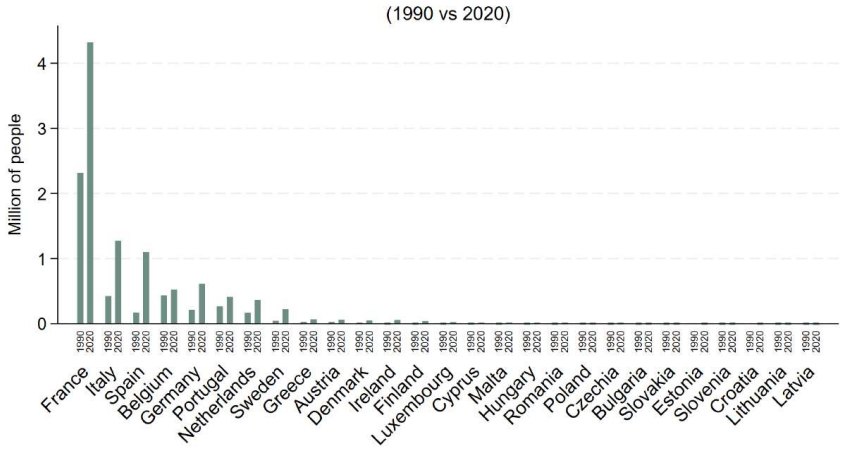
[1]Northern Africa includes: Algeria, Egypt, Libya, Morocco, Sudan, and Tunisia. Western Africa includes: Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Saint Helena, Senegal, Sierra Leone, and Togo.

Table 2.2: Foreign-born resident in the EU by origin

Region of Origin	Thousands of people		Change 1990-2020		Distribution	
	(1990)	(2020)	(Th. of people)	(%)	(1990)	(2020)
Africa	4,117	9,181	5,064	123.0	27.2	24.9
Asia	4,444	11,807	7,363	165.7	29.4	32.0
Non-EU European countries	4,877	9,526	4,649	95.3	32.2	25.8
Latam and Caribbean	808	4,800	4,000	493.1	5.3	13.0
Northern America	447	738	291	65.3	3.0	2.0
RoW (excl. EU)	442	881	439	99.4	2.9	2.4
World (excl. EU)	15,134	36,926	21,792	144.0	100.0	100.0

Source: UN (2022), selected years.

Figure 2.1: African communities in the EU



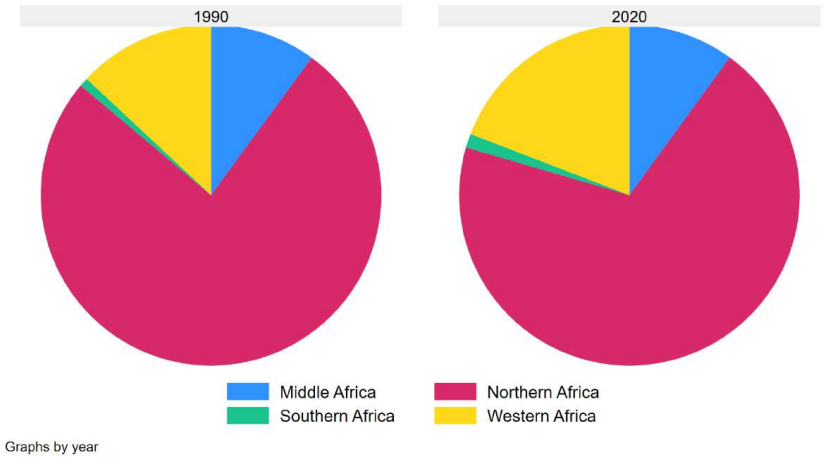
Source: Elaborations on IMS (2022).

remained broadly stable in percentage of the population at origin, while increasing relative to the population at destination, especially in the EU and in Northern America (Tab. 2.1).

This fact is consistent with the underlying demographic trends of these regions. According to the UN Population Prospects, the African population increased from 638 million to almost 1.4 billion in the 30 years to 2020 and will increase by more than 1 billion by 2050. Even under the assumption that the share of African population emigrating to the EU will remain at around 0.7 percent, an additional 70 million Africans may move to the EU in the next 30 years. This, combined with an already shrinking EU-born population would mechanically increase the share of African communities in the EU.

To conclude, the increase of immigration from Africa into the EU is not as exceptional as absolute figures may suggest. Nevertheless, the African community in the EU is currently the world largest and increased both in absolute term and relative to the population at destination over the last 30 years. It is therefore not surprising that the phenomenon is receiving increasing attention by media and policy makers, especially in some EU countries. Looking ahead, the potential for larger inflows of migrants from Africa in the EU is significant. Demographic trends will certainly play an important role, but is not possible at this stage to quantify their contribution relative to economic

Figure 2.2: African migration into the EU by area of origin



Source: Elaborations on IMS (2022).

and non-economic drivers. A task we turn to in the remainder of the paper.

2.3 Exploring the drivers of emigration from Africa

The choice of emigrating may be driven by conditions either at origin that push people to leave their home country or at destination that make other countries more attractive. In order to disentangle the relative role of each component we exploit the decomposition method proposed by Amiti and Weinstein (2018).

In particular, consider a world where people can migrate from N^o countries of origin to N^d countries of destination. A general empirical model for the decomposition of the growth in the stock of migrants born in a country $o \in N^o$ and residing in some other country $d \in N^d$ at any time t can be written as:

$$\Delta \log M_{o,d,t} = O_{o,t} + D_{d,t} + \epsilon_{o,d,t} \tag{2.1}$$

where $M_{o,d,t}$ denotes the stock of migrants born in country o and residing in country d at time, $O_{o,t}$ is the share of the overall change that occurs due to shocks in the country of origin, $D_{d,t}$ measures the role of shocks in the country of destination, and $\epsilon_{o,d,t}$ is an error term with zero mean.[2] The intuition behind the model is straightforward. It says that the stock of migrants may change either because

[2]While this specification does not explicitly considers the role of bilateral idiosyncratic shocks, Amiti and Weinstein (2018) show that it is equivalent [..].

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Northern America	447	738	291	65.3	3.0	2.0
Rest of the World (excl. EU)	442	881	439	99.4	2.9	2.4
World (excl. EU)	15,134	36,926	21,792	144.0	100.0	100.0

Source: UN (2022), selected years.

people in o have an incentive to leave, regardless the destination, or because country d became more attractive to migrants, regardless their origin. The first factor may change for instance for shocks to the domestic labor markets, disposable income, conflicts, natural disasters, or other local amenities. Instead, the destination factor may be affected by changes of economic conditions in the hosting country, cross-border regulations, etc. In every period, the change in the stock of emigrants from country o can be written, exploiting the translog aggregating structure, as

$$E_{o,t} \equiv (log \sum_{d} M_{o,d,t} - log \sum_{d} M_{o,d,t-1}) \approx \sum_{d} \phi_{o,d,t} \Delta \log M_{o,d,t} \tag{2.2}$$

where

$$\phi_{o,d,t} \equiv \frac{1}{2} \left(\frac{M_{o,d,t}}{\sum_d M_{o,d,t}} + \frac{M_{o,d,t-1}}{\sum_d M_{o,d,t-1}} \right)$$

The element $\phi_{o,d,t}$ measures the $(t, t-1)$ mean share of emigrants from o that reside in d over the total number of emigrants from o. The approximation in equations 2.2 and 2.3 follows from the translog aggregating structure and holds precisely when changes in bilateral stocks are small relative to total stocks, which is generally satisfied in our setting given that migration stocks change gradually over five-year intervals. The weight $\phi_{o,d,t}$ ensures that destinations that absorb a larger share of emigrants from o contribute proportionally more to the overall change in emigration from o, and symmetrically for $\theta_{o,d,t}$. Similarly, the change in the stock of immigrants to a country d can be written as

$$I_{d,t} \equiv (log \sum_{o} M_{o,d,t} - log \sum_{o} M_{o,d,t-1}) \approx \sum_{o} \theta_{o,d,t} \Delta \log M_{o,d,t} \tag{2.3}$$

and

$$\theta_{o,d,t} \equiv \frac{1}{2} \left(\frac{M_{o,d,t}}{\sum_o M_{o,d,t}} + \frac{M_{o,d,t-1}}{\sum_o M_{o,d,t-1}} \right)$$

measures the $(t, t-1)$ mean share of immigrants to d from o over the total number of immigrants in d.

Combining 2.1 and 2.3, and exploiting the fact that $E[\sum_d \phi_{o,d,t}\epsilon_{o,d,t}] = 0$ we can chose the $O_{o,t}$'s and the $D_{d,t}$'s to satisfy the following system of conditions:

$$\begin{cases} E_{o,t} = O_{o,t} + \sum_d \phi_{o,d,t} D_{dt} = EO_{o,t} + ED_{o,t} \\ I_{d,t} = D_{d,t} + \sum_o \theta_{o,d,t} O_{o,t} = ID_{d,t} + IO_{d,t} \end{cases} \tag{2.4}$$

where $\phi_{o,d,t}$ and $\theta_{o,d,y}$ were defined above. measures the $(t, t-1)$ mean share of immigrants in d from o over the total number of immigrants in d. Notice that $\sum_d \phi_{o,d,t} = 1$ and $\sum_o \theta_{o,d,t} = 1$. The system in equation (2.4) has a straightforward interpretation. The first line decomposes the overall change in emigration from country o — measured by $E_{o,t}$— into two components: $EO_{o,t}$, which captures the contribution of domestic shocks in the origin country o to the change in emigrant stocks, and $ED_{o,t}$, which captures the weighted contribution of shocks in destination countries, where the weights $\phi_{o,d,t}$ reflect the relative importance of each destination for emigrants from o. The second line performs the symmetric decomposition for the change in immigration into country d — measured by $I_{d,t}$ — into $ID_{d,t}$, the contribution of shocks in the destination country d itself, and $IO_{d,t}$, the weighted contribution of shocks in origin countries, where the weights $\theta_{o,d,t}$ reflect the share of immigrants in d coming from each origin o. Importantly, the system uniquely identifies the origin and destination shocks up to a numeraire, meaning that the absolute values of the components are not informative per se, but their relative magnitudes across countries and over time are. It is important to stress that the conditions in (2.4) uniquely identify the origin and destination shocks up to a numeraire. The choice of the numeraire does not change countries' relative position, but it does affect the interpretation of the numbers, as they measure the deviation from the numeraire itself. Following (Amiti and Weinstein, 2018), we express all components as deviations from the median, as shown in equation (2.5). In order to make the results of the decomposition more informative, we followed Amiti and Weinstein (2018) and express country-level factors in terms of deviations from the median level. The first line in 2.4 can be written as:

$$E_{o,t} = (O_{o,t} - \bar{O}_t) + \sum_d \phi_{o,d,t}(D_{d,t} - \bar{D}_t) + (\bar{O}_t + \bar{D}_t) = \bar{EO}_{o,t} + \bar{ED}_{o,t} + G_t \tag{2.5}$$

Where $\bar{O}_t$ is the median shock in the country of origin o at time t, and $\bar{D}_t$ is the median shock in the country of destination d. Hence, $\bar{EO}_{o,t}$ measures how much shock in the origin country o have pushed the local population to emigrate, regardless the destination. Shocks that would affect the origin component include changes in the demographic characteristics such as the total population or the size of the labor force, or shocks to the domestic economic conditions, as well as to other

non-economic factors that would affect the level of living conditions at origin. Whenever $\bar{EO}_{o,t}$ is positive, it means that the incentive to emigrate from o due to domestic factors is above the median level observed in year t. Symmetrically, the element $\bar{ED}_{o,t}$ measures the weighted contribution to the change in the stock of *emigrants* from o due to shocks in the countries of destination, weighted by the relative importance that each of them has as a destination for o. A positive value of $\bar{ED}_{o,t}$ indicates that the attraction of migrants from o due to shocks in destination countries is above the median level observed in year t. Finally, the element G_t can be interpreted as a global factor that affects both countries of origin and destination.

2.4 The decomposition of the Africa-EU migration patterns

We used the IMS (2022) data on bilateral migrant stocks to solve the system in 2.5 and separate the role of shocks at the origin, destination, and global level in shaping outflows from countries of origin. The decomposition is computed year by year for all countries in the sample. To ensure that the results are not driven by extreme values arising from very small origin populations, observations in the top and bottom 1 percent of the distribution are trimmed; this reduces dispersion substantially while leaving the estimated coefficients virtually unchanged Recall that whenever the domestic component is positive, it means that the incentive to emigrate due to domestic shocks is above the median level.[3] Fig. 2.3 shows the results for all countries in the sample in 2020.[4] For most EU members, the domestic component is lower than the median level, suggesting that the incentive to emigrate from them due to domestic shocks is lower than the level observed in most countries. On the contrary, in Africa it tends to be above median, with few exceptions.

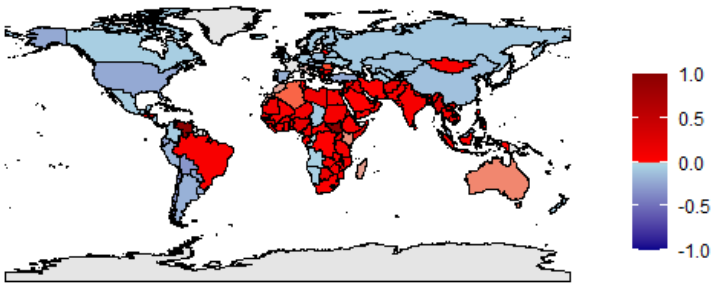
Another way to analyze the results of the decomposition is to look at the relative contribution of the origin, destination, and global components to the overall outflows in each period. Figure 2.4 shows this decomposition for African countries, expressing the outflows as migrants per 1,000 people at the origin. Each decomposed component is first converted into an absolute flow (by multiplying the variation by the lagged migrant stock) and then normalized by the lagged origin population, so that all components are expressed in comparable flow units.The dashed line measures the 5-year change in the stock of African emigrants; the red bars measure the contribution from shocks at origin; the dark blue bars measure the change due to shocks in the EU; the light blue ones the contribution of shocks in other non-EU destinations; and finally, the green bars quantify the role of the global component in each year.[5] From 1990 to 2020, the stock of people emigrated from Africa

[3] Recall that in this specification, country-level factors measure the deviations from the median levels, which are not constant over time. As a consequence, we can compare the relative size of each component to the other two year by year, but the comparison across different observation years is less informative.

[4] The $\bar{EO}_{o,2020}$ in the notation introduced above.

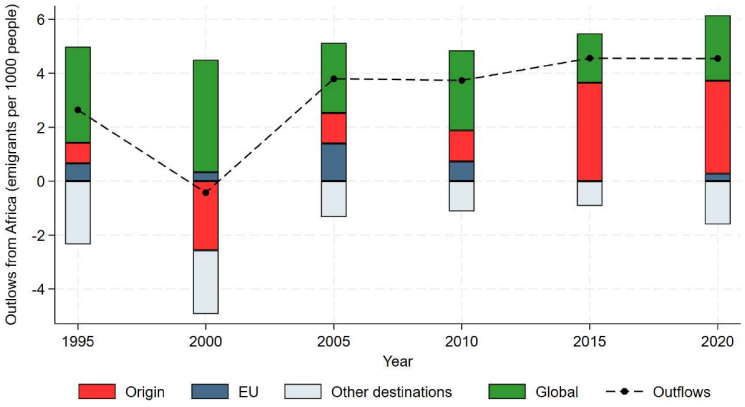
[5] We separated the role of shocks in the EU from the role of shocks in other destinations by decomposing the

Figure 2.3: Origin component by country



Source: Authors' elaborations.
Note: Decomposition of the variation in bilateral stocks from 2015 to 2020 (last available year). Red = countries with an origin component above the sample median; blue = below the median.

Figure 2.4: Outflows from Africa by type of shock



Source: Authors' elaborations.
Note: Following the notation in Section 2.3, the y–axis shows outflows from Africa in $(t-1, t)$ per 1,000 African-born at the beginning of the period ($E_{o,t}/N_{o,t-1}$, $o \in$ Africa). Red: origin component ($\bar{EO}_{o,t}/N_{o,t-1}$); light blue: destination component ($\bar{ED}_{o,t}/N_{o,t-1}$); navy: EU destination component ($\bar{ED}_{EU,t}/N_{EU,t-1}$); green: global component ($G_t/N_{o,t-1}$).

destination component as follows:

$$\bar{ED}_{o,t} = \sum_{d \in EU} \phi_{o,d,t}(D_{d,t} - \bar{D}_t) + \sum_{d \notin EU} \phi_{o,d,t}(D_{d,t} - \bar{D}_t) = \bar{ED}_{EU,t} + \bar{ED}_{Other,t} \tag{2.6}$$

increased by 3 to 5 people per 1,000 people every 5 years, except for a small reduction observed in 1995-2000. Global shocks contributed positively to the increase in all years, promoting a general increase in the world stock of emigrants. These shocks may include lowering transportation costs or better diplomatic international relations that made legal emigrations easier, as well as tighter international economic integration that could increase labor mobility. The contribution of shocks in the origin countries has also been positive in most years and relatively larger than that of the other components more recently. Turning to the role of shocks at destination, the gray bars suggest that shocks in non-EU destination countries reduced outflows from Africa. In contrast, shocks in the EU contributed positively, although to a limited extent.[6] In summary, in Africa domestic shocks contributed to the outflows from the continent positively and relatively more than in most other countries. Also, the push from shocks in country of origin was larger than the contribution from shocks that affected also (or only) countries of destination, as measured by the destination and global components, respectively. One limit of the exercise is that it does not provide indications on the underlying factors driving the different components. An issue that we address in the next section for the origin component, which appears to be the largest contributor in the case of Africa.

2.5 Regression analysis of the origin component

The decomposition exercise isolates the outflows due to shock in the countries of origin. We refer to this as the *origin component*. In what follows, we explore the specific shocks that drive this component. The econometric model is:

$$M_{o,t} = \beta_0 + \beta^{\intercal} X_{o,t-1} + T_t + A_{o,t} + u_{o,t} \tag{2.7}$$

where our dependent variable is the number of outflows due to shocks in the country of origin as a share of the previous period population[7]. The matrix $X_{o,t-1}$ includes lagged migration shares, economic indicators, labor market dynamics, and measures of environmental stresses. The model also includes year fixed effects (T_t) and geographic fixed effects(A_o) to control for unobserved heterogeneity. Table 2.4 contains the descriptive statistics of the variables for the whole sample and for the subsample of African countries.

The results of the econometric analysis are shown in Table 2.5. Columns (1)-(3) consider the role of emigration patterns, labor market dynamics, and economic conditions, while columns (4)-(6)

[6] In order to test the stability of our results, we also run alternative decompositions. One excludes the Syrian Republic to exclude that results could be driven by the exceptional outflows registered from this country in 2011; the other excludes also other extreme migration events. In both cases, the dynamics of the main exercise are confirmed. Details provided in the appendix.

[7] $M_{o,t} = \frac{\bar{EO}_{o,t}}{Pop_{t-1}}$, following the notation introduced above.

Table 2.4: Summary statistics of covariates

	All countries					African countries	
Variable	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs.**	**Mean**
Ratio of migrants to lagged population x1000 ppl	873	0.001	3.0	-31.76	42.19	279	0.28
Share of population living abroad in -1	734	0.08	0.08	.00	8.48	234	0.05
Δ Labor force relative to Δ Population	873	1.01	17.09	-94.61	492.24	279	0.31
Δ Log(Labor Force)	873	0.89	0.87	-0.32	0.84	279	0.14
Log(GDP per capita)	843	8.08	1.63	4.47	11.63	275	6.81
Δ Log(GDP per capita)	843	0.19	0.35	-1.70	1.75	275	0.11
Unemployment rate	873	8.15	6.05	0.14	34.92	279	9.22
Δ Unemployment rate	873	0.15	3.02	-14.5	17.1	279	0.077
Log(Damage from natural disasters per capita) in -1	819	-2.88	3.14	-14.40	3.08	266	-3.00

extend the analysis to explore the impact of natural disasters. In both cases, regressions are run on the whole sample (columns 1 and 4), on the subsample of low- and middle-income countries (columns 2 and 5, labeled L&M), and on the subsample of high-income countries (columns 3 and 6, labeled H), where income classification follows the World Bank definition described in Appendix .5.1. The three main determinants of the origin component that emerge consistently across specifications are: prior migration networks, labor market pressures, and income levels at origin. Consistent with the literature on network effects in migration Beine et al. (2015), the lagged share of the population living abroad is a strong and robust predictor of current emigration across all specifications, with the effect being substantially larger in low- and middle-income countries (coefficient of 16.29 in column 2) than in high-income ones (3.91 in column 3), suggesting that network effects operate primarily as a pull-down mechanism in poorer contexts where migration costs are otherwise prohibitive. Labor market pressures, captured by changes in the labor force and its interaction with unemployment, also emerge as key drivers, aligning with findings by Hatton and Williamson (2005) on the economic push factors of migration. Again, the effect is significantly stronger in low- and middle-income countries, while the sign of the interaction term reverses in high-income countries (1.85 in column 3 versus 1.25 in column 2), suggesting that in wealthier settings labor force growth combined with unemployment does not translate into emigration pressure, possibly because domestic labor markets are better able to absorb such shocks. GDP per capita in the previous period negatively correlates with emigration across most specifications. For instance, in column (1), the coefficient on log(GDP per capita) is 0.54; this means that a 1% increase in GDP per capita (i.e., a 0.01 increase in log(GDP per capita)) is associated with a 0.0054 percentage point decrease in the emigrant-to-population ratio. Since the distribution of the dependent variable is heavy-tailed, the mean is sensitive to extreme values and not a reliable benchmark for gauging the size of this effect; we therefore compare it to the interquartile range (∼0.12 pp), against which the estimated effect is moderate in magnitude.

Interestingly, GDP growth has instead a positive effect, suggesting that relative improvements may facilitate mobility rather than deter it by relaxing financial constraints on migration, as discussed in Clemens (2014). Notably, this positive effect of GDP growth is much stronger in high-income countries (4.61 in column 3), possibly reflecting a composition effect whereby growth in already wealthy countries is associated with higher skilled emigration.

The impact of natural disasters, proxied by per capita damage, is significantly negative overall, but this effect is reversed for African countries. The interaction between the Africa dummy and the log of damage from natural disasters per capita is positive and statistically significant across all income subgroups (columns 4-6), suggesting that environmental shocks act as a stronger push factor in Africa compared to other regions. This finding aligns with the literature on climate-induced migration, which emphasizes the heightened vulnerability of African populations to environmental stressors due to limited adaptive capacity and institutional support. While the direct effect of disaster damage is negative overall, the positive interaction for Africa implies that in these contexts disasters may exacerbate existing socio-economic fragilities, prompting migration as a coping strategy rather than constraining it as in other regions. From a policy perspective, of the three main determinants identified, migration networks and demographic-driven labor force growth are largely structural and difficult to address in the short run. Natural disaster exposure, however, offers a more actionable policy handle: investments in disaster preparedness, climate adaptation, and institutional resilience in African countries could reduce the disaster-to-emigration transmission, thereby addressing one of the channels through which the origin component is amplified.

Table 2.5: Regression analysis

	(1) All	(2) L&M	(3) H	(4) All	(5) L&M	(6) L
Share of population living abroad in -1	7.83***	16.29***	-3.91**	2.84§	10.68***	39.30***
	(1.41)	(1.99)	(1.86)	(1.77)	(2.60)	(10.95)
Δ Labor force relative to Δ Population	0.00**	0.00**	-0.03§	0.00§	0.00*	5.11*
	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(2.66)
Δ Log(Labor Force)	-4.64*	-9.82***	3.41	-5.35*	-9.46**	-39.14*
	(2.43)	(3.23)	(2.96)	(3.03)	(3.83)	(19.10)
Δ Labor force X Unemployment rate	0.75***	1.25***	-1.85***	0.91***	1.72***	3.10§
	(0.22)	(0.30)	(0.34)	(0.27)	(0.38)	(1.85)
Log(GDP per capita) in -1	-0.54***	-0.60***	-0.16	-0.49***	-0.27	-0.34
	(0.12)	(0.17)	(0.25)	(0.14)	(0.20)	(0.94)
Δ Log(GDP per capita)	0.61**	0.58*	4.61***	0.70*	0.79*	0.70
	(0.30)	(0.35)	(0.72)	(0.37)	(0.43)	(0.94)
Log(GDP p. c.) in -1 X Δ Log(GDP p. c.)	0.06	0.14	-1.38***	0.12	-0.07	-0.08
	(0.18)	(0.25)	(0.22)	(0.20)	(0.28)	(1.35)
Unemployment rate	-0.05*	-0.11***	0.06***	-0.04	-0.16***	-0.57*
	(0.03)	(0.04)	(0.02)	(0.03)	(0.05)	(0.31)
Δ Unemployment rate	0.04§	0.07*	-0.01	0.04	0.08*	0.39§
	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.23)
Log(Damage from natural disasters per capita) in -1				-0.28***	-0.25***	-0.45***
				(0.04)	(0.05)	(0.15)
Africa dummy X Log(Damage from nat. dis. per capita)				0.32***	0.29***	0.45**
				(0.09)	(0.10)	(0.17)
Observations	619	418	201	397	259	42
Year FE	Y	Y	Y	Y	Y	Y
Geo area FE	Y	Y	Y	Y	Y	Y

Standard errors in parentheses
§ $p < 0.15$, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

2.5.1 Validation

To assess the robustness of our baseline specification and discipline model complexity, we implement a data–driven validation based on the LASSO. We estimate the LASSO while partialling out country and year fixed effects (so that FE are not penalized and identification remains within–country). This step is important because the high-dimensional fixed effects capture persistent cross-country heterogeneity and common time shocks; removing them before applying the LASSO ensures that the penalization operates only on the substantive covariates and that the selection procedure focuses on the determinants of within-country variation in migration outflows rather than structural differences across countries. We choose the penalty via the EBIC, which is conservative and well-suited to settings with many, potentially collinear, candidates. Relative to cross-validation, the EBIC imposes a stronger penalty on model size and therefore favors more parsimonious specifications, reducing the risk that variables with limited incremental explanatory power are retained simply due to correlations with other regressors.

The coefficient–path in Figure 2.5 marks the EBIC–chosen λ with a vertical line. We decided

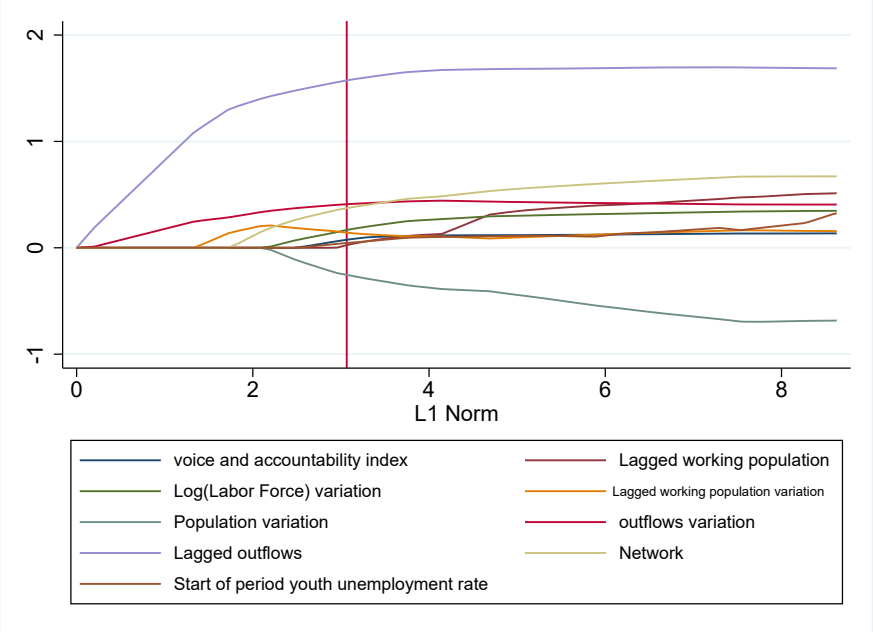


Figure 2.5: LASSO selection of variables

to plot only the covariates whose paths are materially away from zero at that line, which compose the selected model. The coefficient paths illustrate how individual regressors enter the model as the penalty gradually relaxes: when λ is large, all coefficients are shrunk toward zero, while additional variables become active as the constraint on model complexity weakens. The fact that only a limited subset of covariates remains active at the EBIC-selected penalty suggests that a relatively small number of factors explains most of the systematic variation in migration outflows once fixed effects are accounted for. The figure shows a stable, economically coherent set: institutional quality (Voice & Accountability), labor–market and demographic trends (levels and changes in the working–age population and initial youth unemployment), and network/persistence (lagged outflows and its variation). Other candidates are shrunk to zero as the penalty relaxes, indicating weak or redundant contributions once collinearity is accounted for.

We then conduct post–selection inference by estimating an OLS regression on the LASSO–selected regressors, absorbing country and year fixed effects and clustering standard errors by country (Table 2.6). This post-LASSO step serves to obtain unbiased coefficient estimates and conventional inference once the relevant set of covariates has been selected. The fit is strong (overall $R^2 = 0.8235$, within $R^2 = 0.6885$), and the key drivers are precisely estimated: the network proxy and both the lagged and outflows variations are positive and highly significant, while the working–age population is positive and significant. These results indicate that persistence in migration networks and demographic pressures remain central drivers of migration outflows even when the model specification is determined through a purely data-driven procedure.

Importantly, this LASSO screen broadly corroborates the theory-guided baseline in Table 2.5:

the variables favored by EBIC align thematically with those chosen ex ante — networks, demographic and labour-market pressures, and an institutional/economic dimension — confirming these as the principal channels underpinning migration outflows. The variable-by-variable overlap is not one-for-one, as LASSO tends to retain a single representative among collinear proxies.

Table 2.6: Post-LASSO FE regression (dependent variable: *Outflows due to shocks in origin*)

	Coefficient
Voice& Accountability	7.4236^{*}
	(4.2802)
Lagged workingage pop	1.52×10^{-7}
	(1.26×10^{-7})
Lagged working population	0.02418^{**}
	(0.00925)
Lagged working pop variation	-2.37×10^{-7}
	(9.32×10^{-7})
Population Variation	-2.13×10^{-6}
	(1.68×10^{-6})
Outflows variation	0.5238^{***}
	(0.1058)
Lagged outflows	56.140^{***}
	(10.388)
Network	0.2182^{*}
	(0.1268)
Start of period youth unemployment rate	42.600^{***}
	(13.649)
Constant	-50.875^{***}
	(11.832)
Observations	688
Clusters (country)	144
R^2 (overall)	0.8235
Within R^2	0.6885
Fixed effects	Country, Year
SE	Clustered by country

Notes: HDFE OLS with country and year fixed effects; standard errors in parentheses clustered by country. Significance: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

2.6 Concluding remarks

African emigration remains a central issue in EU policy debates, particularly in member states with large African communities. This paper uses the UN dataset on bilateral migrant stocks over 1990–2020 to explore migration patterns and drivers, with a particular focus on migrations from Africa to the EU. First, we decompose changes in migrant stocks to isolate the share attributable to origin-country shocks, as opposed to destination or global shocks. We find that in Africa, origin-related factors are generally larger, positive, and increasing over time — particularly after 2015, when demographic acceleration, climate shocks, and mature migration networks jointly reinforced the push to emigrate from the continent. Notably, the EU destination component remains positive but modest throughout the period, suggesting that the attractiveness of the EU as a destination plays only a secondary role in explaining aggregate African outflows, even during periods of relatively open EU migration policy. This has important policy implications because when origin shocks dominate, the most effective policies would be those directed at improving the domestic conditions of potential emigrants. Instead, tightening the barriers at entry in destination countries would likely have only a limited effect on total outflows, while potentially redirecting destinations and increasing irregular migration, which complicates labor market integration and may strain diplomatic relations. Indeed, undocumented migrants are harder to integrate, tend to operate in informal labor markets, have limited access to social services, and contribute less to fiscal revenues — outcomes that are detrimental both for the migrants themselves and for the hosting societies. Second, we analyze the determinants of the origin component. Our results indicate that migration networks, demographic pressures, labor force growth, high unemployment, and low GDP per capita amplify emigration incentives, especially in low- and middle-income countries. These findings point to a clear hierarchy of policy levers. Migration networks, once established, are largely self-reinforcing and difficult to dismantle through restrictive entry policies alone; a more productive approach is to channel their effects through well-designed legal migration pathways and circular migration schemes that preserve the benefits of networks while reducing irregular flows. Demographic and labor market pressures, on the other hand, call for sustained investments in job creation, vocational training, and economic diversification in African origin countries — an agenda that requires deeper and more structured EU-Africa development cooperation rather than migration management tools alone. Interestingly, GDP growth has a positive effect on emigration in our results, consistent with the well-documented migration hump: as incomes rise from very low levels, people gain the resources to afford migration costs, so short-run improvements in economic conditions may temporarily increase rather than reduce outflows, a dynamic that policymakers should anticipate when designing development-migration policy linkages. Conversely, natural disasters typically reduce migration

globally but induce a positive increase in emigration from Africa — a critical finding given the continent's projected vulnerability to climate change. As droughts, floods, and agricultural crises are expected to intensify across Sub-Saharan Africa in the coming decades, this channel is likely to become an increasingly important driver of African emigration. Investments in climate adaptation, disaster preparedness, and institutional resilience in African countries therefore represent not only a development priority but also a forward-looking migration management tool, with potentially significant long-run returns for the EU. Our results also highlight substantial heterogeneity across African subregions and income groups in the sensitivity to each of these drivers, arguing against one-size-fits-all approaches and in favor of policies tailored to the specific demographic, economic, and environmental profiles of individual origin countries. Overall, the results of the analysis underscore the multifaceted nature of emigration decisions, shaped by both structural economic factors and historical migration patterns. In Africa, more specifically, regional heterogeneity in migration drivers suggest against searching one-fits-all migration policies, while disaster preparedness will be critical in shaping the future migration from the continent.

Chapter 3

Global Trade Fragmentation and the Reshaping of the World Economy

Abstract

This paper examines the recent fragmentation of global trade, focusing on how purely-economic and geopolitical shocks have reshaped bilateral flows. Building on an atheoretical model of bilateral trade growth, we develop an empirical strategy (based on the contribution of Amiti and Weinstein, 2018, in the context of bank-firm lending) that extends beyond standard specifications of the inward and outward multilateral resistance terms by explicitly disentangling shocks related to belonging to different geopolitical trading blocs, in addition to the more standard economic blocs. The results reveal a growing segmentation of trade flows along geopolitical lines where geopolitical trading blocs have been important in determining world export growth after 2018, especially in the years of the first US-China trade war. The hegemons of the two main blocs seem to have a different weight. China has had a persistently higher role than the US in the export dynamics of its blocs (both defined as economic and geopolitical). The only exception is if we consider the USMCA as the US-referenced economic bloc where the US clearly dominates.

Keywords: Geoeconomics, Trading blocs, Gravity Model of International Trade.

3.1 Introduction

Many studies have already documented that the course of globalization has been interrupted since 2016 (for example, Goldberg and Reed, 2023) and a new wave of restrictive measures in international trade has begun to appear. This trend has been reinforced by non-economic events. The pandemic has shown the fragility of global supply chains, and the second Russian invasion of Ukraine in 2022 has included security issues that have affected the dependence on international suppliers of critical goods and materials.

A new strand of literature, generally mentioned as geoeconomics (see, for instance, Clayton et al., 2023, Mohr and Trebesch, 2024, Clayton et al., 2025), started to include political factors in traditional optimizing models in order to take into account the change in international relations from an economic point of view. More specifically, the fragmentation of the world economy has been studied in recent contributions, starting from the work at the IMF where the term *geoeconomic fragmentation* entered in one of the chapters of the Spring 2023 issue of the World Economic Outlook (see also Aiyar et al., 2023). Lately, Fernández-Villaverde et al. (2024) presented a geopolitical fragmentation index using time series techniques, and Becko et al. (2025) show the consequences on trade policy envisaging a more active protectionism as a strategic tool when geopolitical power is concerned.

This study investigates the related fragmentation process of international trade using data starting in 2017, but with particular attention to the period as of 2020, when the pandemic first, and the 2022 Russian invasion of Ukraine next, have both triggered decoupling effects resulting from sanctions and geopolitical realignments. The research seeks to address these new trends by disentangling different factors that could have affected the dynamics of world trade.

The gravity model of international trade offers measures of the exporter's penetration capability and the importer's absorption capacity from bilateral trade data via the estimated multilateral resistance terms, in addition to measures of trade costs. The former two sets of estimates are useful for identifying the supply/exporter and demand/importer innovations that have governed the dynamics of trade flows. However, we deem that it is important to disentangle the role of other innovations, such as innovations related to belonging to trading blocs, defined not only as traditional economic blocs (like the EU and EFTA, or the USMCA), but also as geopolitical blocs (like Western US-led bloc vs. non-Western or China-led blocs). Innovations related to worldwide shocks may have also played a role, for instance, during the pandemic.

In order to identify these different types of shocks, we decided to focus directly on the growth rates of exports and imports. When systemic shocks such as the pandemic, the conflict in Ukraine, and recently the deep change in US trade policy occur, we believe that a focus on growth rates is better able to capture the effects on trade. Recent studies with a similar goal as ours, but starting from measures of trade costs, have also used this same dynamic approach (for example, Bonadio et al., 2025).

The general econometric framework that could encompass the dynamics of exports and imports with the most parsimonious model would include an exporter-time and an importer-time fixed effect. This framework is perfectly compatible with a dynamic version of the gravity model, which remains the dominant framework for assessing trade flows (Larch et al. (2025) provides a comprehensive overview).

One focus may be the estimation of the exporter-time and importer-time fixed effects, apart from measuring trade costs via the residuals. However, there are a number of drawbacks with this approach that are thoroughly discussed in Section 3.2. Data on bilateral trade flows are very informative, but also very volatile when considering their growth rates, especially when including many small low-income countries. The same problem is present, but lessened when growth rates of total country-level exports and imports are used. After all, we are interested in identifying the role of different shocks on the overall trade of each country, but still taking advantage of the information content of bilateral trade flows.

Amiti and Weinstein (2018) had a similar problem when studying the firm-bank relationship in Japan between 1990 and 2010. They wanted to obtain estimates of bank and firm shocks in the dynamics of bank lending starting from the growth rates of bilateral lending data, but using the growth rate of lending of each bank consistently with the bilateral firm-bank lending. Their approach was based on the weighted least squares (WLS) estimation of the growth rates of bilateral lending spurring sample moment conditions that would identify bank and firm shocks from the growth rates of total lending and using the bilateral data to obtain the bank-firm shares.

This methodology adapts perfectly to our case, where we can overcome the problems related to volatile worldwide bilateral trade data (see Section 3.2) by directly using the growth rates of country-level exports and imports. The methodology proposed by Amiti and Weinstein (2018) (hereafter AW methodology) allows us to identify innovations that can trace the dynamics of total exports attributed to the origin and the destination country, i.e. the former as a supply-side and the latter as a demand-side component. However, in addition to these shocks (related to the multilateral resistance terms), our original advancement is to affine and adapt the atheoretical decomposition implied by the AW methodology to identify innovations that can be attributed to belonging to different geopolitical or economic trading blocs, in addition to the role of global shocks.

As an anticipation of the results, our estimates show that belonging to geopolitical trading blocs has a weight similar to belonging to traditional economic blocs, especially before the pandemic during the first US-China trade war. When looking inside the blocs and eliciting the weight of hegemons, China has a consistent higher weight than the US when considering both the economic and geopolitical trading blocs, except when we simply consider the USMCA as the US economic bloc.

Finally, from one of the theoretical derivations of the gravity model and according to the hypotheses of the Armington model, it is possible to link our importer innovation to the impact on each country real income as a measure of welfare.

In the next Section we detail the motivation and the advantages of using the AW methodology in this context. In Section 3.3 we report the major steps of the methodology (details are presented in the two Appendices), while Section 3.4 reports its empirical application. Section 3.5 concludes.

3.2 Methodological Motivation and Advantages

A general dynamic empirical approach to bilateral trade transactions may take the form of the regression of growth rates in bilateral trade flows between the exporter m and the importer n, $d_{mn,t}$, on exporter-time and importer-time fixed effects, as shown in the following Equation, further studied in Section 3.3:

$$d_{mn,t} = \alpha_{n,t} + \beta_{m,t} + \varepsilon_{mn,t} \tag{3.1}$$

The estimation of this general model suffers from two main drawbacks:[1] one refers to the volatility of bilateral growth rates, and another is related to the lack of consistency between the estimated export growth rates at the country level, obtained with aggregations of the estimated

[1] Another drawback is the large number of fixed effects. Adam et al. (2025) mentions this problem of high dimensionality in the fixed effects and offers a computational solution within the ANOVA approach.

coefficients of Equation (3.1), and the actual growth rates.

Regarding the volatility of bilateral growth rates, the range of variation takes implausible values due to high measurement errors and likely missing data. In our sample of 188 countries that span between 2017 and 2024, the 95th percentile of the bilateral growth rate distribution is over 700% and the top values take implausible percentages.[2] Similar variability is not present in the growth rates of *total* exports, whose precision is higher given their aggregate nature.

Figures 3.1a and 3.1b report respectively the cumulated density and the probability density functions of both the bilateral growth rates (trimmed at the 95th percentile) and the country-level export growth rates. They highlight graphically the astonishing difference in variability between the two types of growth rates. Since our focus is to disentangle the dynamics of country-level export growth rates, we are reassured by the reliability of country-level data. As will be clear in the next sections, the information in the bilateral trade flows is still used, but to compute the trade shares, i.e. less volatile data.

The second disadvantage of a standard OLS estimation of (3.1) lies in the possibility of recovering reliable country-level growth rates by properly aggregating the estimates of the export-time and import-time effects. In other words, for the exporter m the estimated growth rate would be: $\widehat{d}_{M,t} = \sum_n w_{mn,t}\widehat{d}_{mn,t} = \widehat{c}_t + \sum_n w_{mn,t}\widehat{\alpha}_{n,t} + \widehat{\dot{\beta}}_{m,t}$ where $w_{mn,t}$ are the weights of each partner n of country m, $\widehat{\alpha}_{n,t}$ and $\widehat{\dot{\beta}}_{m,t}$ are the estimated importer-time and exporter-time effects with respect to a reference country, and $\widehat{c}_t$ is the sum of the estimated effects of the reference country.[3]

In order to check this consistency, we estimated Equation (3.1) in two different versions depending on the definition of the dependent variable $d_{mn,t}$: a) $d_{mn,t}$ is calculated as percentage changes; b) $d_{mn,t}$ is computed with log first difference. In both cases we trimmed the data at the 95th percentile. The estimated exporter-time and importer-time fixed effects are then aggregated summing over the importers n with the appropriate weights in order to obtain the estimated exporter aggregate $\widehat{d}_{M,t}$ that we want to compare with the actual growth rate $d_{M,t}$.

Clearly, the construction of these export aggregates does not imply that they could trace total exports of the country m, but we are interested to check whether these aggregates still provide a good approximation.[4]

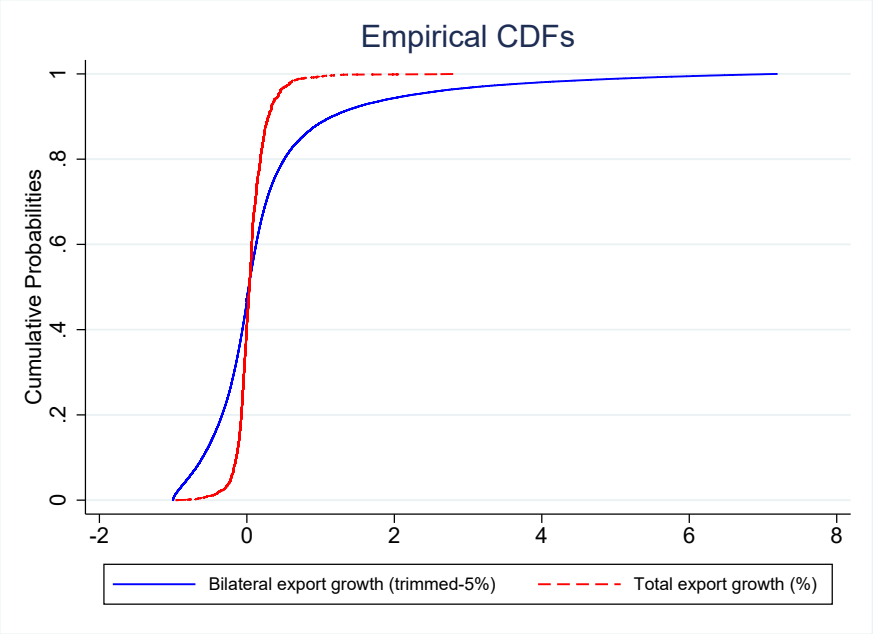
In Figure 3.2 we report the scatter plots between the actual total export growth rates of each country and the estimated aggregate export growth rate according to the two different versions of $d_{mn,t}$.

The R^2 for the estimated growth rates is only 0.0589. The better fit is found for the log first difference, but the R^2 remain very low being 0.XX. Therefore, if our goal is to recover appropriate shocks that could add up to the total export growth, the two estimations above work very poorly.

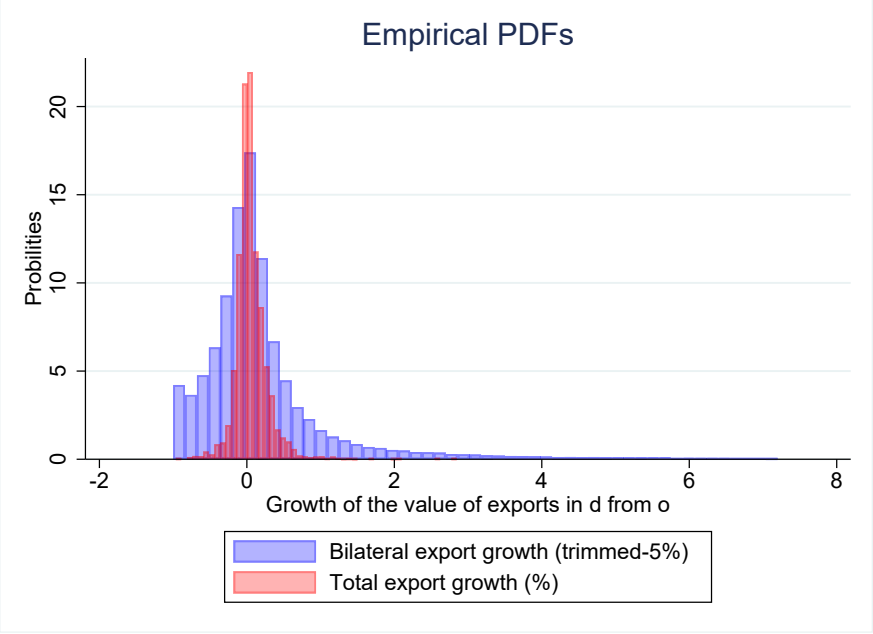
[2]The presence zero values, say $X_t = 0$, implies a lower bound of -1 (for $d_t = \frac{X_t - X_{t-1}}{X_{t-1}}$), but no upper bound (for d_{t+1}).

[3]The reference country's values could be the averages of the importer-time and exporter-time effects.

[4]In Propositions 2 and 3 Amiti and Weinstein (2018) show that OLS and WLS estimation of growth rates or log-first differences provide weighted or unweighted average growth rates. Here we decided to give an additional advantage to the reconstruction of aggregate growth rates by weighting the bilateral growth rates rather then considering the simple averages, as in Section 4 of Amiti and Weinstein (2018).

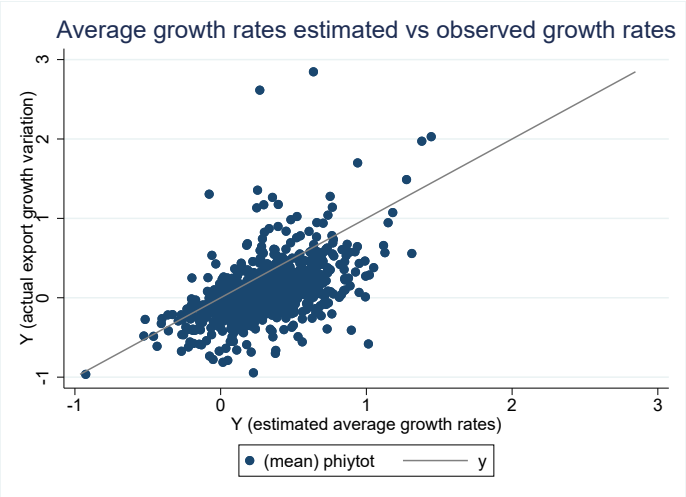


(a) Cumulative Distributions of Bilateral (trimmed at 95%) and Country-Level Total Export Growth Rates

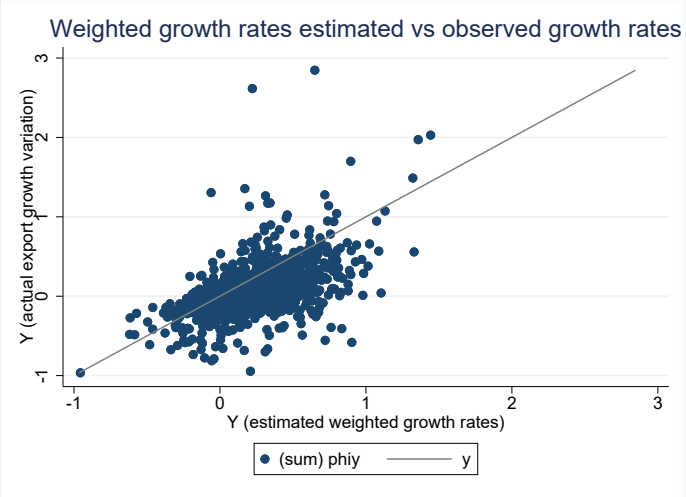


(b) Probability Distributions of Bilateral (trimmed at 95%) and Country-Level Total Export Growth Rates

Figure 3.1: Distributions of Bilateral (trimmed at 95%) and Country-Level Total Export Growth Rates



(a) Scatter plot of estimated and actual average growth rates of country exports – OLS estimation of Equation (3.1) using bilateral growth rates (trimmed at the 95th percentile)



(b) Scatter plot of estimated and actual weighted growth rates of country exports – OLS estimation of Equation (3.1) using log first differences

Figure 3.2: Estimated and actual growth rates of total exports at the country level.

3.2.1 Advantages

The methodology proposed by Amiti and Weinstein, 2018 (the AW methodology henceforth) is based on the sample moments equations of the WLS estimation of (3.1) that would imply a decomposition of the country-level export growth rates into drivers related to exporter shocks, importer shocks and other meaningful components. The AW methodology is thoroughly illustrated and applied to our context in Section 3.3 and in the Appendices.

Applying the AW methodology to trade relationships offers three advantages when the objective is to identify the main drivers of the dynamics of *total* exports of each country.

The first advantage is to recover the role of the exporter-time and importer-time effects in the dynamics of country-level exports without estimating Equation (3.1) on the extremely volatile growth rates of *bilateral* trade flows. As mentioned above, the AW methodology provides a decomposition of the growth rates of *total exports* that derives from the sample moments of the WLS estimation of Equation (3.1). This feature has two important implications. First, by construction the obtained exporter-time and importer-time effects would recover exactly the total export growth rates of each country. As we have seen in Figure 3.2, this is not the case when using estimated exporter-time and importer-time effects for the direct estimation of (3.1). Secondly, bilateral trade data are still used as they are necessary for the decomposition, but simply to obtain the trade shares of exporters and importers at each time period avoiding their highly volatile growth rates.

The second advantage is to disentangle different factors from the overall exporter-time and importer-time effects of Equation (3.1) that could have a relevant interpretation. For example, we can unravel the role of trading blocs, defined according to either economic ties or geopolitical links. Given the importance of geopolitical factors in shaping trade relationships, an important question is whether there has been a significant change, especially during the years of the first US-China trade war and after the 2022 Ukrainian invasion, on the relative relevance of economic and geopolitical components.

Lastly, the decomposition preserves all countries, despite the presence of outliers in the growth rates of bilateral trade flows. We consider this to be an important advantage when dealing with geopolitical issues, especially when some small countries may be engaging in triangular trading to divert tariffs or sanctions and that could cause sudden changes in growth rates.[5]

3.3 Idiosyncratic Shocks in World Trade Flows

Amiti and Weinstein (2018) have originally proposed a method to obtain bank-firm credit shocks starting from individual bank-firm bilateral data, but using the sample moment conditions for a weighted least squares (WLS) estimation. These sample conditions imply estimation equations that involve aggregated data at the level of single units, i.e. the growth rate of total lending of each bank.

The growth rates of bilateral trade data can be treated in a similar way. The WLS estimation would imply sample moment conditions that would involve the *growth rates of total exports* and *total imports* of each country, where the bilateral data are used to obtain trade shares, but without

[5] As an example, Armenia and Azerbaijan have been playing an important role in triangular trade between Russia and some sanctioning countries.

considering their volatile growth rates.

The sample moment conditions deliver a decomposition of the growth rates of total trade flows of each country into insightful idiosyncratic components. In particular, these components dissect overall inward and outward resistance terms into country-specific components and especially into shocks representing the world trend and the belonging to trading blocs.

3.3.1 Sample Moment Conditions with Aggregated Trade Flows

Let us define $d_{mn,t} \equiv \frac{X_{mn,t}-X_{mn,t-1}}{X_{mn,t-1}}$, i.e. the growth rate of exports from the origin country m to the destination country n.[6]

The following generalized class of models can fit the dynamics of trade flows:

$$d_{mn,t} = \alpha_{n,t} + \beta_{m,t} + \varepsilon_{mn,t} \tag{3.1}$$

where $\alpha_{n,t}$ is an importer specific shock, $\beta_{m,t}$ an exporter specific shock and the error term is unbiased and satisfies the orthogonality condition with the regressors.[7]

Factors affecting $\alpha_{n,t}$ are related to all those aspects that can make a country more capable of importing like domestic economic growth or a recession in the destination country, the imposition of new tariffs, or economic sanctions. It is related to the change in the *absorption capabilities* when referring to the general version of the gravity model by Head and Mayer (2014). Similarly $\beta_{m,t}$ is the exporter shock representing the change in the *penetration capabilities* of the origin country m, such as higher productivity or better market access.

In this dynamic version the bilateral fixed effects of the level estimation disappears and the error term embodies all the bilateral shocks that are not otherwise included in the exporter and the importer shock. This version of the gravity model has been used to evaluate the effect of policy changes, like the introduction of FTAs (Baier and Bergstrand, 2007) or general preferential trade agreements (Martinez-Zarzoso et al., 2009). More recently, Bonadio et al. (2025) use the same econometric framework to obtain an estimate of the bilateral trade costs from the residuals.

After the required normalization and the choice of a reference category, we define $\dot{\alpha}_{n,t} = \alpha_{n,t} - \alpha^*_t$ and $\dot{\beta}_{m,t} = \beta_{m,t} - \beta^*_t$ since we consider α^*_t and β^*_t as reference categories; hence, $c_t = \alpha^*_t + \beta^*_t$.

Let us consider the WLS estimation of the normalized version of (3.1) with weights $w_{mn,t} = X_{mn,t-1}$. Appendix **??** shows how the sample moment condition for each m exporter implies:[8]

$$\sum_n d_{mn,t}\phi_{mn,t-1} = \widehat{c}_t \sum_n \phi_{mn,t-1} + \sum_n \phi_{mn,t-1}\widehat{\dot{\alpha}}_{n,t} + \widehat{\dot{\beta}}_{m,t} \sum_n \phi_{mn,t-1}$$

where $\phi_{mn,t-1} \equiv \frac{X_{mn,t-1}}{\sum_n X_{mn,t-1}}$ is the export share of m that is delivered to country n (hence $\sum_n \phi_{mn,t-1} = 1$), and $\sum_n d_{mn,t}\phi_{mn,t-1} \equiv \sum_n \frac{X_{mn,t}-X_{mn,t-1}}{X_{mn,t-1}} \frac{X_{mn,t-1}}{\sum_n X_{mn,t-1}} \equiv \frac{X_{M,t}-X_{M,t-1}}{X_{M,t-1}} \equiv d_{M,t}$ that is the growth rate of total exports of country m. Therefore, the sample moment condition for

[6] We assume that $X_{mn,t-1} > 0$ as normally happens in trade where trade creation and diversion appear as changes in the flows.

[7] Hypotheses on the distribution of $\varepsilon_{mn,t}$ is less important in our context since we rely on the method of moments estimation.

[8] Clearly $\widehat{a}$ is the estimate of parameter a. Moreover, the summation over n excludes $n = m$, i.e. we do not consider the domestic consumption of domestic production.

country m involves only its total export growth rate on the left-hand side:[9]

$$d_{M,t} = \widehat{c}_t + \sum_n \phi_{mn,t-1}\widehat{\dot{\alpha}}_{n,t} + \widehat{\dot{\beta}}_{m,t} \tag{3.2}$$

Similarly for the sample moment condition of each importer n:

$$\sum_m d_{mn,t}\theta_{mn,t-1} = \widehat{c}_t \sum_m \theta_{mn,t-1} + \widehat{\dot{\alpha}}_{n,t} \sum_m \theta_{mn,t-1} + \sum_m \theta_{mn,t-1}\widehat{\dot{\beta}}_{m,t}$$

where $\theta_{mn,t-1} \equiv \frac{X_{mn,t-1}}{\sum_m X_{mn,t-1}}$, i.e. the share of imports of m that is delivered by country n (hence $\sum_m \theta_{mn,t-1} = 1$), and $\sum_m d_{mn,t}\theta_{mn,t-1} \equiv \frac{X_{N,t}-X_{N,t-1}}{X_{N,t-1}} \equiv d_{N,t}$ that is the growth rate of total imports of country n. Therefore, the sample moment condition for country n involves only its total import growth rate on the left hand side:

$$d_{N,t} = \widehat{c}_t + \widehat{\dot{\alpha}}_{n,t} + \sum_m \theta_{mn,t-1}\widehat{\dot{\beta}}_{m,t} \tag{3.3}$$

3.3.2 The Identification of the Idiosyncratic Shocks

Equations (3.2) and (3.3) are the sample moment conditions of each exporter and importer. The whole system can be shown in matrix form as follows before the choice of normalization:

$$\begin{aligned} \mathbf{D}_{M,t} &= \mathbf{B}_t + \mathbf{\Phi}_{t-1}\mathbf{A}_t \\ \mathbf{D}_{N,t} &= \mathbf{A}_t + \mathbf{\Theta}_{t-1}\mathbf{B}_t \end{aligned} \tag{3.4}$$

The matrices and the vectors are intuitive and fully explained in the Appendix .9.

Taking into account the estimated values, the choice of normalization that has been generally indicated with the terms $\widehat{\alpha}^*_t$ and $\widehat{\beta}^*_t$ can now be set to the time-varying median values: $\widehat{\alpha}^*_t = \bar{A}_t$ and $\widehat{\beta}^*_t = \bar{B}_t$. Therefore, the normalized shocks are: $\widehat{\dot{\alpha}}_t = \widehat{\alpha}_t - \bar{A}_t$ and $\widehat{\dot{\beta}}_t = \widehat{\beta}_t - \bar{B}_t$. In addition to functioning for normalization, these time-varying median values encompass the *world trend* of the exporter/importer shock.

During the last decade, geopolitical factors have played an important role in reshaping trade relations. The countries have been assigned to different trading blocs or to a non-aligned group. In the empirical application of Section 3.4 we present different country groupings.

Let us identify the trading bloc with TB. We compute the median of the normalized exporter/importer shocks *within each trading bloc*. This can be interpreted as the component of each exporter/importer shock due to the *affiliation* to TB. Let us define them as $\widehat{\bar{\alpha}}^{TB}_{n,t} = median_{n\in TB}(\widehat{\dot{\alpha}}_{n,t})$ and $\widehat{\bar{\beta}}^{TB}_{m,t} = median_{m\in TB}(\widehat{\dot{\beta}}_{m,t})$.

Hence, in each exporter/importer shock we have three components:

[9] Differently from Amiti and Weinstein (2018) we do not have to deal with possible $X_{mn,t-1} = 0$ and $X_{mn,t} > 0$ in our sample.

$$\widehat{\alpha}_{n,t} = \bar{A}_t + \widehat{\bar{\alpha}}^{TB}_{n,t} + \widehat{\tilde{\alpha}}_{n,t} \tag{3.5}$$

$$\widehat{\beta}_{m,t} = \bar{B}_t + \widehat{\bar{\beta}}^{TB}_{m,t} + \widehat{\tilde{\beta}}_{m,t} \tag{3.6}$$

The sample moments (3.2) and (3.3) become:

$$d_{M,t} = \bar{A}_t + \bar{B}_t + \widehat{\tilde{\beta}}_{m,t} + \widehat{\bar{\beta}}^{TB}_{m,t} + \sum_n \phi_{mn,t-1}\widehat{\bar{\alpha}}^{TB}_{n,t} + \sum_n \phi_{mn,t-1}\widehat{\tilde{\alpha}}_{n,t} \tag{3.7}$$

$$d_{N,t} = \bar{A}_t + \bar{B}_t + \widehat{\tilde{\alpha}}_{n,t} + \widehat{\bar{\alpha}}^{TB}_{n,t} + \sum_m \theta_{mn,t-1}\widehat{\bar{\beta}}^{TB}_{m,t} + \sum_m \theta_{mn,t-1}\widehat{\tilde{\beta}}^{TB}_{m,t} \tag{3.8}$$

In matrix form, as derived in Appendix **??**:

$$\mathbf{D}_{M,t} = \underbrace{\widetilde{\mathbf{B}}_t}_{\text{exporter shock}} + \underbrace{(\bar{A}_t + \bar{B}_t)\mathbf{1}_M}_{\text{world trend shock}} + \underbrace{(\bar{\mathbf{B}}^{TB}_t + \mathbf{\Phi}_{t-1}\bar{\mathbf{A}}^{TB}_t)}_{\text{trading bloc shock}} + \underbrace{\mathbf{\Phi}_{t-1}\widetilde{\mathbf{A}}_t}_{\text{importer shock}} \tag{3.9}$$

$$\mathbf{D}_{N,t} = \widetilde{\mathbf{A}}_t + (\bar{A}_t + \bar{B}_t)\mathbf{1}_N + (\bar{\mathbf{A}}^{TB}_t + \mathbf{\Theta}_{t-1}\bar{\mathbf{B}}^{TB}_t) + \mathbf{\Theta}_{t-1}\widetilde{\mathbf{B}}_t \tag{3.10}$$

Let us define with $w_{m,t} \equiv \frac{\sum_{n\neq m} X_{mn,t-1}}{\sum_m \sum_{n\neq m} X_{mn,t-1}}$ the world weight of country m and insert these weights into the (row) vector $\mathbf{W}_{M,t}$.

When aggregating the Equation (3.9) of the system above with $\mathbf{W}_{M,t}$, we obtain the *growth rate of world exports* D_t and we can identify the different driving shocks:

$$\begin{aligned} D_t = \mathbf{W}_{M,t}\mathbf{D}_{M,t} = & \underbrace{\mathbf{W}_{M,t}\widetilde{\mathbf{B}}_t}_{\text{exporters component}} + \underbrace{(\bar{A}_t + \bar{B}_t)\mathbf{W}_{M,t}\mathbf{1}_M}_{\text{world trend component}} + \underbrace{\mathbf{W}_{M,t}(\bar{\mathbf{B}}^{TB}_t + \mathbf{\Phi}_{t-1}\bar{\mathbf{A}}^{TB}_t)}_{\text{trading blocs component}} + \\ & + \underbrace{\mathbf{W}_{M,t}\mathbf{\Phi}_{t-1}\widetilde{\mathbf{A}}_t}_{\text{importers component}} \end{aligned} \tag{3.11}$$

Besides this first natural aggregation, countries can be assigned in different groups depending on their economic or geopolitical characteristics, and we can identify more thoroughly the role of the different components within each bloc.

3.4 Empirical Analysis

In the next sessions we are going to investigate the main results deriving from the Aw decomposition. It is important to remember that these results are not causal but they do provide useful insights on the dynamics shaping trade.

3.4.1 Decomposing the Growth of World Exports

Our first focus is uncovering the various drivers of world exports growth by applying the decomposition proposed in Equation (3.11). This is reported in three-part Figure 3.3 that treats distinctly

three different definitions of trading blocs – the first two with a geopolitical view and the latter referring to the main regional trade agreements.

Figure 3.3a presents the decomposition of the global export growth rate using the classification proposed by Bonadio et al. (2025). In particular, Bonadio et al. (2025) assigned countries into three groups – China-aligned, US-aligned, and Unaligned – based on the relative changes in bilateral trade costs between each country i and China or the United States.[10] The height and sign of each colored bar in all years represent the magnitude (in percentage) of all components.

The world-trend component contributes consistently with the cycle of merchandise growth. It plays a relevant role during the three years (2018, 2021 and 2022) of highest growth reaching a magnitude close to (positive) one third of total variation. These percentage contributions remain similar across the different definitions of trade blocs in the other two cases, as expected to be the world trend component less affected by the trade bloc definitions.

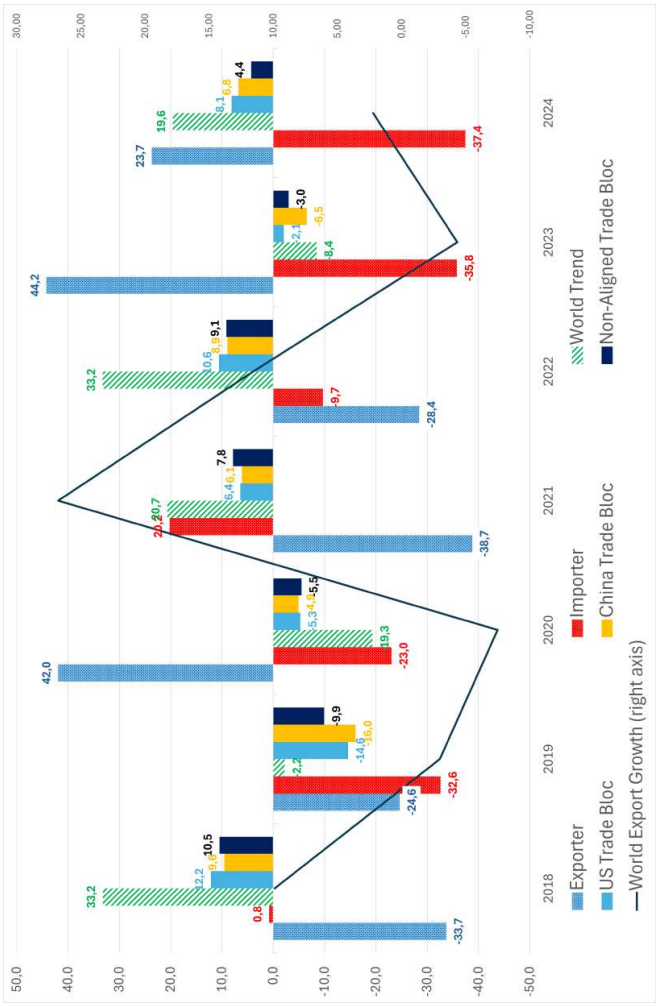
One clear feature is the relevant role of both country-related components. The Outward Resistance component (or exporter/supply shock) is consistently negative in late recession years such as 2021 and 2022 but turns positive in the next two years (contributing on average by one third of the total variation independently on the sign). The Inward Resistance component (or importer/demand shock) also contributes considerably, since it accounts for -35.8% and -37.4% of total export variation in the last two years of the sample.

The Trading Bloc (TB) components do not have such a strong impact on the export dynamics when considered separately but when aggregated into a general TB component. Their highest impact is found in 2018 and 2019, respectively, -32.3% and -40.5%. Both the Chinese and the US blocs accounted for the largest part of the trade tensions started with the muscular trade policy of the first Trump administration. Their role fades away, especially in 2023, but there is a rebound in 2024. The three components move in the same direction all the time. The Unaligned component, as expected, does not dominate, but it is in line with the fact that unaligned countries benefit mostly by trading with both the other two blocs and not within their heterogeneous group.

In the General Geopolitical classification of Figure 3.3b we overcome the problem of a generic group of unaligned countries and assign them to a western-prone or a nonwestern-prone (pseudo)bloc. As a result, the main changes with respect to Figure 3.3a are found in the role of the trading blocs. Once again, their more active role is found in the early years of the sample. In particular, the US bloc represents the component with the highest (negative) weight in 2019 (-41.8%) and in 2018 counts for more than (positive) 1/6 of total variation. When assigning the unaligned countries into two pseudo-aligned groups, we found interesting cases of opposite signs in the contribution of the US bloc and the Western-aligned group (2024), and the contribution of the Chinese bloc and the non-Western-aligned countries (2019). This latter case may indicate the re-organization of the supply chains as a consequence of the trade war between China and the US.

Finally, Figure 3.3c shows that the redefinition of economic content-based trading blocs has an impact not only on the role of trading blocs, but also on the Inward and Outward Resistance terms. This is expected since some of the variation in export growth is absorbed within the blocs. The most relevant change with respect to the previous two figures based on geopolitical groupings is the fact that both exporter/supply-side and importer/demand-side shocks move in the same directions,

[10] We recall that Bonadio et al. (2025) estimate the trade costs that they use in their classification by using a model like Equation (3.1).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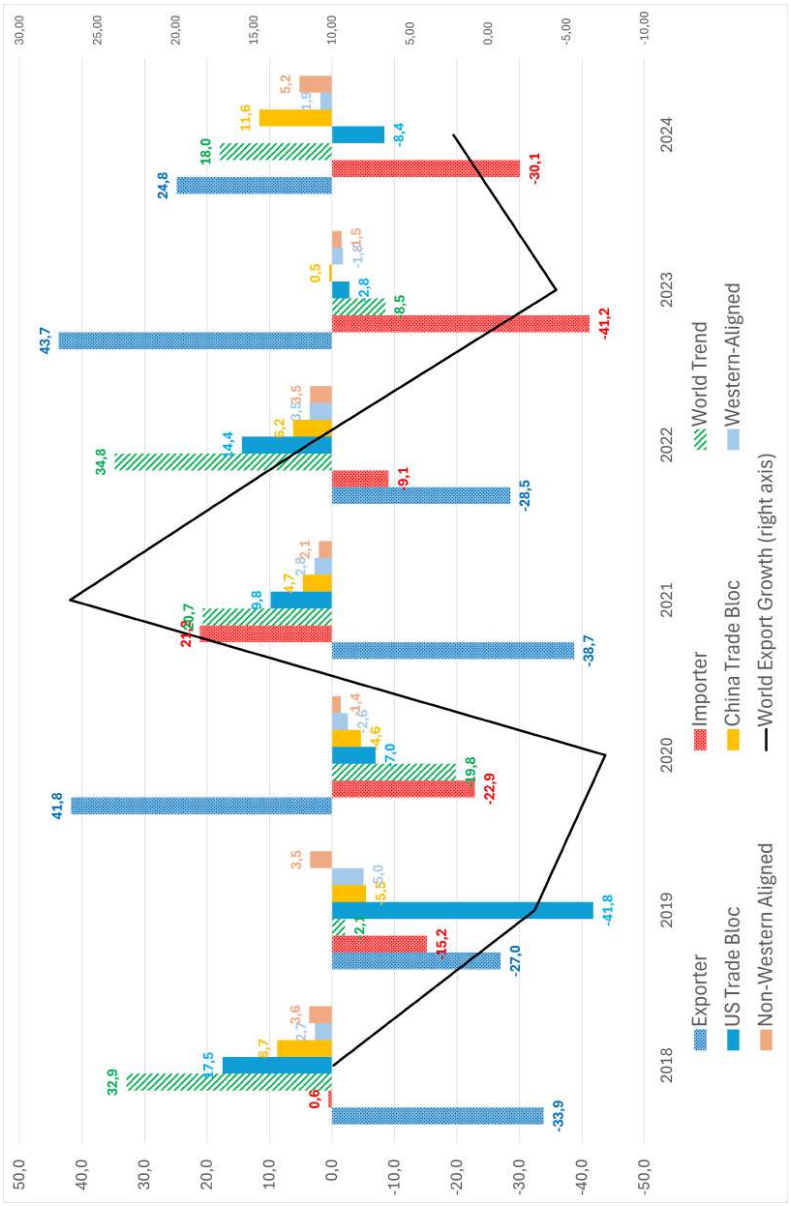
US Trade Bloc
China Trade Bloc
Non-Aligned Trade Bloc
World Export Growth (right axis)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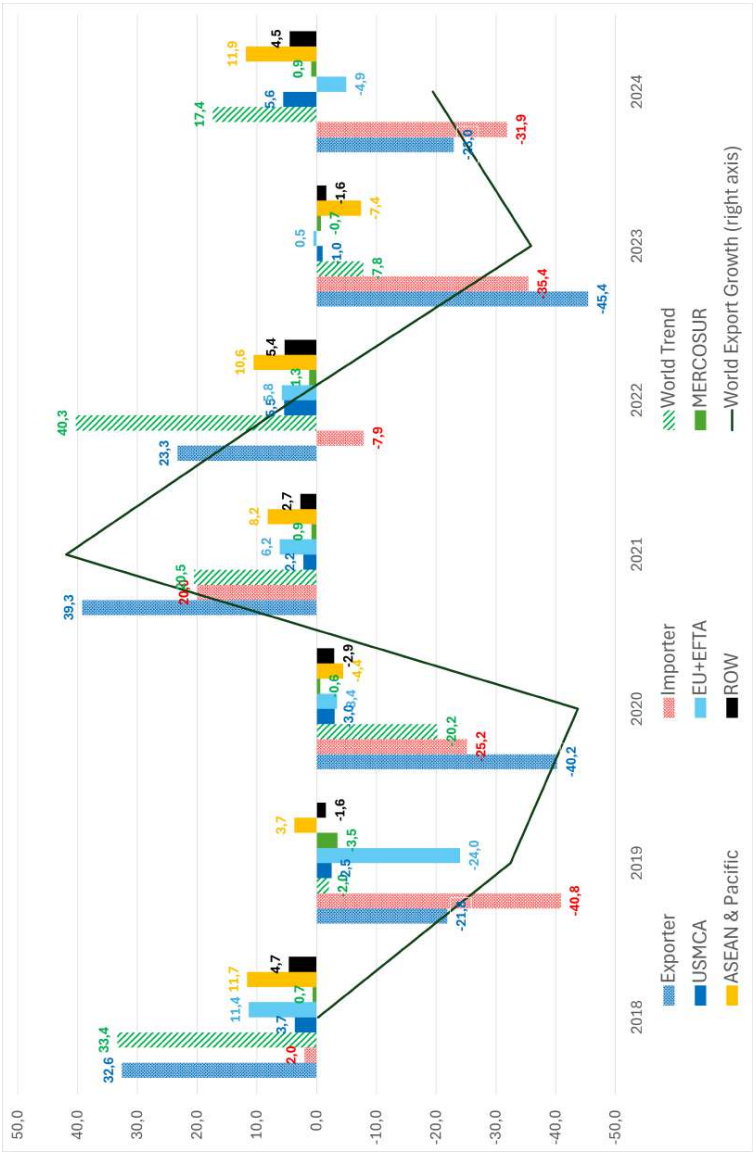
China Trade Bloc
World Export Growth (right axis)
World Trend
Western-Aligned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2024
Exporter
USMCA
ASEAN & Pacific
Importer
EU+EFTA
ROW
World Trend
MERCOSUR
World Export Growth (right axis)

except for 2022 when sanctions on Russia seem to have affected mainly the demand side. The Asian bloc stands out as the one with the highest contribution, both positive and negative. In each year of the sample, the contribution of each economic bloc has had the same sign. The only two exceptions are 2019, when the Asian bloc had the only positive sign, probably as an inward reaction to the US trade tariffs, and 2024, when the EU+EFTA bloc showed the only negative sign, likely as a long wave of the energy crisis in 2023.

3.4.2 The Role of Hegemons

From the components of each trading bloc presented in Figure 3.3 we extracted the contributions of the hegemon countries (either the US or China) that are illustrated in Figure 3.4.

Along with the two geopolitical groups and the economic grouping based on regional trade agreements, we have considered two additional economic-meaningful groups.[11] In the first one (US + EU Core) the US is gathered with the UK and four major European countries (France, Germany, Italy, and Spain). In the second (Asia Core), only Australia, Hong Kong, India, Indonesia, Japan, Pakistan, and South Korea have been considered as partners of China, whose regional trade links are very strong. In fact, the weight of the US in the USMCA and of China in the ASEAN & Pacific are disproportionate, therefore, we decided to also present these opportunely-revised blocs.

For the United States, the contribution is highly volatile across different periods, but generally stable if we look at the different classifications. The role of the US as a driver of the trading bloc component is mostly visible in the economic classification, where it stands out (around the 65%) in the USMCA agreement as expected given the disproportionate dimension of the three countries. Its role is highly reduced to more than 1/4 when considering the US+EU Core bloc where the sign contrasts the overall effect of this latter bloc with respect to USMCA. In the geopolitical classifications, the U.S. plays a smaller role, contributing to the first by 23-24% and to the latter by only 15%. This indicates that when the bloc is broadly defined (e.g., including all European Union countries), the U.S. influence is diluted.

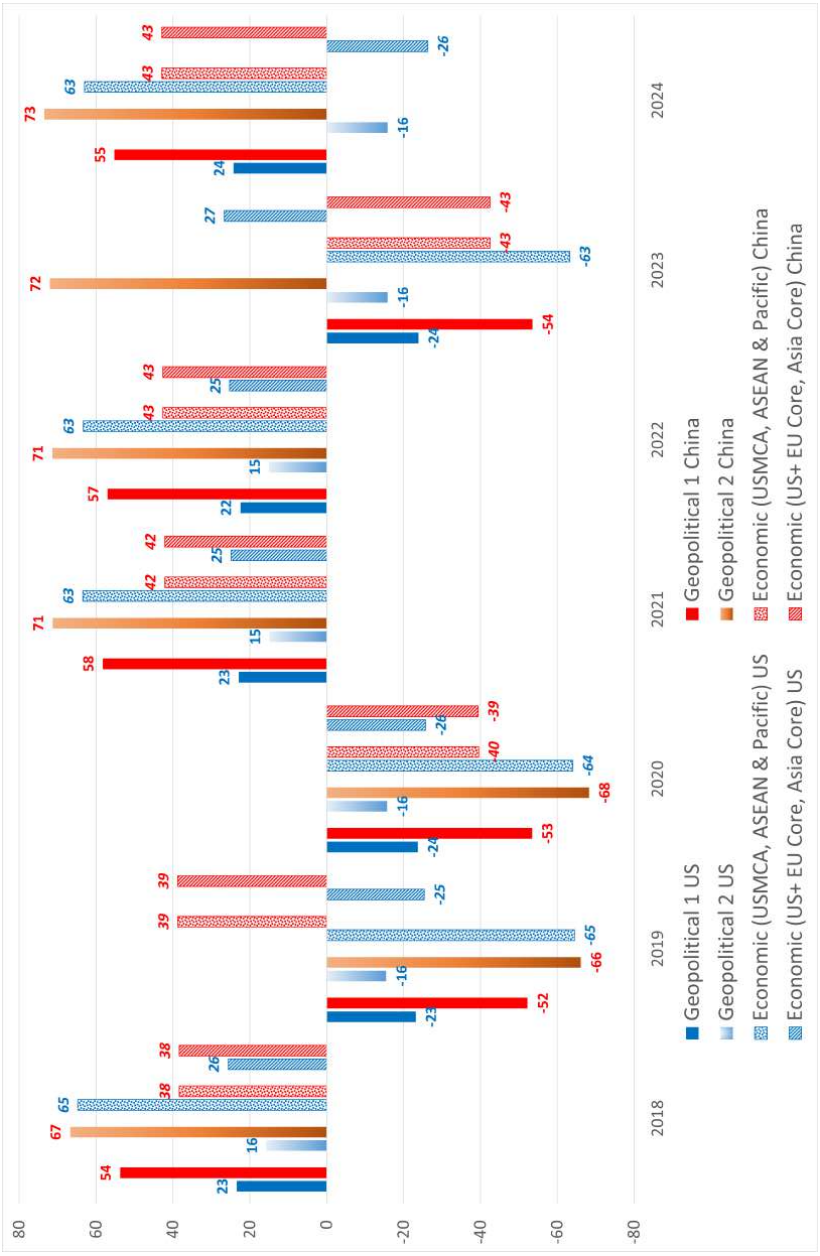
China, on the other hand, appears as a much more consistent and dominant driver within the trading bloc across all classifications. If we consider the first larger economic classification, in opposition to the US the role of China is less preponderant due to the fact that the Asean and the Pacific group is wider and more heterogeneous. However, if we look at the geopolitical classifications, China always explains most of the variation (on average 58%) in the component of the trading bloc defined according to the first classification, and more than 60% if we look at the latter classification.

Overall, these graphs suggest that China's role is structurally more central to its trade blocs, regardless of the classification used, while the US influence is sensitive to how the bloc is defined and appears weaker when broader economic groupings are considered.

3.5 Conclusions and Future Work

This paper applies a decomposition method, originally proposed by Amiti and Weinstein (2018) for bank-firm lending, to the domain of international trade. The key advantage of this approach lies in its ability to isolate and quantify the roles of exporter and importer shocks, as well as the trade-bloc

[11] See Appendix .10.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Geopolitical 1 US
Geopolitical 2 US
Economic (USMCA, ASEAN & Pacific) US
Economic (US+ EU Core, Asia Core) US
Geopolitical 1 China
Geopolitical 2 China
Economic (USMCA, ASEAN & Pacific) China
Economic (US+ EU Core, Asia Core) China

and global shocks, while retaining the relevant information of bilateral trade data. By aggregating granular bilateral flows through weighted contributions, the method minimizes distortions from extreme outliers and avoids the need to exclude volatile trade pairs. This allows us to work on the full sample of trade partners without excluding outliers.

We obtained insightful components of the dynamics of trade flows based on more reliable growth rates of total exports and imports of each country, rather than the more volatile growth rates of bilateral trade flows. These components are identified from the sample moment conditions related to the WLS estimation of bilateral trade flows.

In the gravity model of trade, inward and outward resistance terms are the components associated with the overall components. Our contribution is to disentangle at the country level what drives these general resistance terms. In particular, besides the inward (demand-side) and outward (supply-side) effects, our decomposition is able to identify a global and a trading-bloc component. In this initial exercise, we show the importance of these latter components in the dynamics of world exports.

A first preliminary analysis shows that geopolitical blocs play a non-negligible role, but the long-lasting traditional economic blocs still offer strong resilience with the intra-bloc dynamics. Secondly, we have investigated by how much the US and China contribute to the trade bloc component depending on the type of classification used. We find that when the bloc is broadly defined, the US influence is diluted. China, on the other hand, appears as a much more consistent and dominant driver within the trading bloc across all classifications.

The possibility of deriving exporter and importer shocks at the country level that are fully consistent on the dynamics of exports, together with shocks assigned to the country groupings relevant for the exporter, open a wide range of analyses that could be the objective of future work.

For instance, an important issue is the effect of sanctions as it can be analyzed via the different identified shocks. The second war in Ukraine and the consequent imposition of sanctions have significantly reshaped the geography and dynamics of global trade. The economic literature has extensively analyzed the impact of these events with some studies focusing on trade disruptions (Imbs and Pauwels (2022), Mancini et al. (2024), and Egorov et al. (2024)). Notably, recent work by Yalcin et al. (2024) introduces the fourth version of the Global Sanctions Database. Already in February 2023, a working paper by Chupilkin et al. (2023) shows evidence of sanction circumvention via trade rerouting through neighboring countries. Their analysis shows a sharp decline in direct EU exports to Russia after the sanctions began in March 2022, alongside a notable rise in EU exports to Armenia, Kazakhstan, and Kyrgyzstan — all part of the Eurasian Customs Union. We believe that a thorough analysis of the identified components of export dynamics we propose in the current work could help uncover the effects of sanctions on Russia and on its partners and determine the possible routes of sanction circumvention.

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Appendix 1 — To Russia with (less) love: Sanctions and the decline of EU exports

.1 Robustness Checks

Table 1 reports the results of a Synthetic Difference-in-Differences (SDID) analysis conducted as a robustness check for the year 2014. The coefficient on the treatment indicator (tarafter) is negative and statistically significant at the 5% level, with a value of -0.108 and a t-statistic of -2.46. This suggests that, even when allowing for a more flexible weighting scheme that adjusts for potential imbalance between treated and control units, the imposition of sanctions is associated with a significant decline in the adjusted value of exports. The direction and significance of the effect are consistent with the baseline DiD estimates, reinforcing the credibility of the main findings. The larger magnitude of the SDID coefficient relative to the baseline DiD estimate is expected, as the synthetic weighting scheme down-weights control units that follow dissimilar pre-treatment trends, thereby reducing attenuation bias and yielding a cleaner — and typically stronger — estimate of the treatment effect.

Table 1: SDID analysis for 2022

	(1)
	value_adj
sanctions effect	-0.108*
	(-2.46)
Observations	16112

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 5 displays the SDID diagnostic plot comparing the trends in the outcome variable between the treated and synthetic control groups from 2019Q1 to 2024Q4. The vertical red line marks the onset of the treatment (in this case, the imposition of sanctions against Russia) around 2022Q1. Before the treatment, the treated group (solid red line) and the synthetic control group (dashed blue line) show relatively parallel trends, though the treated group has consistently higher values. This visual similarity in trends prior to 2022Q1 suggests that the SDID method successfully constructed a credible counterfactual for the treated units, enhancing the reliability of the estimated post-treatment effects. The green triangle at the bottom-left represents the distribution of the synthetic control weights (lambda) across control units. The sharp peak implies that the SDID estimator

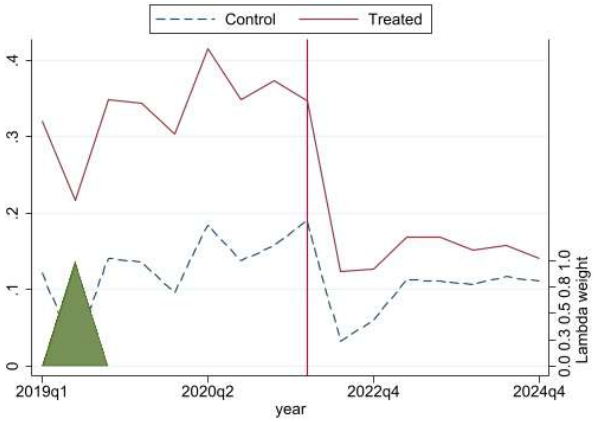

Figure 5: Synthetic Diff in diff- 2022

placed relatively high weight on a small number of control units in forming the synthetic control. This concentrated weighting is not uncommon in SDID applications and may reflect that only a few control units closely resemble the treated units in terms of pre-treatment trends and covariates. After the treatment, the treated group shows a clear and sustained drop in the outcome variable, while the synthetic control remains stable. This growing divergence supports the interpretation that the sanctions had a significant and negative impact on the outcome of interest — likely the adjusted value of exports from the EU to Russia.

To further corroborate the successful impact of sanctions we also show, in 6 the evolution of export values for the treated and control groups, normalized to 2019 levels (2019=100). Prior to the imposition of sanctions in 2022, both groups follow broadly similar trends, supporting the parallel trend assumption underlying the DiD estimation. Following the onset of the sanctions regime, the treated group experiences a sharp and persistent decline in export values, while the control group remains broadly stable. This divergence provides further visual evidence of the negative impact of sanctions on EU exports to Russia, consistent with the regression results reported in the main text.

.2 List of sanctioned and non-sanctioned commodities

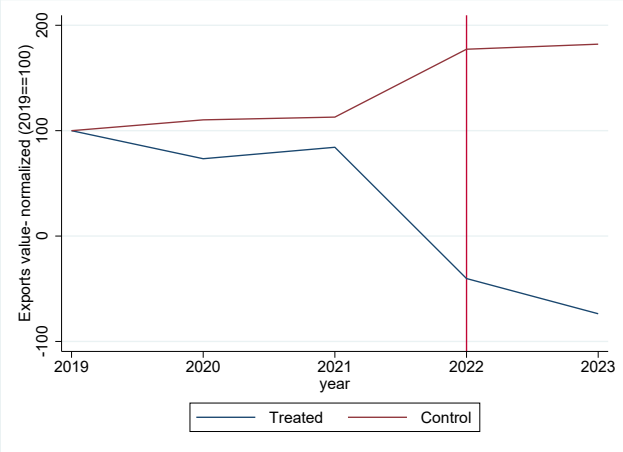

Figure 6: Graphic representation of the DiD model for the 2022 sanctions regime, with the export value is normalized (2019=100)

cmdcode	description	sanctioned
2204	Wine of fresh grapes, including fortified wines; grape must other than that of heading no. 2009	0
2206	Fermented beverages, n.e.c. in chapter 22; (e.g. cider, perry, mead, sake)	0
2207	Ethyl alcohol, undenatured; of an alcoholic strength by volume of 80% vol. or higher; ethyl alcohol and other spirits, denatured, of any strength	0
2208	Ethyl alcohol, undenatured; of an alcoholic strength by volume of less than 80% volume; spirits, liqueurs and other spirituous beverages	1
2209	Vinegar and substitutes for vinegar obtained from acetic acid	0
2302	Bran, sharps and other residues; whether or not in the form of pellets derived from the sifting, milling or other working of cereals or of leguminous plants	0
2303	Residues of starch manufacture, similar residues; beet-pulp, bagasse and other waste of sugar manufacture, brewing or distilling dregs and waste, whether or not in the form of pellets	1
2304	Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil	0
2306	Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of vegetable or microbial fats or oils, other than those of heading no. 2304 or 2305	0
2401	Tobacco, unmanufactured; tobacco refuse	0
2402	Cigars, cheroots, cigarillos and cigarettes; of tobacco or of tobacco substitutes	1
2403	Manufactured tobacco and manufactured tobacco substitutes n.e.c; homogenised or reconstituted tobacco; tobacco extracts and essences	0
2504	Graphite; natural	0
2505	Sands of all kinds; natural, whether or not coloured, other than metal-bearing sands of chapter 26	0
2507	Kaolin and other kaolinic clays; whether or not calcined	0
2508	Clays; (not including expanded clays of heading no. 6806), andalusite kyanite and sillimanite, whether or not calcined; mullite; chamotte or dinas earth	1
2509	Chalk	1
2511	Natural barium sulphate (barytes); natural barium carbonate, (witherite) whether or not calcined, other than barium oxide of heading no. 2816	1
2512	Siliceous fossil meals (e.g. kieselguhr, tripolite and diatomite) and similar siliceous earths; whether or not calcined, of an apparent specific gravity of 1 or less	1
2513	Pumice stone; emery; natural corundum, natural garnet and other natural abrasives, whether or not heat treated	1
2515	Marble, travertine, ecaussine and other calcareous stone; of an apparent specific gravity of less than 2.5, alabaster, whether cut by sawing etc, into blocks, slabs of a rectangular (square) shape	1
2516	Granite, porphyry, basalt, sandstone, other monumental and building stone, whether or not roughly trimmed, cut, by sawing etc, into blocks or slabs of a rectangular (including square) shape	1
2517	Pebbles, gravel, crushed stone for concrete aggregates for road or railway ballast, shingle or flint; macadam of slag, dross etc tarred granules, chippings, powder of stones of heading no. 2515 and 2516	1
2521	Limestone flux; limestone and other calcareous stone, of a kind used for the manufacture of lime or cement	1
2522	Quicklime, slaked lime and hydraulic lime; other than calcium oxide and hydroxide of heading no. 2825	1
2523	Portland cement, aluminous cement (ciment fondu), slag cement, supersulphate cement and similar hydraulic cements, whether or not coloured or in the form of clinkers	1
2525	Mica, including splittings; mica waste	1
2526	Natural steatite; whether or not roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a rectangular (including square) shape; talc	1
2528	Natural borates and concentrates thereof (whether or not calcined), but not including borates separated from natural brine; natural boric acid containing not more than 85 % of H3BO3 calculated on the dry weight	0
2529	Feldspar; leucite; nepheline and nepheline syenite; fluorspar	0
2701	Coal; briquettes, ovoids and similar solid fuels manufactured from coal	1
2703	Peat; (including peat litter), whether or not agglomerated	1
2704	Coke and semi-coke; of coal, lignite or peat, whether or not agglomerated; retort carbon	1
2706	Tar distilled from coal, from lignite, peat and other mineral tars, whether or not dehydrated or partially distilled; including reconstituted tars	1
2707	Oils and other products of the distillation of high temperature coal tar; similar products in which the weight of the aromatic constituents exceeds that of the non-aromatic constituents	1
2708	Pitch and pitch coke; obtained from coal tar or from other mineral tars	1
2709	Petroleum oils and oils obtained from bituminous minerals; crude	0
2710	Petroleum oils and oils from bituminous minerals, not crude; preparations n.e.c, containing by weight 70% or more of petroleum oils or oils from bituminous minerals; these being the basic constituents of the preparations; waste oils	1
2712	Petroleum jelly; paraffin wax, micro-crystalline petroleum wax, slack wax, ozokerite, lignite wax, peat wax, other mineral waxes, similar products obtained by synthesis, other processes; coloured or not	1
2713	Petroleum coke, petroleum bitumen; other residues of petroleum oils or oils obtained from bituminous minerals	1
2714	Bitumen and asphalt, natural; bituminous or oil shale and tar sands; asphaltites and asphaltic rocks	1
2715	Bituminous mixtures based on natural asphalt; on natural bitumen, on petroleum bitumen, on mineral tar or on mineral tar pitch (e.g. bituminous mastics, cut-backs)	1
2716	Electrical energy	0
2802	Sulphur; sublimed or precipitated, colloidal sulphur	0
2803	Carbon; carbon blacks and other forms of carbon n.e.c.	1
2804	Hydrogen, rare gases and other non-metals	1
2805	Alkali or alkaline-earth metals; rare-earth metals, scandium and yttrium, whether or not intermixed or interalloyed; mercury	0
2807	Sulphuric acid; oleum	0
2808	Nitric acid; sulphonitric acids	
2809	Diphosphorus pentaoxide; phosphoric acid; polyphosphoric acids, whether or not chemically defined	0
2810	Oxides of boron; boric acids	0
2811	Inorganic acids and other inorganic oxygen compounds of non-metals; n.e.c. in heading no. 2806 to 2810	1
2818	Aluminium oxide (including artificial corundum); aluminium hydroxide	1
2819	Chromium oxides and hydroxides	0
2825	Hydrazine and hydroxylamine and their inorganic salts; other inorganic bases; other metal oxides, hydroxides and peroxides	1
2828	Hypochlorites; commercial calcium hypochlorite; chlorites; hypobromites	1
2834	Nitrites; nitrates	1
2835	Phosphinates (hypophosphites), phosphonates (phosphites), and phosphates; and polyphosphates, whether or not chemically defined	1
2836	Carbonates; peroxocarbonates (percarbonates); commercial ammonium carbonate containing ammonium carbamate	

cmdcode	description	sanctioned
cmdcode	description	tariff
2837	Cyanides, cyanide oxides and complex cyanides	0
2839	Silicates; commercial alkali metal silicates	1
2842	Salts of inorganic acids or peroxoacids, n.e.c. including aluminosilicates whether or not chemically defined, but excluding azides	0
2843	Colloidal precious metals; inorganic or organic compounds of precious metals, whether or not chemically defined; amalgams of precious metals	1
2846	Compounds, inorganic or organic, of rare-earth metals; of yttrium or of scandium or of mixtures of these metals	1
2847	Hydrogen peroxide; whether or not solidified with urea	1
2849	Carbides, whether or not chemically defined	1
2850	Hydrides, nitrides, azides, silicides and borides, whether or not chemically defined, other than compounds which are also carbides of heading no. 2849	1
2901	Acyclic hydrocarbons	1
2902	Cyclic hydrocarbons	1
2903	Halogenated derivatives of hydrocarbons	1
2904	Sulphonated, nitrated or nitrosated derivatives of hydrocarbons; whether or not halogenated	1
2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2906	Alcohols; cyclic, and their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2907	Phenols; monophenols, polyphenols, and phenol-alcohols	1
2909	Ethers, ether-alcohols, ether-phenols, ether-alcohol-phenols, alcohol peroxides, ether peroxides, acetal and hemiacetal peroxides, ketone peroxides (chemically defined or not), and their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2910	Epoxides, epoxyalcohols, epoxyphenols and epoxyethers; with a three-membered ring and their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2911	Acetals and hemiacetals; whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrostated derivatives	1
2912	Aldehydes, whether or not with other oxygen function; cyclic polymers of aldehydes; paraformaldehyde	1
2913	Aldehydes; halogenated, sulphonated, nitrated or nitrosated derivatives of products of heading no. 2912	0
2914	Ketones and quinones; whether or not with other oxygen function, and their halogenated, sulphonated, nitrated or nitrostated derivatives	1
2915	Acids; saturated acyclic monocarboxylic acids and their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2916	Acids; unsaturated acyclic monocarboxylic, cyclic monocarboxylic, their anhydrides, halides, peroxides and peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2917	Acids; polycarboxylic acids, their anhydrides, halides, peroxides and peroxy-acids; their halogenated, sulphonated, nitrated or nitrosated derivatives	1
2918	Acids; carboxylic acid with additional oxygen function and their anhydrides, halides, peroxides, peroxyacids; their halogenated, sulphonated, nitrated or nitrosated derivatives	0
2919	Esters; phosphoric, and their salts, including lactophosphates, their halogenated, sulphonated, nitrated or nitrosated derivatives	0
2922	Oxygen-function amino-compounds	1
2923	Quaternary ammonium salts and hydroxides; lecithins and other phosphoaminolipids, whether or not chemically defined	1
2931	Other organo-inorganic compounds	1
3005	Wadding, gauze, bandages (dressings, adhesive plasters, poultices), impregnated or coated with pharmaceutical substances or in forms or packings for retail sale, for medical, surgical or veterinary use	0
3201	Tanning extracts of vegetable origin; tannins and their salts, ethers, esters and other derivatives	1
3202	Tanning substances; synthetic organic or inorganic tanning substances; tanning preparations, whether or not containing natural tanning substances, enzymatic preparations for pre-tanning	1
3203	Colouring matter of vegetable or animal origin (including dyeing extracts, not animal black); whether or not chemically defined; preparations based on colouring matter of vegetable or animal origin	1
3205	Colour lakes; preparations based on colour lakes as specified in note 3 to this chapter	1
3207	Pigments, prepared; opacifiers, colours, vitrifiable enamels, glazes, engobes (slips), liquid lustres etc as used in the ceramic enamelling or glass industry; glass frit and powder, granules or flakes	1
3208	Paints, varnishes; (enamels and lacquers) based on synthetic polymers or chemically modified natural polymers, dispersed or dissolved in a non-aqueous medium	1
3209	Paints and varnishes (including enamels and lacquers) based on synthetic or chemically modified natural polymers, dispersed or dissolved in an aqueous medium	1
3210	Paints and varnishes (including enamels, lacquers and distempers), excluding those of heading no. 3209, prepared water pigments of a kind used for finishing leather	1
3211	Driers; prepared	0
3214	Glaziers' putty, grafting putty, resin cements, caulking compounds and other mastics; painters' fillings; non-refractory surfacing preparations for facades, indoor walls, floors, ceilings or the like	1
3301	Oils; essential (concretes, absolutes); concentrates thereof in fats, fixed oils, waxes or the like (obtained by enfleurage or maceration); aqueous distillates, solutions and terpenic by-products thereof; resinoids; extracted oleoresins	1
3303	Perfumes and toilet waters	0
3304	Cosmetic and toilet preparations; beauty, make-up and skin care preparations (excluding medicaments, including sunscreen or sun tan preparations), manicure or pedicure preparations	1
3305	Hair preparations; for use on the hair	1
3306	Oral or dental hygiene preparations; including fixative pastes and powders; yarn used to clean between the teeth (dental floss), in individual retail packages	1
3307	Perfumery, cosmetic or toilet preparations; pre-shave, shaving, after-shave, bath preparations; personal deodorants and depilatories; room deodorisers, perfumed or not with disinfectant properties or not	1
3401	Soap; organic surface-active preparations used as soap, skin washing, in bars, cakes, moulded pieces, shapes, liquid or cream, containing soap or not; for retail, paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent	1
3402	Organic surface-active agents (not soap); surface-active, washing (including auxiliary washing) and cleaning preparations, containing soap or not, excluding those of heading no. 3401	1
3403	Lubricating preparations and those used in oil or grease treatment of textile and similar materials; excluding preparations containing 70% or more (by weight) of petroleum or bituminous mineral oils	1
3404	Waxes; artificial, prepared	1
3405	Polishes, creams, scouring pastes, powders and similar; in any form, (including articles impregnated, coated or covered with such), for furniture, footwear, floors, coachwork, glass or metal	0
3406	Candles, tapers and the like	0
3601	Explosives; propellent powders	1

cmdcode	description	sanctioned
3701	Photographic plates and film in the flat, sensitised, unexposed, of any material other than paper, paperboard or textiles; instant print film in the flat, sensitised, unexposed, whether or not in packs	0
3702	Photographic film in rolls, sensitised, unexposed, of any material other than paper, paperboard or textiles; instant print film in rolls, sensitised, unexposed	1
3703	Photographic paper, paperboard and textiles; sensitised, unexposed	1
3704	Photographic plates, film, paper, paperboard and textiles, exposed but not developed	0
3707	Chemical preparations for photographic uses (other than varnishes, glues, adhesives and similar preparations); unmixed products for photographic uses, put up in measured portions or for retail sale	0
3801	Artificial graphite; colloidal or semi-colloidal graphite; preparations based on graphite or other carbon in the form of pastes, blocks, plates or other semi-manufactures	1
3802	Activated carbon; activated natural mineral products; animal black, including spent animal black	0
3807	Wood tar; wood tar oils; wood creosote; wood naphtha; vegetable pitch; brewers' pitch and similar preparations based on rosin, resin acids or on vegetable pitch	1
3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products, plant growth regulators, disinfectants and the like, put up in forms or packings for retail sale or as preparations or articles	0
3809	Finishing agents, dye carriers to accelerate the dyeing, fixing of dyestuffs, other products and preparations, of a kind used in the textile, paper, leather or like industries, n.e.c. or included	1
3810	Metal-pickling preparations; fluxes etc for soldering, brazing; welding powders, pastes of metal and other materials; preparations used as cores or coatings for welding electrodes or rods	1
3811	Anti-knock preparations, oxidation and gum inhibitors, viscosity improvers, anti-corrosive preparations and the like, for mineral oils (including gasoline) or other liquids used for the same purposes	1
3812	Prepared rubber accelerators; compound plasticisers for rubber or plastics, n.e.c. or included; anti-oxidising preparations and other compound stabilisers for rubber or plastics	1
3813	Preparations and charges for fire extinguishers; charged fire-extinguishing grenades	1
3814	Organic composite solvents and thinners, not elsewhere specified or included; prepared paint or varnish removers	1
3815	Reaction initiators, reaction accelerators and catalytic preparations n.e.c. or included	1
3816	Refractory cements, mortars, concretes and similar compositions, including dolomite ramming mix, other than products of heading 38.01	1
3817	Mixed alkylbenzenes and mixed alkylnaphthalenes, other than those of heading no. 2707 or 2902	1
3819	Hydraulic brake fluids and other prepared liquids for hydraulic transmission, not containing or containing less than 70% by weight of petroleum oils or oils obtained from bituminous minerals	1
3820	Anti-freezing preparations and prepared de-icing fluids	1
3821	Prepared culture media for the development or maintenance of micro-organisms (including viruses and the like) or of plant, human or animal cells	0
3822	Reagents; diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents whether or not on a backing, whether or not put up in the form of kits, other than those of heading 30.06; certified reference materials	0
3823	Industrial monocarboxylic fatty acids; acid oils from refining; industrial fatty alcohols	1
3824	Prepared binders for foundry moulds or cores; chemical products and preparations of the chemical or allied industries (including those consisting of mixtures of natural products), not elsewhere specified or included	1
3901	Polymers of ethylene, in primary forms	1
3902	Polymers of propylene or of other olefins, in primary forms	1
3903	Polymers of styrene, in primary forms	1
3904	Polymers of vinyl chloride or of other halogenated olefins, in primary forms	1
3905	Polymers of vinyl acetate or of other vinyl esters, in primary forms; other vinyl polymers in primary forms	1
3906	Acrylic polymers in primary forms	1
3907	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms	1
3908	Polyamides in primary forms	1
3910	Silicones in primary forms	1
3912	Cellulose and its chemical derivatives, n.e.c. or included, in primary forms	1
3913	Natural polymers (e.g. alginic acid) and modified natural polymers (e.g. hardened proteins, chemical derivatives of natural rubber), n.e.c. or included, in primary forms	0
3914	Ion-exchangers; based on polymers of heading no. 3901 to 3913, in primary forms	0
3916	Monofilament of which any cross-sectional dimension exceeds 1mm, rods, sticks and profile shapes, whether or not surface-worked but not otherwise worked, of plastics	1
3918	Floor coverings of plastics, self-adhesive or not, in rolls or tiles; wall or ceiling coverings of plastics, in rolls of a width not less than 45cm	0
3919	Self-adhesive plates, sheets, film, foil, tape, strip and other flat shapes, of plastics, whether or not in rolls	1
3920	Plastics; plates, sheets, film, foil and strip (not self-adhesive); non-cellular and not reinforced, laminated, supported or similarly combined with other materials, n.e.c. in chapter 39	1
3921	Plastic plates, sheets, film, foil and strip n.e.c. in chapter 39	1
3923	Plastic articles for the conveyance or packing of goods; stoppers, lids, caps and other closures of plastics	1
3924	Tableware, kitchenware, other household articles and hygienic or toilet articles, of plastics	0
3925	Plastics; builders' wares n.e.c. or included	1
3926	Articles of plastics and articles of other materials of heading no. 3901 to 3914, n.e.c. in chapter 39	1
4001	Natural rubber, balata, gutta-percha, guayule, chicle and similar gums; in primary forms or in plates, sheets or strip	1
4002	Synthetic rubber and factice derived from oils, in primary forms or in plates, sheets or strip; mixtures of heading no. 4001 and 4002, in primary forms or in plates, sheets or strip	1
4003	Reclaimed rubber in primary forms or in plates, sheets or strip	1
4004	Waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom	1
4005	Compounded rubber, unvulcanised, in primary forms or in plates, sheets or strip	1
4007	Vulcanised rubber thread and cord	0
4010	Conveyor or transmission belts or belting, of vulcanised rubber	0
4011	New pneumatic tyres, of rubber	1
4012	Retreaded or used pneumatic tyres of rubber; solid or cushion tyres, tyre treads and tyre flaps, of rubber	1
4013	Inner tubes, of rubber	0
4107	Leather further prepared after tanning or crusting, including parchment-dressed leather, of bovine (including buffalo) or equine animals, without hair on, whether or not split, other than leather of heading 41.14	1
4201	Saddlery and harness for any animal (including traces, leads, knee pads, muzzles, saddle cloths, saddle bags, dog coats and the like) of any material	0
4202	Trunks; suit, camera, jewellery, cutlery cases; travel, tool, similar bags; wholly or mainly covered by leather, composition leather, plastic sheeting, textile materials, vulcanised fibre, paperboard	1
4301	Raw furskins (including heads, tails, paws, other pieces or cuttings, suitable for furriers' use), excluding raw hides and skins of heading no. 4101, 4102 or 4103	1
4302	Tanned or dressed furskins (including heads, tails, paws, other pieces, cuttings), unassembled, or assembled (without addition of other materials), excluding those of heading no. 4303	0

cmdcode	description	sanctioned
4503	Cork; articles of natural cork	1
4504	Agglomerated cork (with or without a binding substance) and articles of agglomerated cork	1
4701	Wood pulp, mechanical wood pulp	1
4702	Chemical wood pulp, dissolving grades	0
4703	Chemical wood pulp, soda or sulphate, other than dissolving grades	1
4704	Chemical wood pulp, sulphite, other than dissolving grades	1
4705	Wood pulp obtained by a combination of mechanical and chemical pulping processes	1
4706	Pulps of fibres derived from recovered (waste and scrap) paper or paperboard or of other fibrous cellulosic material	1
4707	Waste and scrap of paper and paperboard	1
4801	Newsprint, in rolls or sheets	1
4802	Uncoated paper and paperboard, used for writing, printing or other graphics, non perforated punch-cards and punch tape paper, in rolls or rectangular sheets, of any size, other than paper of heading 4801 or 4803; hand-made paper and paperboard	1
4803	Tissue, towel, napkin stock or similar; for household or sanitary uses, cellulose wadding, webs of cellulose fibres, in rolls over 36cm in width or rectangular sheets with one side exceeding 36cm when unfolded	1
4804	Uncoated kraft paper and paperboard, in rolls or sheets, other than that of heading no. 4802 or 4803	1
4805	Uncoated paper and paperboard n.e.c., in rolls or sheets	1
4806	Vegetable parchment, greaseproof papers, tracing papers, glassine and other glazed transparent or translucent papers, in rolls or sheets	1
4807	Composite paper and paperboard, (made by sticking layers together with an adhesive), not surface-coated or impregnated, whether or not internally reinforced, in rolls or sheets	1
4809	Carbon paper, self copy paper, and other copying or transfer papers (including coated or impregnated paper for duplicator stencils or offset plates), whether or not printed, in rolls or sheets	1
4810	Paper and paperboard, coated one or both sides with kaolin (china clay) or inorganic substances, with binder or not, no other coating, surface coloured or not, surface decorated or printed, in rolls or rectangular (including square) sheets, of any size	1
4811	Paper, paperboard, cellulose wadding and webs of cellulose fibres, coated, impregnated, covered, surface-coloured, decorated or printed, rolls or sheets, other than goods of heading no. 4803, 4809, or 4810	1
4812	Filter blocks, slabs and plates of paper pulp	0
4817	Envelopes, letter cards, plain postcards and correspondence cards, of paper, paperboard; boxes, pouches, wallets and writing compendiums, of paper or paperboard containing assortment of paper stationery	0
4818	Toilet paper, width 36cm or less or cut to size/shape; handkerchiefs, tissues, towels, serviettes, bed sheets and similar household or hospital articles, apparel and clothing accessories of paper pulp, paper, cellulose wadding or webs of cellulose fibres	1
4819	Cartons, boxes, cases, bags and the like, of paper, paperboard, cellulose wadding or fibres; box files, letter trays and the like, of paper or paperboard, of a kind used in offices, shops or the like	1
4821	Paper or paperboard labels of all kinds, whether or not printed	0
4822	Bobbins, spools, cops and similar supports of paper pulp, paper or paperboard (whether or not perforated or hardened)	1
4823	Paper, paperboard, cellulose wadding and webs of cellulose fibres; cut to size or shape, articles of paper pulp, paper and paper-board, cellulose wadding or webs of cellulose fibres, n.e.c. in chapter 48	1
4905	Maps and hydrographic or similar charts of all kinds, including atlases, wall maps, topographical plans and globes, printed	0
4906	Plans and drawings; for architectural, engineering, industrial, commercial, topographical or similar, being originals drawn by hand; hand-written texts; photo- graphic reproductions; their carbon copies	1
4907	Unused postage, revenue or similar stamps of current or new issue in the country in which they have, or will have, a recognised face value; stamp-impressed paper; cheque forms; banknotes, stock, share or bond certificates and the like of similar title	0
5104	Wool, or fine or coarse animal hair; garnetted stock	0
5105	Wool and fine or coarse animal hair; carded or combed (including combed wool in fragments)	1
5106	Yarn of carded wool, not put up for retail sale	1
5107	Yarn of combed wool, not put up for retail sale	1
5108	Yarn of fine animal hair (carded or combed), not put up for retail sale	0
5109	Yarn of wool or of fine animal hair, put up for retail sale	0
5110	Yarn of coarse animal hair or of horsehair (including gimped horsehair yarn), whether or not put up for retail sale	0
5111	Woven fabrics of carded wool or of carded fine animal hair	0
5112	Woven fabrics of combed wool or of combed fine animal hair	1
5113	Woven fabrics of coarse animal hair or of horsehair	0
5203	Cotton, carded or combed	0
5204	Cotton sewing thread, whether or not put up for retail sale	0
5205	Cotton yarn (other than sewing thread), containing 85% or more by weight of cotton, not put up for retail sale	1
5211	Woven fabrics of cotton, containing less than 85% by weight of cotton, mixed mainly or solely with man-made fibres, weighing more than 200g/m2	1
5212	Other woven fabrics of cotton, n.e.c. in chapter 52	0
5307	Yarn of jute or of other textile bast fibres of heading no. 5305	0
5308	Yarn of other vegetable textile fibres; paper yarn	1
5401	Sewing thread of man-made filaments, whether or not put up for retail sale	0
5402	Synthetic filament yarn (other than sewing thread), not put up for retail sale, including synthetic monofilament of less than 67 decitex	1
5403	Artificial filament yarn (other than sewing thread), not put up for retail sale, including artificial monofilament of less than 67 decitex	1
5404	Synthetic monofilament of 67 decitex or more, of which no cross-sectional dimension exceeds 1mm; strip and the like (e.g. artificial straw) of synthetic textile materials of an apparent width not exceeding 5mm	1
5405	Artificial monofilament of 67 decitex or more, no cross-sectional dimension exceeds 1mm; strip and the like (e.g. artificial straw), of artificial textile materials of a width not exceeding 5mm	0
5501	Synthetic filament tow	1
5502	Artificial filament tow	1
5503	Synthetic staple fibres, not carded, combed or otherwise processed for spinning	1
5506	Synthetic staple fibres, carded, combed or otherwise processed for spinning	1
5507	Artificial staple fibres, carded, combed or otherwise processed for spinning	1
5508	Sewing thread of man-made staple fibres, whether or not put up for retail sale	0
5515	Woven fabrics of synthetic staple fibres, n.e.c. in chapter 55	0
5516	Woven fabrics of artificial staple fibres	1
5601	Wadding of textile materials and articles thereof; textile fibres, not exceeding 5 mm in length (flock), textile dust and mill neps	1
5602	Felt; whether or not impregnated, coated, covered or laminated	0
5603	Nonwovens; whether or not impregnated, coated, covered or laminated	1

cmdcode	description	sanctioned
5604	Rubber thread and cord, textile covered; textile yarn and strip and the like of heading no. 5404, 5405; impregnated, coated, covered or sheathed with rubber or plastics	1
5605	Yarn; metallised, whether or not gimped, of textile yarn, or strip or the like of heading no. 5404 or 5405, combined with metal in the form of thread, strip or powder or covered with metal	1
5606	Yarn and strip and the like of heading no. 5404 or 5405, gimped (other than those of heading no. 5606 and gimped horsehair yarn); chenille yarn (including flock chenille yarn); loop wale-yarn	0
5802	Fabrics; terry towelling and similar woven terry fabrics other than narrow fabrics of heading no. 5806; tufted textile fabrics, excluding products of heading no. 5703	0
5803	Gauze; other than narrow fabrics of heading no. 5806	1
5901	Textile fabrics, gum or amylaceous substance coated, used for outer book covers and like; tracing cloth, prepared painting canvas; buckram and similar stiffened textile fabrics used for hat foundation	1
5902	Textile fabrics; tyrecord of high tenacity yarn of nylon or other polyamides polyesters or viscose rayon	0
5906	Textile fabrics, rubberised; other than those of heading no. 5902	0
5907	Textile fabrics; otherwise impregnated, coated or covered; painted canvas being theatrical scenery, studio back-cloths or the like	0
5908	Textile wicks, woven, plaited or knitted; for lamps, stoves, lighters, candles or the like; incandescent gas mantles and tubular knitted gas mantle fabric therefor, whether or not impregnated	1
5909	Textile hose piping and similar textile tubing; with or without lining, armour or accessories of other materials	0
5910	Textiles; transmission or conveyor belts or belting, of textile material, whether or not impregnated, coated, covered or laminated with plastics, or reinforced with metal or other material	1
6003	Fabrics; knitted or crocheted fabrics, other than those of heading 60.01 and 60.02, of a width not exceeding 30 cm,	1
6004	Fabrics; knitted or crocheted fabrics of a width exceeding 30 cm, other than those of heading 60.01, containing by weight 5% or more of elastomeric yarn or rubber thread	0
6203	Suits, ensembles, jackets, blazers, trousers, bib and brace overalls, breeches and shorts (other than swimwear); men's or boys' (not knitted or crocheted)	0
6204	Suits, ensembles, jackets, dresses, skirts, divided skirts, trousers, bib and brace overalls, breeches and shorts (other than swimwear); women's or girls' (not knitted or crocheted)	1
6305	Sacks and bags, of a kind used for the packing of goods	1
6306	Tarpaulins, awnings and sunblinds; tents (including temporary canopies and similar articles); sails for boats, sailboards or landcraft; camping goods	0
6307	Textiles; made up articles n.e.c. in chapter 63, including dress patterns	0
6308	Textiles; sets of woven fabric and yarn, with or without accessories, for making into rugs, tapestries, embroidered tablecloths, serviettes and similar textile articles, in packings for retail sale	0
6309	Textiles; worn clothing and other worn articles	1
6402	Footwear; with outer soles and uppers of rubber or plastics (excluding waterproof footwear)	0
6403	Footwear; with outer soles of rubber, plastics, leather or composition leather and uppers of leather	1
6805	Abrasive powder or grain; natural or artificial, on a base of textile material, of paper, paperboard or of other material, whether or not cut to shape or sewn or otherwise made up	0
6806	Slag, rock wool and similar mineral wools; exfoliated vermiculite, expanded clays, foamed slag, mixtures and articles of heat, sound insulating or sound-absorbing mineral materials	1
6807	Asphalt or similar material; articles (e.g. petroleum bitumen or coal tar pitch)	1
6808	Panels, boards, tiles, blocks and the like; of vegetable fibre, of straw, shavings, chips, particles, sawdust or other waste, of wood, agglomerated with cement, plaster or other mineral binders	1
6810	Cement, concrete or artificial stone; whether or not reinforced, articles thereof	1
6811	Asbestos-cement, of cellulose fibre-cement or the like	1
6812	Fabricated asbestos fibres; mixtures with a basis of asbestos or of asbestos and magnesium carbonate; articles of such mixtures or of asbestos (e.g. thread, woven fabric, clothing, footwear), whether or not reinforced, not goods of heading 6811 or 6813	0
6813	Friction material and articles thereof (e.g. sheets, rolls, strips, segments, discs, washers, pads) not mounted; for brakes, clutches or the like, with a basis of asbestos, other mineral substances, or cellulose	1
6814	Mica; worked, articles of, including agglomerated or reconstituted mica; whether or not on a support of paper, paperboard or other materials	1
6815	Stone or other mineral substances; articles thereof (including carbon fibres, articles of carbon fibres and articles of peat), not elsewhere specified or included	1
6901	Bricks, blocks, tiles and other ceramic goods of siliceous fossil meals (e.g. kieselguhr, tripolite or diatomite) or of similar siliceous earths	1
6902	Refractory bricks, blocks, tiles and similar refractory ceramic constructional goods; other than those of siliceous fossil meals or similar siliceous earths	1
6903	Ceramic goods; (e.g. retorts, crucibles, muffles, nozzles, plugs, supports cupels, tubes, pipes, sheaths, rods and slide gates) excluding those of siliceous fossil meals or of similar siliceous earths	0
6905	Roofing tiles, chimney-pots, cowls, chimney liners, architectural ornaments and other ceramic constructional goods	1
6906	Ceramic pipes, conduits, guttering and pipe fittings	1
6907	Ceramic flags and paving, hearth or wall tiles; ceramic mosaic cubes and the like, whether or not on a backing; finishing ceramics	1
7001	Glass; cullet and other waste and scrap of glass, excluding glass from cathode ray tubes or other activated glass of heading 85.49, glass in the mass	0
7002	Glass in balls (other than microspheres of heading no. 7018), rods or tubes, unworked	1
7003	Glass; cast glass and rolled glass in sheets or profiles, whether or not having an absorbent, reflecting or non-reflecting layer, but not otherwise worked	1
7004	Glass; drawn glass and blown glass, in sheets, whether or not having an absorbent, reflecting or non-reflecting layer, but not otherwise worked	1
7005	Glass; float glass and surface ground or polished glass, in sheets, whether or not having an absorbent, reflecting or non-reflecting layer, but not otherwise worked	1
7007	Safety glass, consisting of toughened (tempered) or laminated glass	1
7010	Carboys, bottles, flasks, jars, pots, phials, ampoules, containers of glass of a kind used for the conveyance or packing of goods; preserving jars of glass; stoppers, lids and other closures of glass	1
7018	Glass beads, imitation pearls, precious or semi-precious stones and similar glass smallwares, statuettes and other ornaments of worked glass; glass microspheres not exceeding 1mm in diameter	0
7019	Glass fibres (including glass wool) and articles thereof (e.g. yarn, rovings, woven fabrics)	1
7020	Glass; articles n.e.c. in chapter 70	0
7103	Precious (excluding diamond) and semi-precious stone; worked, graded, not strung, mounted, set; ungraded precious (excluding diamond) and semi-precious stone, temporarily strung for convenience of transport	0
7104	Stones; synthetic or reconstructed precious or semi-precious, whether or not worked or graded but not strung, mounted or set; ungraded synthetic or reconstructed precious or semi-precious stones, temporarily strung for convenience of transport	1
7105	Dust and powder of natural or synthetic precious or semi-precious stone	0
7106	Silver (including silver plated with gold or platinum); unwrought or in semi-manufactured forms, or in powder form	1
7110	Platinum; unwrought or in semi-manufactured forms, or in powder form	0
7111	Base metals, silver or gold, clad with platinum; not further worked than semi-manufactured	0

cmdcode	description	sanctioned
7112	Waste and scrap of precious metal or of metal clad with precious metal; other waste and scrap containing precious metal compounds, of a kind uses principally for the recovery of precious metal other than goods of heading 85.49	1
7113	Jewellery articles and parts thereof, of precious metal or of metal clad with precious metal	1
7114	Articles of goldsmiths' or silversmiths' wares and parts thereof, of precious metal or of metal clad with precious metal	1
7115	Articles of precious metal or of metal clad with precious metal	1
7116	Articles of natural or cultured pearls, precious or semi-precious stones (natural, synthetic or reconstructed)	0
7301	Iron or steel sheet piling, whether or not drilled, punched or made from assembled elements; welded angles, shapes and sections, of iron or steel	1
7302	Railway or tramway track constructions of iron or steel; rails, check and track rails, switch blades, crossing frogs, point rods, sleepers, fish-plates, chair wedges, sole plates, bedplates, ties and the like	1
7303	Tubes, pipes and hollow profiles, of cast iron	1
7304	Tubes, pipes and hollow profiles, seamless, of iron (other than cast iron) or steel	1
7305	Iron or steel (excluding cast iron); tubes and pipes (e.g. welded, riveted or similarly closed), having circular cross-sections, external diameter of which exceeds 406.4mm, not seamless	1
7306	Iron or steel (excluding cast iron); tubes, pipes and hollow profiles (not seamless), n.e.c. in chapter 73	1
7307	Tube or pipe fittings (e.g. couplings, elbows, sleeves), of iron or steel	1
7308	Structures of iron or steel and parts thereof; plates, rods, angles, shapes, sections, tubes and the like, prepared for use in structures	1
7309	Reservoirs, tanks, vats and similar containers; for any material (excluding compressed or liquefied gas), of iron or steel, capacity exceeding 300l, whether or not lined or heat insulated	1
7310	Tanks, casks, drums, cans, boxes and similar containers, for any material (excluding compressed or liquefied gas), of iron or steel, capacity not exceeding 300l, whether or not lined or heat-insulated	1
7311	Containers for compressed or liquefied gas, of iron or steel	1
7312	Stranded wire, ropes, cables, plaited bands, slings and the like, of iron or steel, not electrically insulated	0
7313	Barbed wire of iron or steel; twisted hoop or single flat wire, barbed or not and loosely twisted double wire, of a kind used for fencing, of iron or steel	0
7407	Copper; bars, rods and profiles	1
7408	Copper wire	1
7409	Copper plates, sheets and strip; of a thickness exceeding 0.15mm	1
7410	Copper foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials) of a thickness (excluding any backing) not exceeding 0.15mm	1
7411	Copper tubes and pipes	1
7412	Copper; tube or pipe fittings (e.g. couplings, elbows, sleeves)	1
7413	Copper; stranded wire, cables, plaited bands and the like, not electrically insulated	1
7502	Nickel; unwrought	0
7503	Nickel; waste and scrap	0
7504	Nickel; powders and flakes	1
7505	Nickel; bars, rods, profiles and wire	1
7506	Nickel; plates, sheets, strip and foil	1
7507	Nickel; tubes, pipes and tube or pipe fittings (e.g. couplings, elbows, sleeves)	1
7508	Nickel; articles thereof n.e.c. in chapter 75	1
7601	Aluminium; unwrought	0
7602	Aluminium; waste and scrap	0
7604	Aluminium; bars, rods and profiles	1
7605	Aluminium wire	1
7606	Aluminium; plates, sheets and strip, thickness exceeding 0.2mm	1
7607	Aluminium foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials) of a thickness (excluding any backing) not exceeding 0.2mm	1
7608	Aluminium; tubes and pipes	1
7609	Aluminium; tube or pipe fittings (e.g. couplings, elbows, sleeves)	1
7610	Aluminium; structures (excluding prefabricated buildings of heading no. 9406) and parts (e.g. bridges and sections, towers, lattice masts, etc) plates, rods, profiles and tubes for structures	1
7611	Aluminium; reservoirs, tanks, vats and the like for material (not compressed or liquefied gas) of capacity over 300l, whether or not lined, heat-insulated, not fitted with mechanical, thermal equipment	1
7612	Aluminium casks, drums, cans, boxes etc (including rigid, collapsible tubular containers), for materials other than compressed, liquefied gas, 300l capacity or less, lined, heat-insulated or not	1
7613	Aluminium; containers for compressed or liquefied gas	1
7614	Aluminium; stranded wire, cables, plaited bands and the like, (not electrically insulated)	0
7615	Aluminium; table, kitchen or other household articles and parts thereof, pot scourers and scouring or polishing pads, gloves and the like, sanitary ware and parts thereof	0
7801	Lead; unwrought	1
7804	Lead; plates, sheets, strip and foil, lead powders and flakes	1
7904	Zinc; bars, rods, profiles and wire	0
7905	Zinc; plates, sheets, strip and foil	1
8001	Tin; unwrought	1
8003	Tin; bars, rods, profiles and wire	1
8007	Tin; articles n.e.c. in chapter 80	1
8102	Molybdenum; articles thereof, including waste and scrap	1
8109	Zirconium; articles thereof, including waste and scrap	1
8111	Manganese; articles thereof, including waste and scrap	1
8206	Tools, hand; two or more of heading no. 8202 to 8205, put up in sets for retail sale	0
8207	Tools, interchangeable; for hand tools, whether or not power-operated, or for machine tools (pressing, stamping, punching, drilling etc), including dies for drawing or extruding metal, and rock drilling or earth boring tools	1
8212	Razors and razor blades; (including razor blade blanks in strips)	1
8213	Scissors; tailors' shears and similar shears, and blades therefore	0
8302	Base metal mountings, fittings and similar articles for furniture, doors, staircases, windows, trunks, chests etc, castors with mountings of base metal, automatic door closers of base metal	1
8303	Safes; armoured or reinforced, strong-boxes, doors and safe deposit lockers for strong-rooms, cash or deed boxes and the like, of base metal	0

cmdcode	description	tariff
8307	Tubing; flexible, with or without fittings, of base metal	1
8308	Clasps, frames with clasps, buckles, buckle-clasps, hooks, eyes, eyelets etc for clothing & accessories, footwear, jewellery, wrist-watches, books, awnings, leather goods, travel goods, saddlery etc, tubular etc rivets, beads, spangles, of base metal	0
8309	Stoppers, caps, lids (including crown corks, screw caps, pouring stoppers); capsules for bottles, threaded bungs, bung covers, seals and other packaging accessories, of base metal	1
8310	Sign plates, name plates, address plates and similar plates, numbers, letters and other symbols, of base metal, excluding those of heading no. 9405	0
8401	Nuclear reactors; fuel elements (cartridges), non-irradiated, for nuclear reactors, machinery and apparatus for isotopic separation	0
8402	Boilers; steam or other vapour generating (other than central heating hot water boilers, capable also of producing low pressure steam), super heated water boilers	1
8403	Central heating boilers; excluding those of heading no. 8402	0
8404	Auxiliary plant for use with boilers of heading no. 8402 or 8403; e.g. economisers, super-heaters, soot removers, gas recoverers), condensers for steam or other vapour power units	1
8405	Generators for producer or water gas with or without their purifiers acetylene gas generators and similar water process gas generators, with or without their purifiers	1
8406	Turbines; steam and other vapour turbines	1
8407	Reciprocating or rotary internal combustion piston engines	1
8408	Compression-ignition internal combustion piston engines (diesel or semi-diesel engines)	1
8409	Parts suitable for use solely or principally with the engines of heading no. 8407 or 8408	1
8410	Turbines; hydraulic water wheels and regulators therefor	1
8411	Turbo-jets, turbo-propellers and other gas turbines	1
8412	Engines and motors; n.e.c. (e.g. reaction engines, hydraulic power engines, pneumatic power engines)	1
8416	Furnace burners for liquid fuel, for pulverised solid fuel or for gas; mechanical grates, mechanical ash dischargers and similar appliances	1
8417	Furnaces and ovens; industrial or laboratory, including incinerators, non-electric	1
8418	Refrigerators, freezers and other refrigerating or freezing equipment, electric or other; heat pumps other than air conditioning machines of heading no. 8415	1
8419	Machinery, plant (not domestic), or laboratory equipment; electrically heated or not, (excluding items in 85.14) for the treatment of materials by a process involving change of temperature; including instantaneous or non electric storage water heaters	1
8421	Centrifuges, including centrifugal dryers; filtering or purifying machinery and apparatus for liquids or gases	1
8422	Dish washing machines; machinery for cleaning, drying, filling, closing, sealing, capsuling or labelling bottles, cans, boxes, bags, etc, machinery for aerating beverages	1
8424	Mechanical appliances for projecting, dispersing or spraying liquids or powders; fire extinguishers, spray guns, steam, sand blasting machines	1
8426	Derricks, cranes, including cable cranes, mobile lifting frames, straddle carriers and works trucks fitted with a crane	1
8427	Fork-lift and other works trucks; fitted with lifting or handling equipment	1
8429	Bulldozers, graders, levellers, scrapers, angledozers, mechanical shovels, excavators, shovel loaders, tamping machines and road rollers, self-propelled	1
8430	Moving, grading, levelling, scraping, excavating, tamping, compacting, extracting or boring machinery, for earth, minerals, or ores; pile drivers and extractors; snow ploughs and snow blowers	1
8431	Machinery parts; used solely or principally with the machinery of heading no. 8425 to 8430	1
8444	Textile machinery; for extruding, drawing, texturing or cutting man-made textile materials	1
8445	Textile machinery; spinning, doubling, twisting machines, textile reeling or winding machines and machines for preparing textile yarns for use on machines of heading no. 8446 and 8447	0
8448	Machinery, auxiliary; for use with machines of heading no. 8444 to 8447 (e.g. dobbies, jacquards, automatic stop motions, shuttle changing mechanisms) parts, accessories for machines of heading no. 8444, 8447	1
8449	Machinery; for manufacture or finishing felt or non-wovens in the piece or in shapes, including machinery for making felt hats, blocks for making hats	0
8450	Household or laundry-type washing machines; including machines which both wash and dry	1
8452	Sewing machines; other than book-sewing machines of heading no. 8440; furniture, bases and covers specially designed for sewing machines; sewing machine needles	0
8453	Machinery for preparing, tanning or working hides, skins or leather or for making or repairing footwear or other articles of hides, skins or leather, other than sewing machines	1
8454	Converters, ladles, ingot moulds and casting machines; of a kind used metallurgy or in metal foundries	1
8455	Metal-rolling mills and rolls therefor	1
8456	Machine-tools; for working any material by removal of material, by laser or other light or photon beam, ultrasonic, electro-discharge, electro-chemical, electron beam, ionic-beam, or plasma arc processes; water-jet cutting machines	1
8457	Machining centres, unit construction machines (single station) and multi-station transfer machines for working metal	1
8458	Lathes for removing metal	1
8459	Machine-tools; (including way-type unit head machines) for drilling, boring, milling, threading or tapping by removing metal, other than lathes of heading no. 8458	1
8460	Machine-tools; for deburring, sharpening, grinding, honing, lapping, polishing or otherwise finishing metal, sintered metal carbides or cermets by means of grinding stones, abrasives or polishing products	1
8461	Machine-tools; for planing, shaping, slotting, broaching, gear cutting and grinding, finishing, sawing, cutting off and other tools working by removing metal, sintered metal carbides or cermets n.e.c.	1
8462	Machine-tools (including presses) for working metal by forging, hammering or die forging (excluding rolling mills); machine-tools (including presses, slitting lines and cut-to-length lines) for working metal by bending, folding, straightening, flattening,	1
8463	Machine-tools; n.e.c. for working metal, sintered metal carbides or cermets without removing material	1
8464	Machine-tools; for working stone, ceramics, concrete, asbestos-cement or like mineral materials or for cold working glass	1
8465	Machine-tools; (including machines for nailing, stapling, glueing or otherwise assembling) for working wood, cork, bone, hard plastics or rubber or similar hard materials	1
8466	Parts & accessories suited for use only/mainly with machines of headings 8456-8465, including work/tool holders, self-opening dieheads, dividing heads & other special attachments for the machines; tool holders for any type of tool for working in the hand	1
8467	Tools; for working in the hand, pneumatic, hydraulic or with self-contained electric or non-electric motor	1
8468	Machinery and apparatus for soldering, brazing, welding, whether or not capable of cutting, other than those of heading no. 8515; gas-operated surface tempering machines and appliances	1
8470	Calculating machines and pocket-size data recording, reproducing and displaying machines with calculating functions; accounting machines, postage-franking machines, ticket-issuing machines and similar, incorporating a calculating device; cash registers	0
8471	Automatic data processing machines and units thereof, magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, not elsewhere specified or included	1
8472	Office machines; not elsewhere classified	0
8473	Machinery; parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines of headings 84.70 to 84.72	1
8474	Machinery for sorting, screening, separating, washing, crushing, grinding, mixing or kneading earth, stone, ores in solid form, shaping, moulding machinery for solid mineral fuels	1
8475	Machines; for assembling electric or electronic lamps, tubes, valves, flashbulbs, in glass envelopes, machines for manufacturing or hot working glass or glassware	1
8477	Machinery; for working rubber or plastics or for the manufacture of products from these materials, n.e.c. in this chapter	1

cmdcode	description	sanctioned
8478	Machinery; for preparing or making up tobacco, n.e.c. in this chapter	0
8479	Machinery and mechanical appliances; having individual functions, n.e.c. in this chapter	1
8480	Moulding boxes for metal foundry, moulding patterns, moulds for metals (excluding ingot moulds), metal carbides, glass, mineral materials, rubber or plastics	1
8481	Taps, cocks, valves and similar appliances for pipes, boiler shells, tanks, vats or the like, including pressure-reducing valves and thermostatically controlled valves	1
8482	Ball or roller bearings	1
8483	Transmission shafts (including cam and crank) and cranks; bearing housings and plain shaft bearings; gears and gearing; ball or roller screws; gear boxes and other speed changers; flywheels and pulleys; clutches and shaft couplings	1
8484	Gaskets and similar joints of metal sheeting combined with other material or of two or more layers of metal; sets or assortments of gaskets and similar joints, dissimilar in composition, put up in pouches, envelopes or similar packings; mechanical seals	1
8485	Machines for additive manufacturing	1
8501	Electric motors and generators (excluding generating sets)	1
8502	Electric generating sets and rotary converters	1
8503	Electric motors and generators; parts suitable for use solely or principally with the machines of heading no. 8501 or 8502	1
8504	Electric transformers, static converters (e.g. rectifiers) and inductors	1
8505	Electro-magnets; permanent magnets, intended permanent magnets; electro-magnetic, permanent magnet chucks, clamps, similar; electromagnetic couplings, clutches, brakes; electro-magnetic lifting heads	1
8506	Cells and batteries; primary	1
8507	Electric accumulators, including separators therefor; whether or not rectangular (including square)	1
8508	Vacuum cleaners	0
8509	Electro-mechanical domestic appliances; with self-contained electric motor, other than vacuum cleaners of heading 85.08.	0
8510	Shavers, hair clippers and hair removing appliances, with self-contained electric motor	0
8511	Ignition or starting equipment; used for spark-ignition or compression-ignition internal combustion engines; generators and cut outs used in conjunction with such engines	1
8514	Industrial or laboratory electric furnaces and ovens (including those functioning by induction or dielectric loss); other industrial or laboratory equipment for the heat treatment of materials by induction or dielectric loss	1
8515	Electric (electrically heated gas) soldering, brazing, welding machines and apparatus, capable or not of cutting, electric machines and apparatus for hot spraying of metals or sintered carbides	1
8516	Electric water, space, soil heaters; electro-thermic hair-dressing apparatus; hand dryers, irons; electro-thermic appliances for domestic purposes; electro heating resistors, not of heading no. 8545	1
8517	Telephone sets, including smartphones and other telephones for cellular/wireless networks; other apparatus for the transmission or reception of voice, images or other data (including wired/wireless networks), excluding items of 8443, 8525, 8527, or 8528	1
8518	Microphones and their stands; loudspeakers, mounted or not in their enclosures; headphones and earphones, combined or not with a microphone, and sets of a microphone and one or more loudspeakers; audio-frequency and electric sound amplifiers and sets	0
8519	Sound recording or reproducing apparatus	0
8521	Video recording or reproducing apparatus	0
8522	Sound or video recording apparatus; parts and accessories suitable for use solely or principally with the apparatus of heading 8519 or 8521	0
8523	Discs, tapes, solid-state non-volatile storage devices, smart cards and other media for the recording of sound or of other phenomena, whether or not recorded, including matrices and masters for the production of discs, excluding products of Chapter 37	1
8524	Flat panel display modules, whether or not incorporating touch-sensitive screens	0
8525	Transmission apparatus for radio-broadcasting or television, whether or not incorporating reception apparatus or sound recording or reproducing apparatus; television cameras, digital cameras and video camera recorders	1
8526	Radar apparatus, radio navigational aid apparatus and radio remote control apparatus	1
8530	Signalling, safety or traffic control equipment; for railways, tramways, roads, inland waterways, parking facilities, port installations, airfields, excluding those of heading no. 8608	1
8531	Signalling apparatus; electric sound or visual (e.g. bells, sirens, indicator panels, burglar or fire alarms), excluding those of heading no. 8512 or 8530	1
8534	Circuits; printed	1
8535	Electrical apparatus for switching, protecting electrical circuits, for making connections to or in electrical circuits; for a voltage exceeding 1000 volts	1
8536	Electrical apparatus for switching, protecting electrical circuits, for making connections to or in electrical circuits, for a voltage not exceeding 1000 volts; connectors for optical fibres, optical fibre bundles or cables	1
8537	Boards, panels, consoles, desks, cabinets, bases with apparatus of heading no. 8535, 8536 for electricity control and distribution, (other than switching apparatus of heading no. 8517)	1
8538	Electrical apparatus; parts suitable for use solely or principally with the apparatus of heading no. 8535, 8536 and 8537	1
8539	Lamps; electric filament or discharge lamps, including sealed beam lamp units and ultra-violet or infra-red lamps, arc lamps, light-emitting diode (LED) light sources	1
8540	Thermionic, cold cathode or photo-cathode valves and tubes (e.g. vacuum, vapour, gas filled valves and tubes, mercury arc rectifying valves and tubes, cathode-ray and television camera tubes)	1
8541	Semiconductor devices (e.g. diodes, transistors, semiconductor based transducers); including photovoltaic cells assembled or not in modules or panels, light-emitting diodes (LED) assembled with other LEDs or not, mounted piezo-electric crystals	1
8542	Electronic integrated circuits	1
8543	Electrical machines and apparatus; having individual functions, not specified or included elsewhere in this chapter	1
8544	Insulated wire, cable and other electric conductors, connector fitted or not; optical fibre cables of individually sheathed fibres, whether or not assembled with electric conductors or fitted with connectors	1
8545	Carbon electrodes, carbon brushes, lamp carbons, battery carbons and other articles of graphite or other carbon; with or without metal, of a kind used for electrical purposes	1

cmdcode	description	sanctioned
8546	Electrical insulators of any material	0
8547	Insulating fittings; for electrical machines, appliances, equipment, excluding insulators of heading no. 8546, electrical conduit tubing and joints therefore	1
8548	Electrical parts of machinery or apparatus; not specified or elsewhere included in this chapter	1
8601	Rail locomotives; powered from an external source of electricity or by electric accumulators	0
8602	Rail locomotives; (other than those of heading no. 8601), locomotive tenders	1
8603	Railway or tramway coaches, vans and trucks; self-propelled tenders, other than those of heading no. 8604	1
8604	Railway or tramway maintenance or service vehicles; whether or not self-propelled (e.g. workshops, cranes, ballast tampers, trackliners, testing coaches and track inspection vehicles)	1
8605	Railway or tramway coaches; passenger coaches, luggage vans, post office coaches and other special purpose railway or tramway coaches, not self-propelled (excluding those of heading no. 8604)	0
8606	Railway or tramway goods vans and wagons; not self-propelled	1
8607	Railway or tramway locomotives or rolling stock; parts thereof	0
8608	Railway or tramway track fixtures and fittings; mechanical (including electro-mechanical) signalling, safety or traffic control equipment for railways, tramways, roads, inland waterways, parking facilities, port installations or airfields; parts thereof	0
8701	Tractors; (other than tractors of heading no 8709)	1
8702	Vehicles; public transport passenger type	0
8703	Motor cars and other motor vehicles; principally designed for the transport of persons (other than those of heading no. 8702), including station wagons and racing cars	1
8704	Vehicles; for the transport of goods	1
8705	Special purpose motor vehicles; not those for the transport of persons or goods (e.g. breakdown lorries, road sweeper lorries, spraying lorries, mobile workshops, mobile radiological units etc)	1
8706	Chassis; fitted with engines, for the motor vehicles of heading no. 8701 to 8705	0
8707	Bodies; (including cabs) for the motor vehicles of heading no. 8701 to 8705	0
8708	Motor vehicles; parts and accessories, of heading no. 8701 to 8705	0
8716	Trailers and semi-trailers; other vehicles, not mechanically propelled; parts thereof	1
8802	Aircraft n.e.c. in heading no. 8801, except unmanned aircraft of heading 8806, (e.g. helicopters, aeroplanes); spacecraft (including satellites) and suborbital and spacecraft launch vehicles	1
8901	Cruise ships, excursion boats, ferry-boats, cargo ships, barges and similar vessels for the transport of persons or goods	1
8902	Fishing vessels, factory ships and other vessels; for processing or preserving fishery products	1
8903	Yachts and other vessels; for pleasure or sports, rowing boats and canoes	1
8904	Tugs and pusher craft	1
8905	Light-vessels, fire-floats, dredgers, floating cranes, other vessels; the navigability of which is subsidiary to main function; floating docks, floating, submersible drilling, production platforms	1
9001	Optical fibres and optical fibre bundles; optical fibre cables not of heading no. 8544; sheets, plates of polarising material; lenses, prisms, mirrors, of any material; unmounted; not non optical glass	1
9003	Frames and mountings; for spectacles, goggles or the like, and parts	0
9004	Spectacles, goggles and the like; corrective, protective or other	0
9005	Binoculars, monoculars, other optical telescopes, mountings therefore; other astronomical instruments, mountings therefore, but not including instruments for radio-astronomy	1
9006	Cameras, photographic (excluding cinematographic); photographic flashlight apparatus and flashbulbs other than discharge lamps of heading no. 8539	1
9007	Cinematographic cameras and projectors, whether or not incorporating sound recording or reproducing apparatus	1
9008	Image projectors, other than cinematographic; photographic (other than cinematographic) enlargers and reducers	0
9010	Photographic (including cinematographic) laboratory apparatus and equipment, n.e.c. in chapter 90; negatoscopes; projection screens	1
9012	Microscopes (excluding optical microscopes); diffraction apparatus	1
9013	Lasers, other than laser diodes; other optical appliances and instruments n.e.c. in this chapter	1
9014	Navigational instruments and appliances; direction finding compasses	1
9015	Surveying (including photogrammetrical surveying), hydrographic, oceanographic, hydrological, meteorological or geophysical instruments and appliances, excluding compasses, rangefinders	1
9016	Balances; of a sensitivity of 5cg or better, with or without weights	0
9017	Drawing, marking-out, mathematical calculating instruments (drafting machines, protractors, drawing sets etc); instruments for measuring length (e.g. measuring rods, tapes, micrometers, callipers) n.e.c.	0
9018	Instruments and appliances used in medical, surgical, dental or veterinary sciences, including scintigraphic apparatus, other electro-medical apparatus and sight testing instruments	0
9019	Mechano-therapy, massage appliances; psychological aptitude testing apparatus; ozone, oxygen, aerosol therapy, artificial respiration or other therapeutic respiration apparatus	0
9020	Breathing appliances and gas masks; excluding protective masks having neither mechanical parts nor replaceable filters and excluding apparatus of item no. 9019.20	1
9024	Machines and appliances for testing the hardness, strength, compressibility, elasticity of other mechanical properties of materials (e.g. metals, wood, textiles, paper, plastics)	1
9026	Instruments, apparatus for measuring or checking the flow, level, pressure of liquids, gases (e.g. flow meters, heat meters etc), not instruments and apparatus of heading no. 9014, 9015, 9028 or 9032	1
9027	Instruments and apparatus; for physical or chemical analysis (e.g. polarimeters, spectrometers), for measuring or checking viscosity, porosity, etc, for measuring quantities of heat, sound or light	1
9028	Gas, liquid or electricity supply or production meters, including calibrating meters therefor	0
9029	Revolution counter, production counters, taximeters, mileometers, pedometers and the like, speed indicators and tachometers, other than those of heading no. 9015, stroboscopes	1
9030	Instruments, apparatus for measuring, checking electrical quantities not meters of heading no. 9028; instruments, apparatus for measuring or detecting alpha, beta, gamma, x-ray, cosmic and other radiations	1
9031	Measuring or checking instruments, appliances and machines, n.e.c. or included in this chapter; profile projectors	1
9032	Regulating or controlling instruments and apparatus; automatic type	1

cmdcode	description	sanctioned
9033	Machines and appliances, instruments or apparatus of chapter 90; parts and accessories n.e.c. in chapter 90	0
9101	Wrist-watches, pocket-watches, stop-watches and other watches; with case of precious metal or of metal clad with precious metal	1
9102	Wrist-watches, pocket-watches, stop-watches and other watches, other than those of heading no. 9101	0
9303	Firearms; other similar devices (e.g. sporting shotguns and rifles, muzzle-loading firearms, very pistols, devices for firing flares or blank ammunition, captive bolt humane killers, line throwing guns)	0
9304	Firearms; (e.g. spring, air or gas guns and pistols, truncheons), excluding those of heading no. 9307	1
9401	Seats (not those of heading no. 9402), whether or not convertible into beds and parts thereof	1
9402	Furniture; medical, surgical, dental or veterinary (e.g. operating tables, hospital beds, dentists' chairs) barbers' chairs; parts	0
9403	Furniture and parts thereof, n.e.c. in chapter 94	1
9404	Mattress supports; articles of bedding (e.g. mattresses, quilts, eiderdowns, cushions pouffes and pillows), fitted with springs or stuffed, whether or not covered	1
9405	Luminaires and light fittings; including searchlights, spotlights and parts thereof, n.e.c.; illuminated signs, name-plates and the like, having permanently fixed light source and parts thereof n.e.c. or included	1
9406	Buildings; prefabricated	1
9503	Tricycles, scooters, pedal cars and similar wheeled toys; dolls' carriages; dolls; other toys; reduced-size (scale) models and similar recreational models, working or not; puzzles of all kinds	1
9606	Buttons, press-fasteners, snap-fasteners and press-studs, button moulds and other parts of these articles; button blanks	1
9607	Slide fasteners and parts thereof	0
160411	Fish preparations; salmon, prepared or preserved, whole or in pieces (but not minced)	0
160412	Fish preparations; herrings, prepared or preserved, whole or in pieces (but not minced)	0
160413	Fish preparations; sardines, sardinella and brisling or sprats, prepared or preserved, whole or in pieces (but not minced)	0
160414	Fish preparations; tunas, skipjack tuna and bonito (Sarda spp.), prepared or preserved, whole or in pieces (but not minced)	0
160415	Fish preparations; mackerel, prepared or preserved, whole or in pieces (but not minced)	0
160416	Fish preparations; anchovies, prepared or preserved, whole or in pieces (but not minced)	0
160419	Fish preparations; fish prepared or preserved, whole or in pieces (but not minced), n.e.c. in heading no. 1604	0
160420	Fish preparations; fish minced or in forms n.e.c. in heading no. 1604, prepared or preserved	0
251810	Dolomite, not calcined or sintered; including dolomite roughly trimmed, or merely cut by sawing or otherwise into blocks or slabs of rectangular (including square) shape	0
251820	Dolomite, calcined or sintered; including dolomite roughly trimmed, or merely cut by sawing or otherwise into blocks or slabs of rectangular (including square) shape	1
251910	Magnesium carbonate (magnesite); natural	1
251990	Magnesia, fused or dead-burned (sintered); whether or not containing small quantities of other oxides added before sintering, other magnesium oxide, whether or not pure, (not natural magnesium carbonate)	0
252010	Gypsum; anhydrite	1
252020	Plasters; (consisting of calcined gypsum or calcium sulphate), whether or not coloured, with or without small quantities of accelerators or retarders	0
253010	Vermiculite, perlite and chlorites; unexpanded	0
271111	Petroleum gases and other gaseous hydrocarbons; liquefied, natural gas	0
271112	Petroleum gases and other gaseous hydrocarbons; liquefied, propane	1
271113	Petroleum gases and other gaseous hydrocarbons; liquefied, butanes	1
271114	Petroleum gases and other gaseous hydrocarbons; liquefied, ethylene, propylene, butylene and butadiene	1
271119	Petroleum gases and other gaseous hydrocarbons; liquefied, n.e.c. in heading no. 2711	1
271129	Petroleum gases and other gaseous hydrocarbons; in gaseous state, other than natural gas	0
281290	Halides and halide oxides of non-metals; excluding chloride	1
281310	Carbon disulphide	1
281390	Sulphides of non-metals, (excluding carbon); commercial phosphorus trisulphide	0
281511	Sodium hydroxide (caustic soda); solid	0
281512	Sodium hydroxide (caustic soda); in aqueous solution (soda lye or liquid soda)	1
281520	Potassium hydroxide (caustic potash)	0
281530	Peroxides of sodium or potassium	0
282612	Fluorides; of aluminium	1
282619	Fluorides; other than of aluminium	1
282630	Sodium hexafluoroaluminate (synthetic cryolite)	0
282690	Fluorides; fluorosilicates, fluoroaluminates and other complex fluorine salts, n.e.c. in heading no. 2826	0
282731	Chlorides; of magnesium	1
282732	Chlorides; of aluminium	0
282735	Chlorides; of nickel	1
282739	Chlorides; other than of ammonium, calcium, magnesium, aluminium and nickel	0
282911	Chlorates; of sodium	1
282919	Chlorates; other than sodium	0
282990	Perchlorates; bromates and perbromates; iodates and periodates	0
283210	Sulphites; of sodium	0
283220	Sulphites; other than of sodium	1
283230	Thiosulphates	0
283321	Sulphates; of magnesium	0
283322	Sulphates; of aluminium	0
283324	Sulphates; of nickel	1
283325	Sulphates; of copper	0
283327	Sulphates; of barium	0
283329	Sulphates; n.e.c. in item no. 2833.2	0
283330	Alums	1
284019	Borates; disodium tetraborate (refined borax), other than anhydrous	0
284020	Borates; n.e.c. in heading no. 2840	0
284150	Salts; chromates, dichromates, peroxochromates; n.e.c. in heading no. 2841	1
284161	Salts; of oxometallic or peroxometallic acids, manganites, manganates and permanganates, potassium permanganate	0
284169	Salts; of oxometallic or peroxometallic acids, manganites, manganates and permanganates, other than potassium permanganate	0
284170	Salts; molybdates	0
284180	Salts; tungstates (wolframates)	1

cmdcode	description	sanctioned
284190	Salts of oxometallic or peroxometallic acids; n.e.c. in heading no. 2841	0
292090	Esters; other than thiophosphoric esters (phosphorothioates) and phosphite esters and their salts, their halogenated, sulphonated, nitrated or nitrosated derivatives, n.e.c. in heading no. 2920	1
292121	Amine-function compounds; acyclic polyamines and their derivatives, ethylenediamine and its salts	0
292122	Amine-function compounds; acyclic polyamines and their derivatives, hexamethylenediamine and its salts	1
292129	Amine-function compounds; acyclic polyamines and their derivatives, and salts thereof, n.e.c. in item no. 2921.2	1
292130	Amine-function compounds; cyclanic, cyclenic or cycloterpenic mono- or polyamines and their derivatives; salts thereof	0
292141	Amine-function compounds; aromatic monoamines and their derivatives, aniline and its salts	1
292142	Amine-function-compounds; aromatic monoamines and their derivatives, aniline derivatives and their salts	0
292143	Amine-function compounds; aromatic monoamines and their derivatives, toluidines and their derivatives; salts thereof	0
292144	Amine-function compounds; aromatic monoamines and their derivatives, diphenylamine and its derivatives; salts thereof	1
292145	Amine-function compounds; aromatic monoamines and their derivatives; 1-naphthylamine (alpha-naphthylamine), 2-naphthylamine (beta-naphthaylamine) and their derivatives; salts thereof	0
292421	Cyclic amides (including cyclic carbamates) and their derivatives, ureines and their derivatives; salts thereof	1
292429	Cyclic amides (including cyclic carbamates) and their derivatives; other than the derivatives and salts of ureines, 2-acetamidobenzoic acid (N-acetylanthancillic acid),ethinamate S, and alachlor (ISO) and their derivatives and salts	1
293020	Organo-sulphur compounds; thiocarbamates and dithiocarbamates	0
293030	Organo-sulphur compounds; thiuram mono-, di- or tetrasulphides	0
293040	Organo-sulphur compounds; methionine	1
293331	Heterocyclic compounds; containing an unfused pyridine ring (whether or not hydrogenated) in the structure, pyridine and its salts	1
293332	Heterocyclic compounds; containing an unfused pyridine ring (whether or not hydrogenated) in the structure, piperidine and its salts	0
293333	Heterocyclic compounds; containing an unfused pyridine ring (whether or not hydrogenated) in the structure, alfentanil (INN), anileridine (INN), bezitramide (INN), bromazepam (INN), carfentanil (INN), difenoxin (INN), diphenoxylate (INN), dipipanone (INN)	0
293352	Heterocyclic compounds; containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, malonylurea (barbituric acid) and its salts	0
293353	Allobarbital (INN), amobarbital (INN), barbital (INN), butalbital (INN), butobarbital, cyclobarbital (INN), methylphenobarbital (INN), pentobarbital (INN), phenobarbital (INN), secbutabarbital (INN), secobarbital (INN) and vinylbital (INN); salts thereof	1
293354	Heterocyclic compounds; containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, other derivatives of malonylurea (barbituric acid) and salts thereof, n.e.c. in 2933.53	1
293359	Heterocyclic compounds; containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, (other than malonylurea and its derivatives, loprazolam, mecloqualone, methaqualone, zipeprol, and salts thereof) n.e.c. in 2933.5	0
293371	Heterocyclic compounds; lactams; 6-hexanelactam (epsilon-caprolactam)	1
293372	Heterocyclic compounds; lactams; clobazam (INN) and methyprylon (INN)	0
293499	Nucleic acids and their salts, other heterocyclic compounds, n.e.c. in heading number 2934	1
300390	Medicaments; (not containing antibiotics, hormones, alkaloids or their derivatives), for therapeutic or prophylactic uses, (not packaged for retail sale)	1
300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale	1
310551	Fertilizers, mineral or chemical; containing nitrates and phosphates	0
310559	Fertilizers, mineral or chemical; containing the two fertilizing elements nitrogen and phosphorus, other than nitrates and phosphates	0
310560	Fertilizers, mineral or chemical; containing the two fertilizing elements phosphorus and potassium	1
310590	Fertilizers, mineral or chemical; n.e.c. in heading no. 3105	1
320420	Dyes; synthetic organic products of a kind used as fluorescent brightening agents	0
320490	Dyes; synthetic organic products n.e.c. in heading no. 3204 (e.g. of a kind used as luminophores), whether or not chemically defined	1
320620	Colouring matter; pigments and preparations based on chromium compounds	0
320641	Colouring matter; ultramarine and preparations based thereon	1
320642	Colouring matter; lithopone and other pigments and preparations based on zinc sulphide	0
320649	Colouring matter; other preparations n.e.c. in item no. 3206.4	1
320650	Colouring matter; inorganic products of a kind used as luminophores	0
321210	Pigments; of a kind used in the manufacture of paints, stamping foils	0
321290	Pigments; of a kind used in the manufacture of paints, other than stamping foils	1
321511	Ink; for printing, black, whether or not concentrated or solid	1
321519	Ink; for printing, other than black, whether or not concentrated or solid	1
321590	Ink; writing, drawing and other inks, n.e.c. in heading no. 3215, whether or not concentrated or solid	0
330210	Odoriferous substances and mixtures; of a kind used in the food or drink industries	1
330290	Odoriferous substances and mixtures; used as raw materials in industries other than the food or drink industries	1
350510	Dextrins and other modified starches	1
350520	Glues; based on starches, or on dextrins or other modified starches	0
350610	Glues or adhesives; prepared, products suitable for use as glues or adhesives, put up for retail sale as glues or adhesives, not exceeding a net weight of 1kg	0
350691	Adhesives; prepared, based on polymers of heading 3901 to 3913 or on rubber	0
350699	Glues and other adhesives; prepared, n.e.c. in heading no. 3506, not exceeding a net weight of 1kg	1
370110	Photographic plates and film; for x-ray, in the flat, sensitised, unexposed, of any material other than paper, paperboard or textiles	0
370120	Photographic plates and film; instant print film, in the flat, sensitised, unexposed, whether or not in packs	1
370130	Photographic plates and film; in the flat, sensitised, unexposed, with any side exceeding 225mm, of any materials other than paper, paperboard or textiles	0
370191	Photographic plates and film; for colour photography (polychrome), in the flat, sensitised, unexposed, with no side exceeding 255mm, of any material other than paper, paperboard or textiles	1
370199	Photographic plates and film; (for other than colour photography), in the flat, sensitised, unexposed, with no side exceeding 255mm, of any material other than paper, paperboard or textiles	1
380610	Rosin and resin acids	0
380620	Rosin and resin; salts of rosin, of resin acids or of derivatives of rosin or resin acids, other than salts of rosin adducts	1
382561	Residual products of the chemical or allied industries, not elsewhere specified or included; (other than sewage sludge, municipal waste or waste covered in 27.10); other wastes n.e.c. in 3825; those mainly containing organic constituents	0
382590	Residual products of the chemical or allied industries, not elsewhere specified or included; n.e.c. in 3825 or 27.10	1
390910	Amino-resins; urea and thiourea resins, in primary forms	0
390920	Amino-resins; melamine resins, in primary forms	1
390940	Phenolic resins; in primary forms	1
390950	Polyurethanes; in primary forms	1
391190	Polysulphides, polysulphones and similar products of chemical synthesis n.e.c. in chapter 39; in primary forms	1
391510	Ethylene polymers; waste, parings and scrap	0

cmdcode	description	tariff
391520	Styrene polymers; waste, parings and scrap	1
391530	Vinyl chloride polymers; waste, parings and scrap	0
392220	Plastics; lavatory seats and covers	0
392290	Plastics; bidets, lavatory pans, flushing cisterns and similar sanitary ware n.e.c. in heading no. 3922	1
400610	Rubber; unvulcanised, camel-back strips for retreading rubber tyres	1
400690	Rubber; unvulcanised, other than camel back strips for retreading rubber tyres	0
400821	Rubber; vulcanised (other than hard rubber), in plates, sheets and strip, of non-cellular rubber	1
400829	Rubber; vulcanised (other than hard rubber), non-cellular rubber, in forms other than plates, sheets or strip	0
400912	Rubber; vulcanised (other than hard rubber), tubing, piping and hoses, not reinforced or otherwise combined with other materials, with fittings	1
400941	Rubber; vulcanised (other than hard rubber), tubing, piping and hoses, reinforced or otherwise combined with materials other than metal or textiles, without fittings	1
400942	Rubber; vulcanised (other than hard rubber), tubing, piping and hoses, reinforced or otherwise combined with materials other than metal or textiles, with fittings	0
401692	Rubber; vulcanised (other than hard rubber), erasers, of non-cellular rubber	0
401693	Rubber; vulcanised (other than hard rubber), gaskets, washers and other seals, of non-cellular rubber	1
401695	Rubber; vulcanised (other than hard rubber), inflatable articles (other than boat or dock fenders), of non-cellular rubber	0
420310	Apparel; articles of apparel, of leather or of composition leather	0
420329	Clothing accessories; gloves, mittens and mitts, n.e.c. in heading no. 4203, of leather or composition leather, not specially designed for use in sports	0
420330	Clothing accessories; belts and bandoliers, of leather or of composition leather	1
420340	Clothing accessories; of leather or of composition leather, n.e.c. in heading no. 4203	0
481420	Wallpaper and similar wall coverings; coated or covered on the face side, with a grained, embossed, coloured, design-printed or otherwise decorated layer of plastics	0
481490	Wallpaper and similar wall coverings and window transparencies of paper; n.e.c. in heading 4814	1
520641	Cotton yarn; (not sewing thread), multiple or cabled, of combed fibres, less than 85% by weight of cotton, 714.29 decitex or more (not exceeding 14 metric number) per single yarn, not for retail sale	0
520642	Cotton yarn; (not sewing thread), multiple or cabled, of combed fibres, less than 85% by weight of cotton, 714.28 to 232.56 decitex (15 to 43 metric number) per single yarn, not for retail sale	1
520643	Cotton yarn; (not sewing thread), multiple or cabled, of combed fibres, less than 85% by weight of cotton, 232.55 to 192.31 decitex (44 to 52 metric number) per single yarn, not for retail sale	0
520911	Fabrics, woven; containing 85% or more by weight of cotton, unbleached, plain weave, weighing more than 200g/m2	1
520912	Fabrics, woven; containing 85% or more by weight of cotton, unbleached, 3-thread or 4-thread twill, including cross twill, weighing more than 200g/m2	0
520919	Fabrics, woven; containing 85% or more by weight of cotton, unbleached, of weaves n.e.c. in item no. 5209.1, weighing more than 200g/m2	0
540720	Fabrics, woven; from strip or the like, of synthetic textile materials	0
540730	Fabrics, woven; from synthetic filament yarn, adhesive or thermal bonded	1
540741	Fabrics, woven; containing 85% or more by weight of filaments of nylon or other polyamides, unbleached or bleached	0
550410	Fibres; artificial staple fibres, of viscose, not carded, combed or otherwise processed for spinning	0
550490	Fibres; artificial staple fibres, other than of viscose, not carded, combed or otherwise processed for spinning	1
551219	Fabrics, woven; of synthetic staple fibres, containing 85% or more by weight of polyester staple fibres, other than unbleached or bleached	0
551221	Fabrics, woven; of synthetic staple fibres, containing 85% or more by weight of acrylic or modacrylic staple fibres, unbleached or bleached	1
551229	Fabrics, woven; of synthetic staple fibres, containing 85% or more by weight of acrylic or modacrylic staple fibres, other than unbleached or bleached	0
551291	Fabrics, woven; of synthetic staple fibres, containing 85% or more by weight of such fibres n.e.c. in heading no. 5512, unbleached or bleached	0
551299	Fabrics, woven; of synthetic staple fibres, containing 85% or more by weight of such fibres n.e.c. in heading no. 5512, other than unbleached or bleached	1
560741	Twine; binder or baler twine, of polyethylene or polypropylene	1
560749	Twine, cordage, ropes, cables; of polyethylene or polypropylene (excluding binder or baler twine), whether or not plaited, braided or rubber or plastic impregnated, coated, covered or sheathed	0
580126	Fabrics; chenille, of cotton, other than fabrics of heading no. 5802 or 5806	0
580131	Fabrics; woven pile, of man-made fibres, uncut weft pile fabrics, other than fabrics of heading no. 5802 or 5806	0
580639	Fabrics; narrow woven fabrics, n.e.c. in heading no. 5806, of textile materials n.e.c. in item no. 5806.3 (excluding goods of heading no. 5807)	0
580640	Fabrics; narrow woven, consisting of warp without weft, assembled by means of an adhesive (bolducs)	1
591110	Textile fabric, felt & felt-lined woven fabrics, coated/covered/laminated with rubber, leather or other material, for card clothing, similar fabrics used for technical purposes, including rubber impregnated narrow velvet fabrics to cover weaving spindles	1
591120	Textile products and articles for technical uses; bolting cloth, whether or not made up	0
591131	Textiles; fabrics and felts, endless or fitted with linking devices, of a kind used in paper-making or similar machines, weighing less than 650g/m2	1
591132	Textiles; fabrics and felts, endless or fitted with linking devices, of a kind used in paper-making or similar machines, weighing 650g/m2 or more	1
591140	Textile products and articles for technical uses; straining cloth of a kind used in oil presses and the like, including that of human hair	1
591190	Textile products and articles for technical uses; n.e.c. in heading no. 5911	0
600191	Fabrics; pile fabrics (excluding long pile and loop pile), of cotton, knitted or crocheted	0
600192	Fabrics; pile fabrics (excluding long pile and loop pile), of man-made fibres, knitted or crocheted	0
600199	Fabrics; pile fabrics (excluding long pile and loop pile), of textile materials (other than cotton or man-made fibres), knitted or crocheted	1

cmdcode	description	sanctioned
600543	Fabrics; warp knit (including those made on galloon knitting machines), other than those of headings 60.01 to 60.04, of artificial fibres, of yarns of different colours	0
600544	Fabrics; warp knit (including those made on galloon knitting machines), other than those of headings 60.01 to 60.04, of artificial fibres, printed	1
600610	Fabrics; knitted or crocheted fabrics, other than those of headings 60.01 to 60.04, of wool or fine animal hair	1
600621	Fabrics; knitted or crocheted fabrics, other than those of headings 60.01 to 60.04, of cotton, unbleached or bleached	0
650610	Headgear; safety, whether or not lined or trimmed	1
650691	Headgear; (other than safety headgear), of rubber or plastics, whether or not lined or trimmed	0
680292	Stone; calcareous (excluding marble, travertine, alabaster) articles thereof, (other than simply cut or sawn, with a flat or even surface)	1
680299	Stone; natural (excluding marble, travertine, alabaster, other calcareous stone or granite), monumental or building stone, (other than simply cut or sawn, with a flat or even surface)	0
680421	Millstones, grindstones, grinding wheels and the like; of agglomerated synthetic or natural diamond	0
680422	Millstones, grindstones, grinding wheels and the like; of other agglomerated abrasives or of ceramics	0
680423	Millstones, grindstones, grinding wheels and the like; of natural stone	1
680911	Plaster, or plaster compositions; boards, sheets, panels, tiles and similar articles, faced or reinforced with paper or paperboard only, not ornamented	0
680919	Plaster, or plaster compositions; boards, sheets, panels, tiles and similar articles, (other than faced or reinforced with paper or paperboard only), not ornamented	1
680990	Plaster articles or articles of compositions based on plaster; n.e.c. in heading no. 6809	0
690410	Ceramic building bricks	1
690490	Ceramic flooring blocks, supports or filler tiles and the like (excluding building bricks)	0
690919	Ceramic wares; for laboratory, chemical or other technical uses, other than articles having a hardness equivalent to 9 or more on the Mohs scale or of porcelain or china	0
690990	Ceramic wares; pots, jars and similar articles of a kind used for the conveyance or packing of goods and ceramic troughs, tubs and similar receptacles used in agriculture	1
701110	Glass envelopes (including bulbs and tubes); open, and glass parts thereof, without fittings, for electric lighting	1
710221	Diamonds; industrial, unworked or simply sawn, cleaved or bruted, but not mounted or set	0
710229	Diamonds; industrial, (other than unworked or simply sawn, cleaved or bruted), but not mounted or set	0
710231	Diamonds; non-industrial, unworked or simply sawn, cleaved or bruted, but not mounted or set	1
710239	Diamonds; non-industrial, (other than unworked or simply sawn, cleaved or bruted), but not mounted or set	1
731412	Iron or steel; woven cloth, endless bands for machinery, of stainless steel	1
731414	Iron or steel; woven cloth, of stainless steel, (other than endless bands for machinery)	0
731419	Iron or steel; woven cloth, other than of stainless steel	0
731823	Iron or steel; non-threaded rivets	1
731824	Iron or steel; non-threaded cotters and cotter-pins	1
731829	Iron or steel; non-threaded articles, n.e.c. in item no. 7318.2	1
732010	Iron or steel; leaf-springs and leaves therefor	1
732020	Iron or steel; helical springs and leaves for springs	1
732090	Iron or steel; springs n.e.c. in heading no. 7320	1
732219	Radiators and parts thereof; for central heating, (not electrically heated), of iron or steel other than cast iron	1
732290	Air heaters and hot air distributors, (not electrically heated), incorporating a motor-driven fan or blower and parts thereof, of iron or steel	1
732421	Cast iron, baths, whether or not enamelled	1
732429	Iron (other than cast) or steel; baths	1
732490	Iron or steel; sanitary ware and parts thereof, excluding sinks, wash basins and baths	1
732620	Iron or steel; wire articles	1
732690	Iron or steel; articles n.e.c. in heading 7326	1
740610	Copper; powders of non-lamellar structure	1
740620	Copper; powders of lamellar structure, flakes	1
741510	Copper; nails and tacks, drawing pins, staples and similar articles of copper, or of iron or steel with copper heads	0
741521	Copper; washers, (including spring washers), not threaded	1
741529	Copper; rivets, cotters, cotter-pins and similar articles, not threaded	0
760310	Aluminium; powders of non-lamellar structure	1
760320	Aluminium; powders of lamellar structure, flakes	1
761610	Aluminium; nails, tacks, staples (other than those of heading no. 8305), screws, bolts, nuts, screw hooks, rivets, cotters, cotter-pins, washers and similar articles	1
761699	Aluminium; articles n.e.c. in heading 7616	1
790310	Zinc dust	1
790390	Zinc; powders and flakes	0
810110	Tungsten (wolfram); articles thereof, including waste and scrap, powders	1
810194	Tungsten (wolfram); unwrought, including bars and rods obtained simply by sintering	0
810320	Tantalum; unwrought, including bars and rods obtained simply by sintering, powders	1
810520	Cobalt; mattes and other intermediate products of cobalt metallurgy, unwrought cobalt, powders	1
810590	Cobalt; articles n.e.c. in heading no. 8105	1
810820	Titanium; unwrought, powders	1
811010	Antimony and articles thereof; unwrought antimony, powders	1
811020	Antimony; waste and scrap	0
811090	Antimony and articles thereof; wrought, other than waste and scrap	0
811212	Beryllium and articles thereof; unwrought beryllium, powders	1
811219	Beryllium and articles thereof; wrought other than waste and scrap	0
811221	Chromium and articles thereof; unwrought chromium, powders	1
811229	Chromium and articles thereof; wrought other than waste and scrap	0
811292	Gallium, germanium, indium, niobium (columbium) and vanadium; articles thereof, unwrought, including waste and scrap, powders	1
811299	Gallium, germanium, indium, niobium (columbium) and vanadium; articles thereof, other than unwrought including waste and scrap and powders	0
820220	Tools, hand; band saw blades	1
820231	Tools, hand; circular saw blades (including slitting or slotting saw blades), with working part of steel	0
820810	Tools; knives and cutting blades, for machines or for mechanical appliances, for metal working	1
820820	Tools; knives and cutting blades, for wood working machines or mechanical appliances	1
820840	Tools; knives and cutting blades, for agricultural, horticultural or forestry machines or mechanical appliances	1
820890	Tools; knives and cutting blades, for machines or mechanical appliances, n.e.c. in heading no. 8208	1
830120	Locks; of a kind used for motor vehicles (key, combination or electrically operated), of base metal	1
830130	Locks; of a kind used for furniture (key, combination or electrically operated), of base metal	0

cmdcode	description	sanctioned
830130	Locks; of a kind used for furniture (key, combination or electrically operated), of base metal	0
830160	Locks; parts of padlocks, locks, clasps and frames with clasps incorporating locks, of base metal	0
830170	Keys; presented separately, of base metal	1
842511	Pulley tackle and hoists; powered by an electric motor (excluding skip hoists or hoists of a kind used for raising vehicles)	1
842519	Pulley tackle and hoists; not powered by an electric motor (excluding skip hoists or hoists of a kind used for raising vehicles)	0
842531	Winches; capstans; powered by an electric motor	1
842539	Winches; capstans; not powered by an electric motor	0
842810	Lifts and skip hoists	0
842820	Elevators and conveyors; pneumatic	1
842831	Elevators and conveyors; continuous-action, for goods and materials, specially designed for underground use, n.e.c. in item no. 8428.20	1
842832	Elevators and conveyors; continuous-action, for goods or materials, bucket type, n.e.c. in item no. 8428.20 or 8428.31	1
842833	Elevators and conveyors; continuous-action, for goods or materials, belt type, n.e.c. in item no. 8428.20 or 8428.31	1
842839	Elevators and conveyors; continuous-action, for goods or materials, n.e.c. in item no. 8428.20, 8428.31, 8428.32 or 8428.33	1
842840	Escalators and moving walkways	0
842860	Teleferics, chair-lifts, ski-draglines, traction mechanisms for funiculars	0
842890	Lifting, handling, loading or unloading machinery; n.e.c. in heading no. 8425, 8426, 8427 or 8428	1
843910	Machinery; for making pulp of fibrous cellulosic material	1
843920	Machinery; for making paper or paperboard	0
843930	Machinery; for finishing paper or paperboard	1
843999	Machinery; parts of machinery for making or finishing paper or paperboard	0
844010	Book-binding machinery; including book-sewing machines	0
844090	Book-binding machinery; including book-sewing machines, parts thereof	1
844130	Machines; for making cartons, boxes, cases, tubes, drums or similar containers (other than by moulding), of paper pulp, paper or paperboard	1
844190	Machinery; parts of machinery for making up paper pulp, paper or paperboard, including cutting machines of all kinds	0
844230	Machinery, apparatus and equipment (excluding machines of heading no. 8456 to 8465) for preparing or making printing components	0
844240	Machinery, apparatus and equipment (excluding machines of heading no. 8456 to 8465) for preparing or making printing components; parts thereof	1
844312	Printing machinery; offset, sheet-fed, office type (sheet size not exceeding 22 x 36cm in the unfolded state)	0
844319	Printing machinery; used for printing by means of plates, cylinders and other printing components of heading 84.42, n.e.c. in item no. 8443.1	1
845110	Dry-cleaning machines	1
845121	Drying machines; of a dry linen capacity not exceeding 10kg	0
845129	Drying machines; of a dry linen capacity exceeding 10kg	1
845130	Ironing machines and presses (including fusing presses)	1
845140	Machines; for washing, bleaching or dyeing	0
845150	Machines; for reeling, unreeling, folding, cutting or pinking textile fabrics	0
845180	Machinery; for wringing, dressing, finishing, coating or impregnating textile yarns, fabrics or made up textile articles; for applying paste to base fabric used in manufacture of floor coverings	0
845190	Machinery; parts, of the machinery of heading no. 8451	1
851210	Lighting or visual signalling equipment; electrical, of a kind used on bicycles, excluding articles of heading no. 8539	0
851220	Lighting or visual signalling equipment; electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)	1
851230	Sound signalling equipment; electrical, used on cycles or motor vehicles (excluding articles of heading no. 8539)	0
851290	Lighting or signalling equipment; electrical, (excluding articles of heading no. 8539), windscreen wipers, defrosters and demisters; parts, of those kinds used for cycles or motor vehicles	1
852721	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles; combined with sound recording or reproducing apparatus	1
852729	Radio-broadcast receivers not capable of operating without an external source of power, of a kind used in motor vehicles; not combined with sound recording or reproducing apparatus	0
852910	Reception and transmission apparatus; aerials and aerial reflectors of all kinds and parts suitable for use therewith	1
852990	Reception and transmission apparatus; for use with the apparatus of heading no. 8524 to 8528, excluding aerials and aerial reflectors	0
853210	Electrical capacitors; fixed, designed for use in 50/60 Hz circuits and having a reactive power handling capacity of not less than 0.5 kvar (power capacitors)	1
853221	Electrical capacitors; fixed, tantalum	1
853222	Electrical capacitors; fixed, aluminium electrolytic	0
853223	Electrical capacitors; fixed, ceramic dielectric, single layer	0
853224	Electrical capacitors; fixed, ceramic dielectric, multilayer	1
853225	Electrical capacitors; fixed, dielectric of paper or plastics	0
853229	Electrical capacitors; fixed, n.e.c. in heading no. 8532	1
853230	Electrical capacitors; variable or adjustable (pre-set) capacitors	1
853290	Electrical capacitors; parts of the capacitors of heading no. 8532	1
853321	Electrical resistors; fixed, for a power handling capacity not exceeding 20W (including rheostats and potentiometers but excluding heating resistors and carbon resistors)	0
853329	Electrical resistors; fixed, for a power handling capacity exceeding 20W (including rheostats and potentiometers but excluding heating resistors and carbon resistors)	1
853340	Electrical resistors; variable, including rheostats and potentiometers (excluding heating)	0
853390	Resistors; parts of the resistors of heading no. 8533	1
870919	Vehicles; (not electrical), self-propelled, without handling equipment, used for short distance transport of goods in factories, airports and such, and tractors of the type used on railway station platforms	1

cmdcode	description	sanctioned
870990	Vehicles; parts of the vehicles of heading no. 8709	1
890610	Vessels; warships	1
890690	Vessels; other, including lifeboats other than rowing boats, other than warships	1
900211	Lenses; objective, for cameras, projectors or photographic enlargers or reducers, mounted, being parts or fittings for instruments or apparatus, of any material (excluding glass not optically worked)	1
900219	Lenses; objective, (other than for cameras, projectors or photographic enlargers or reducers), mounted, of any material (excluding elements of glass not optically worked)	1
900220	Filters; mounted as parts or fittings for instruments or apparatus, of any material (excluding elements of glass not optically worked)	1
900290	Optical elements; n.e.c. in heading no. 9002 (e.g. prisms and mirrors), mounted, being parts or fittings for instruments or apparatus, of any material (excluding elements of glass not optically worked)	0
901120	Microscopes, compound optical; for photomicrography, cinephotomicrography or microprojection	1
901180	Microscopes, compound optical; (other than stereoscopic and microscopes for photomicrography, cinephotomicrography or microprojection)	0
902212	Apparatus based on the use of x-rays; including radiography or radiotherapy apparatus, whether or not for medical, surgical, dental or veterinary uses, computed tomography apparatus	0
902214	Apparatus based on the use of x-rays; including radiography or radiotherapy apparatus, for medical, surgical or veterinary uses, not dental uses, excluding computed tomography apparatus	0
902219	Apparatus based on the use of x-rays, including radiography or radiotherapy apparatus; for other than medical, surgical, dental or veterinary uses	1
902221	Apparatus based on the use of alpha, beta, gamma or other ionising radiations, including radiography or radiotherapy apparatus; for medical, surgical, dental or veterinary uses	0
902229	Apparatus based on the use of alpha, beta, gamma or other ionising radiations, including radiography or radiotherapy apparatus; (for other than medical, surgical, dental or veterinary uses)	1
902230	X-ray tubes	1
902290	Apparatus based on use of x-rays and similar; parts and accessories (x-ray generators, tubes, high tension generators, control panels and desks, screens, examination or treatment tables, chairs and like	1
902580	Hydrometers and similar floating instruments, barometers, hygrometers, psychrometers, thermometers, pyrometers; recording or not, any combination of these instruments (excluding thermometers and barometers not combined with other instruments)	0
902590	Hydrometers and similar floating instruments, barometers, hygrometers, psychrometers, thermometers, pyrometers; recording or not, any combination of these instruments, parts and accessories	1
930591	Firearms; parts and accessories, of military weapons of heading 9301	0
930599	Firearms; parts and accessories, of firearms other than the military weapons of heading 9301	1
950621	Sailboards; for water sport	0
950629	Water sport equipment; water-skis, surf-boards and other water-sport equipment, excluding sailboards	1

Appendix 2 — Pushed to Move: The Forces Behind Africa's Emigration Flows

.3 Data

The primary data source on cross-border migration is the United Nations International Migration Database. This is part of the Global Migration Database, a comprehensive collection of empirical data on the number of international migrants by country of birth and citizenship, sex and age as enumerated by population censuses, population registers, nationally representative surveys, and other official statistical sources from more than 200 countries and territories in the world. In particular, we used the estimates of the bilateral stocks of migrants provided from 1990 to 2020 with a 5-year interval. Data is available for 238 countries and territories by gender, but in this paper, we use the total number of migrants. The estimates for population and working-age population are from the World Population Prospects Database published by the Population Division of the Department of Economic and Social Affairs of the United Nations. We consider the working age population data, i.e. people between 15 and 64 years old. The estimates for per capita real GDP level and growth rates are from the April 2023 World Economic Outlook database of the International Monetary Fund. We consider the level in USD of per capita GDP at the beginning of each period of time and its average growth rate in the previous five years. Data on the unemployment rate are from the World Bank and are collected from the Modelled Estimates and Projections database from the International Labour Organization. We consider, both the level of unemployment rate at the beginning of the quinquennium and the change in unemployment rate over the previous five years. Finally, we use the International Disasters Database to get data on natural disasters. The dataset contains data on the occurrence and impacts of over 26,000 mass disasters worldwide from 1900 to the present day. The database is compiled from various sources, including United Nations agencies, non-governmental organizations, reinsurance companies, research institutes, and press agencies. We compute the number of affected people (net of deaths) in percent of the total population and the damage per capita measured by the economic costs caused by the natural disaster divided by the current population.

.4 Sensitivity analysis on sample composition

Emigration patterns vary significantly across countries and years. In particular, during the period 1990-2020 several migration crises materialized and there is a possibility that those isolated episodes may have driven the results of the analysis. To address this concern, we perform two alternative

decompositions in which we drop those episodes. In the first one, we drop Syria. The Syrian refugee migration crisis began in March 2011 as a result of a violent government crackdown on public demonstrations. In 2015 a record 1.3 million migrants applied for asylum in the EU, Norway and Switzerland, mostly from Syria. Fig. 7 shows the results. Figures change almost exclusively for the year 2015, confirming that the impact of the Syrian migrations affected the results for that year but not for the others. Looking at the immigrations into the EU, when Syrian inflows are excluded, the increase in the stock of immigrants for 2015 drop to almost zero, suggesting that Syrian migrations were crowding out migrations from other areas. From the African countries perspective, in 2015 the attraction from the EU drops to zero.

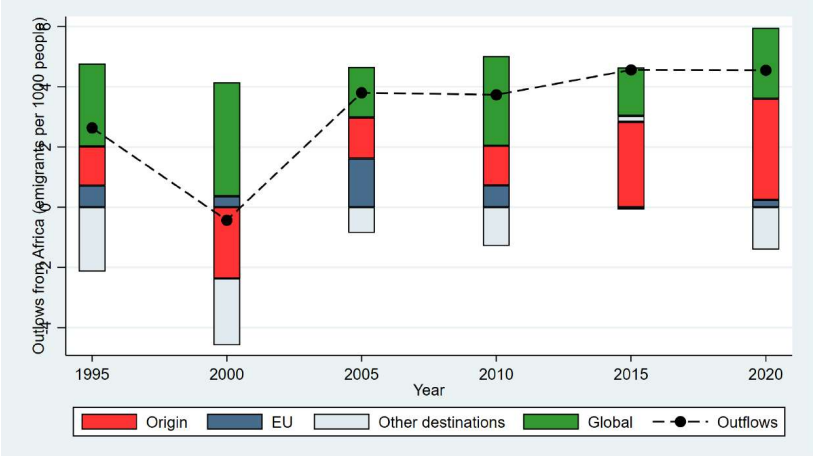

Figure 7: Outflows from Africa by type of shock — excluding Syria.
Source: Elaborations on IMS (2022). *Note*: Notation and variable definitions as in the main text.

In a second exercise we drop all countries that underwent dramatic emigration episodes (including Syria). The countries dropped are: Albania, Bhutan, Central African Republic, Ecuador, Eritrea, Gabon, Madagascar, Rwanda, Sierra Leone, South Sudan, Syria, and Venezuela.

Figure 8 confirms that the results are qualitatively consistent with the findings in the paper. In particular, the signs of the origin, destination and global components do not change.

.5 Countries Classification

.5.1 Countries by income level

The countries included in the UN International migration are grouped into four income levels (high, medium-high, medium-low, and low), following the the World Bank classification.

High-income countries include: Mayotte, Réunion, Hong Kong, Macao, Taiwan, Japan, Republic of Korea, Brunei Darussalam, Bahrain, Cyprus, Israel, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Czechia, Hungary, Poland, Romania, Slovakia, Denmark, Estonia, Faroe Islands, Finland, Guernsey, Iceland, Ireland, Isle of Man, Jersey, Latvia, Lithuania, Norway, Sweden,

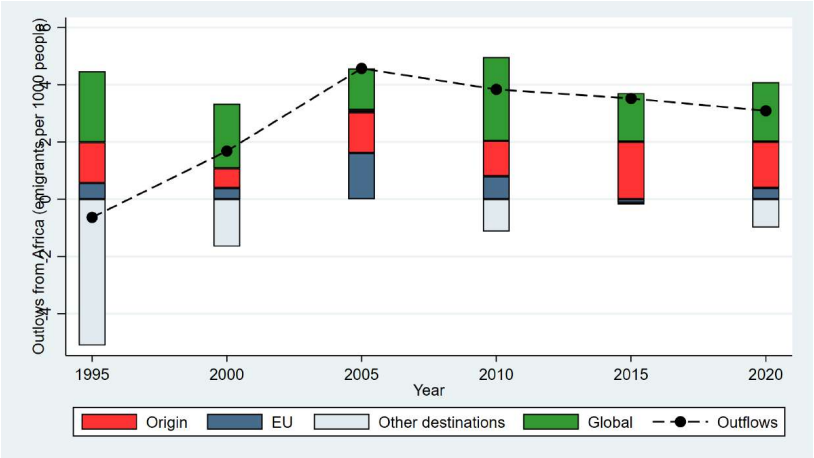

Figure 8: Outflows from Africa by type of shock — excluding extreme episodes.
Source: Elaborations on IMS (2022).

United Kingdom, Andorra, Croatia, Gibraltar, Greece, Italy, Malta, Portugal, San Marino, Slovenia, Spain, Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands, Switzerland, Aruba, British Virgin Islands, Cayman Islands, Curaçao, Guadeloupe, Martinique, Puerto Rico, Saint Barthélemy, Saint Martin (French part), Sint Maarten (Dutch part), Turks and Caicos Islands, United States Virgin Islands, Panama, Chile, Uruguay, Bermuda, Canada, Greenland, Saint Pierre and Miquelon, United States of America, Australia, New Zealand, New Caledonia, Guam, Northern Mariana Islands, French Polynesia, Falkland Islands.

Upper-middle-income countries include: Equatorial Guinea, Gabon, Libya, Botswana, Namibia, South Africa, Kazakhstan, Turkmenistan, China, Malaysia, Thailand, Armenia, Azerbaijan, Georgia, Iraq, Jordan, Turkey, Belarus, Bulgaria, Republic of Moldova, Russian Federation, Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, Serbia, Costa Rica, Guatemala, Mexico, Argentina, Brazil, Colombia, Ecuador, Guyana, Paraguay, Peru, American Samoa.

Lower-middle-income countries include: Djibouti, Kenya, United Republic of Tanzania, Zimbabwe, Angola, Cameroon, Congo, Algeria, Egypt, Morocco, Tunisia, Eswatini, Lesotho, Benin, Côte d'Ivoire, Ghana, Mauritania, Nigeria, Senegal, Kyrgyzstan, Tajikistan, Uzbekistan, Mongolia, Bangladesh, Bhutan, India, Iran, Nepal, Pakistan, Sri Lanka, Cambodia, Indonesia, Lao People's Democratic Republic, Myanmar, Philippines, Viet Nam, Lebanon, State of Palestine, Ukraine, El Salvador, Honduras, Nicaragua, Bolivia.

All other countries in the sample are **low-income**. Low and middle-income countries include low-, upper-middle-, and lower-middle-income countries.

.5.2 Geographic areas

Geographic areas are defined following the UN Statistical Division classification as: Eastern Africa, Middle Africa, Northern Africa, Southern Africa, Western Africa, Central Asia, Eastern Asia, South-Eastern Asia, Southern Asia, Western Asia, Eastern Europe, Northern Europe, Southern Europe, Western Europe, Central America, South America (including Caribbean), Australia and New Zealand, and Northern America.

.6 Empirical Analysis Specification

Table 2: Coefficients and selected effects

	Coefficient	**Std. Err.**	**z**	$P > \|z\|$	**95% CI**
Endowments					
ICRG Political Risk Index	-0.45	0.13	-3.56	0.00	[-0.70, -0.20]
FE Northern Africa	0.21	0.10	2.22	0.03	[0.03, 0.40]
Coefficients					
Δ labor force (pp)	0.21	0.08	2.71	0.01	[0.06, 0.37]
FE Northern Africa	0.21	0.10	2.22	0.03	[0.03, 0.40]
Interactions					
FE Northern Africa	-0.21	0.10	-2.22	0.03	[-0.40, -0.03]
FE Northern America	0.02	0.01	1.82	0.07	[-0.00, 0.04]
FE South-Eastern Asia	0.08	0.05	1.76	0.08	[-0.01, 0.17]

Note: In the detailed section, only statistically significant coefficients are reported. Complete table available on request.

.7 Oaxaca-Blinder Decomposition

.7.1 Africa vs Low- and Middle-Income Countries

	Coefficient	Std. Err.	z	$P > \|z\|$	95% CI
Overall difference:					
Low- and Middle-Income Countries	0.16	0.11	1.44	0.15	[-0.06, 0.38]
Africa	0.26	0.09	2.80	0.01	[0.08, 0.45]
Difference	-0.10	0.15	-0.69	0.49	[-0.39, 0.19]
Endowments	-0.14	0.76	-0.18	0.86	[-1.64, 1.36]
Coefficients	0.12	1.17	0.10	0.92	[-2.17, 2.41]
Interaction	-0.08	1.37	-0.06	0.95	[-2.76, 2.60]
Details:					
Endowments					
ICRG Political Risk Index	-0.24	0.08	-2.88	0.00	[-0.40, -0.08]
FE Northern Africa	0.21	0.10	2.22	0.03	[0.03, 0.40]
Coefficients					
Δ labor force (pp)	0.19	0.08	2.41	0.02	[0.04, 0.35]
Unemployment rate	-0.85	0.50	-1.70	0.09	[-1.83, 0.13]
FE Year 2010	-0.12	0.08	-1.48	0.14	[-0.27, 0.04]
FE Northern Africa	0.21	0.10	2.22	0.03	[0.03, 0.40]
Interactions					
FE Northern Africa	-0.21	0.10	-2.22	0.03	[-0.40, -0.03]

Note: In the detailed section, only statistically significant coefficients are reported. Complete table available on request.

.7.2 Africa vs High-Income Countries

	Coefficient	Std. Err.	z	$P > \|z\|$	95% CI
Overall difference:					
High-Income countries	-0.52	0.14	-3.54	0.00	[-0.80, -0.23]
Africa	0.26	0.09	2.80	0.01	[0.08, 0.45]
Difference	-0.78	0.17	-4.50	0.00	[-1.12, -0.44]
Endowments	-8.68	9.61	-0.90	0.37	[-27.51, 10.15]
Coefficients	0.73	0.46	1.60	0.11	[-0.17, 1.64]
Interaction	7.17	9.62	0.75	0.46	[-11.69, 26.03]
Details:					
Endowments					
ICRG Political Risk Index	-1.03	0.26	-3.92	0.00	[-1.55, -0.52]
FE Northern Africa	0.21	0.10	2.22	0.03	[0.03, 0.40]
Coefficients					
Labor force in % of population	-4.87	1.96	-2.48	0.01	[-8.71, -1.02]
FE Year 2010	0.14	0.08	-1.78	0.08	[-0.15, 0.30]
FE Northern Africa	0.21	0.10	2.22	0.03	[0.03, 0.40]
Constant	5.07	2.50	2.03	0.04	[0.17, 9.96]
Interactions					
Eastern Europe	-0.14	0.08	-1.68	0.09	[-0.31, 0.02]
FE Northern Africa	-0.21	0.10	-2.22	0.03	[-0.40, -0.03]
Southern Europe	-0.35	0.11	-3.08	0.00	[-0.57, -0.14]
Western Europe	-0.19	0.11	-1.79	0.07	[-0.40, 0.02]

Note: In the detailed section, only statistically significant coefficients are reported. Complete table available on request.

Appendix 3"Global Trade Fragmentation and the Reshaping of the World Economy"

.8 Derivation of the Sample Moment Conditions for Total Exports and Total Imports

Let us define $d_{mn,t} \equiv \frac{X_{mn,t}-X_{mn,t-1}}{X_{mn,t-1}}$, i.e. the growth rate of exports from the origin country m to the destination country n.[12]

The following generalized class of models can fit the dynamics of trade flows:

$$d_{mn,t} = \alpha_{n,t} + \beta_{m,t} + \varepsilon_{mn,t} \tag{12}$$

where $\alpha_{n,t}$ is an importer specific shock, $\beta_{m,t}$ an exporter specific shock and the error term is unbiased and satisfies the orthogonality condition with the regressors: $E(\varepsilon_{mn,t}) = 0$.

The estimation of (12) requires a normalization with the choice of a reference category:

$$d_{mn,t} = c_t + \dot{\alpha}_{n,t} + \dot{\beta}_{m,t} + \varepsilon_{mn,t} \tag{13}$$

where $\dot{\alpha}_{n,t} = \alpha_{n,t} - \alpha_t^*$ and $\dot{\beta}_{m,t} = \beta_{m,t} - \beta_t^*$ since we consider α_t^* and β_t^* as reference categories; hence, $c_t = \alpha_t^* + \beta_t^*$.

Let us consider the WLS estimation of (13) with weights $w_{mn,t} = X_{mn,t-1}$. The theoretical moment conditions are the following:[13]

$$E\left[\sum_m \sum_n w_{mn,t}\varepsilon_{mn,t}\right] = 0 \tag{14}$$

$$E\left[\sum_n w_{mn,t}\varepsilon_{mn,t}\right] = 0 \quad \text{for any origin/exporter } m \tag{15}$$

$$E\left[\sum_n w_{mn,t}\varepsilon_{mn,t}\right] = 0 \quad \text{for any destination/importer } n \tag{16}$$

where (14) is for the reference category.

Let us consider the sample moment condition for the m exporter, i.e. the sample moment condition referring to (15):

$$\frac{1}{\sum_n X_{mn,t-1}} \sum_n X_{mn,t-1}\widehat{\varepsilon}_{mn,t} = 0$$

If we define $\phi_{mn,t-1} \equiv \frac{X_{mn,t-1}}{\sum_n X_{mn,t-1}}$, i.e. the share of exports of m that is delivered at country n (hence $\sum_n \phi_{mn,t-1} = 1$), then the sample moment condition can be rewritten as follows:

[12] We assume that $X_{mn,t-1} > 0$ as normally happens in trade where trade creation and diversion appear as changes in the flows.

[13] All the summations exclude $m \neq n$ since we do not consider production that is home delivered-only (exports to oneself) or similarly expenditure on home-produce products. We omit this condition in each summation to simplify the notation.

$$\sum_n \widehat{\varepsilon}_{mn,t}\phi_{mn,t-1} = 0$$

Since $\widehat{\varepsilon}_{mn,t} = d_{mn,t} - \widehat{c}_t - \widehat{\alpha}_{n,t} - \widehat{\dot{\beta}}_{m,t}$, then:

$$\sum_n d_{mn,t}\phi_{mn,t-1} = \widehat{c}_t \sum_n \phi_{mn,t-1} + \sum_n \phi_{mn,t-1}\widehat{\alpha}_{n,t} + \widehat{\dot{\beta}}_{m,t} \sum_n \phi_{mn,t-1}$$

Let us note that $\sum_n d_{mn,t}\phi_{mn,t-1} \equiv \sum_n \frac{X_{mn,t}-X_{mn,t-1}}{X_{mn,t-1}} \frac{X_{mn,t-1}}{\sum_n X_{mn,t-1}} \equiv \frac{X_{M,t}-X_{M,t-1}}{X_{M,t-1}} \equiv d_{M,t}$ that is the growth rate of total exports of country m. Therefore, the sample moment condition for country m involves only its total export growth rate:[14]

$$d_{M,t} = \widehat{c}_t + \sum_n \phi_{mn,t-1}\widehat{\dot{\alpha}}_{n,t} + \widehat{\dot{\beta}}_{m,t} \tag{17}$$

Similarly for the sample moment condition for the importer n:

$$\frac{1}{\sum_m X_{mn,t-1}} \sum_m X_{mn,t-1}\widehat{\varepsilon}_{mn,t} = 0$$

If we define $\theta_{mn,t-1} \equiv \frac{X_{mn,t-1}}{\sum_m X_{mn,t-1}}$, i.e. the share of imports of m that is delivered by country n (hence $\sum_m \theta_{mn,t-1} = 1$), then the sample moment condition can be rewritten as follows:

$$\sum_m \widehat{\varepsilon}_{mn,t}\theta_{mn,t-1} = 0$$

or

$$\sum_m d_{mn,t}\theta_{mn,t-1} = \widehat{c}_t \sum_m \theta_{mn,t-1} + \widehat{\dot{\alpha}}_{n,t} \sum_m \theta_{mn,t-1} + \sum_m \theta_{mn,t-1}\widehat{\dot{\beta}}_{m,t}$$

where $\sum_m d_{mn,t}\theta_{mn,t-1} \equiv \frac{X_{N,t}-X_{N,t-1}}{X_{N,t-1}} \equiv d_{N,t}$ that is the growth rate of total imports of country n. Therefore, the sample moment condition for country n involves only its total import growth rate:

$$d_{N,t} = \widehat{c}_t + \widehat{\dot{\alpha}}_{n,t} + \sum_m \theta_{mn,t-1}\widehat{\dot{\beta}}_{m,t} \tag{18}$$

.9 Derivation of the Idiosyncratic Shocks

Equations (3.2) and (3.3), reproposed in (17) and (18), are representative of the sample moment conditions and the whole system can be shown in matrix form as follows before the choice of normalization:

$$\begin{aligned} \mathbf{D}_{M,t} &= \mathbf{B}_t + \mathbf{\Phi}_{t-1}\mathbf{A}_t \\ \mathbf{D}_{N,t} &= \mathbf{A}_t + \mathbf{\Theta}_{t-1}\mathbf{B}_t \end{aligned} \tag{19}$$

where the vectors with the shocks are the following:

$$\mathbf{A}_t = \begin{pmatrix} \alpha_{1,t} \\ \vdots \\ \alpha_{n,t} \\ \vdots \\ \alpha_{N,t} \end{pmatrix} \quad \mathbf{B}_t = \begin{pmatrix} \beta_{1,t} \\ \vdots \\ \beta_{m,t} \\ \vdots \\ \beta_{M,t} \end{pmatrix}$$

The matrices with the data follow:

[14] Differently from Amiti and Weinstein (2018) we do not have to deal with possible $X_{mn,t-1} = 0$ and $X_{mn,t} > 0$ in our sample.

$$\mathbf{D}_{M,t} = \begin{pmatrix} D^M_{1,t} \\ \vdots \\ D^M_{M,t} \end{pmatrix} \qquad \mathbf{D}_{N,t} = \begin{pmatrix} D^N_{1,t} \\ \vdots \\ D^N_{N,t} \end{pmatrix}$$

$$\underset{(M\times N)}{\mathbf{\Phi}_{t-1}} = \begin{pmatrix} \phi_{11,t-1} & \cdots & \phi_{1N,t-1} \\ \vdots & \ddots & \vdots \\ \phi_{M1,t-1} & \cdots & \phi_{MN,t-1} \end{pmatrix} \qquad \underset{(N\times M)}{\mathbf{\Theta}_{t-1}} = \begin{pmatrix} \theta_{11,t-1} & \cdots & \theta_{1M,t-1} \\ \vdots & \ddots & \vdots \\ \theta_{N1,t-1} & \cdots & \theta_{NM,t-1} \end{pmatrix}$$

The reference categories the terms $\widehat{\alpha}^*_t$ and $\widehat{\beta}^*_t$ in (17) and (18) are set to the time-varying median values: $\widehat{\alpha}^*_t = \bar{A}_t$ and $\widehat{\beta}^*_t = \bar{B}_t$.

Then, we can define $\dot{\mathbf{A}}_t \equiv \mathbf{A}_t - \bar{A}_t\mathbf{1}_N$ and $\dot{\mathbf{B}}_t \equiv \mathbf{B}_t - \bar{B}_t\mathbf{1}_M$, where $\mathbf{1}_N$ and $\mathbf{1}_M$ are (column) vectors of 1s of dimensions N and M respectively. Hence, the system (19) becomes:

$$\begin{aligned} \mathbf{D}_{M,t} &= \dot{\mathbf{B}}_t + \bar{B}_t\mathbf{1}_M + \mathbf{\Phi}_{t-1}\dot{\mathbf{A}}_t + \bar{A}_t\mathbf{\Phi}_{t-1}\mathbf{1}_N \\ \mathbf{D}_{N,t} &= \dot{\mathbf{A}}_t + \bar{A}_t\mathbf{1}_N + \mathbf{\Theta}_{t-1}\dot{\mathbf{B}}_t + \bar{B}_t\mathbf{\Theta}_{t-1}\mathbf{1}_M \end{aligned}$$

Since the elements of $\mathbf{\Phi}_{t-1}$ and $\mathbf{\Theta}_{t-1}$ are shares, then $\mathbf{\Phi}_{t-1}\mathbf{1}_N = \mathbf{1}_M$ and $\mathbf{\Theta}_{t-1}\mathbf{1}_M = \mathbf{1}_N$. Therefore, the system of moment conditions simplifies as follows:

$$\begin{aligned} \mathbf{D}_{M,t} &= \dot{\mathbf{B}}_t + \mathbf{\Phi}_{t-1}\dot{\mathbf{A}}_t + (\bar{A}_t + \bar{B}_t)\mathbf{1}_M \\ \mathbf{D}_{N,t} &= \dot{\mathbf{A}}_t + \mathbf{\Theta}_{t-1}\dot{\mathbf{B}}_t + (\bar{A}_t + \bar{B}_t)\mathbf{1}_N \end{aligned} \tag{20}$$

The geopolitical factors are inserted by considering two new vectors that include for each country the medians of the exporter and of the importer shocks of the trading block to which it is assigned: $\bar{\mathbf{A}}^{TB}_t \equiv median_{n\in TB}(\dot{\mathbf{A}}_t)$ for the exporters and $\bar{\mathbf{B}}^{TB}_t \equiv median_{m\in TB}(\dot{\mathbf{B}}_t)$ for the importers. For countries that are not assigned to any trading block (the non-aligned countries as referred to by Bonadio et al., 2025) the trading block component is zero since $median(\dot{\mathbf{A}}_t) = median(\dot{\mathbf{B}}_t) = 0$.

Let us define exporter and importer shocks after taking out the general trend, represented by $(\bar{A}_t + \bar{B}_t)$, and the trading block trend, included in $(\bar{\mathbf{A}}^{TB}_t + \bar{\mathbf{B}}^{TB}_t)$:

$$\begin{aligned} \widetilde{\mathbf{A}}_t \equiv \dot{\mathbf{A}}_t - \bar{\mathbf{A}}^{TB}_t \equiv \mathbf{A}_t - \bar{A}_t\mathbf{1}_N - \bar{\mathbf{A}}^{TB}_t \Rightarrow \mathbf{A}_t \equiv \widetilde{\mathbf{A}}_t + \bar{A}_t\mathbf{1}_N + \bar{\mathbf{A}}^{TB}_t \\ \widetilde{\mathbf{B}}_t \equiv \dot{\mathbf{B}}_t - \bar{\mathbf{B}}^{TB}_t \equiv \mathbf{B}_t - \bar{B}_t\mathbf{1}_M - \bar{\mathbf{B}}^{TB}_t \Rightarrow \mathbf{B}_t \equiv \widetilde{\mathbf{B}}_t + \bar{B}_t\mathbf{1}_M + \bar{\mathbf{B}}^{TB}_t \end{aligned} \tag{21}$$

By inserting (21) into the original system (19) we obtain the following final shock decomposition:

$$\mathbf{D}_{M,t} = \underbrace{\widetilde{\mathbf{B}}_t}_{\text{exporter shock}} + \underbrace{(\bar{A}_t + \bar{B}_t)\mathbf{1}_M}_{\text{world trend shock}} + \underbrace{(\bar{\mathbf{B}}^{TB}_t + \mathbf{\Phi}_{t-1}\bar{\mathbf{A}}^{TB}_t)}_{\text{trading block shock}} + \underbrace{\mathbf{\Phi}_{t-1}\widetilde{\mathbf{A}}_t}_{\text{importer shock}} \tag{22}$$

Similarly for the importers:

$$\mathbf{D}_{N,t} = \widetilde{\mathbf{A}}_t + (\bar{A}_t + \bar{B}_t)\mathbf{1}_N + (\bar{\mathbf{A}}^{TB}_t + \mathbf{\Theta}_{t-1}\bar{\mathbf{B}}^{TB}_t) + \mathbf{\Theta}_{t-1}\widetilde{\mathbf{B}}_t$$

By defining $w_{m,t} \equiv \frac{\sum_{n\neq m} X_{mn,t-1}}{\sum_m \sum_{n\neq m} X_{mn,t-1}}$ and inserting them into the (row) vector $\mathbf{W}_{M,t}$, we can obtain a decomposition for the growth rate of world exports D_t by aggregating the equation of system (22) with $\mathbf{W}_{M,t}$:

$$\begin{aligned} D_t = \mathbf{W}_{M,t}\mathbf{D}_{M,t} = \underbrace{\mathbf{W}_{M,t}\widetilde{\mathbf{B}}_t}_{\text{exporters component}} + \underbrace{(\bar{A}_t + \bar{B}_t)\mathbf{W}_{M,t}\mathbf{1}_M}_{\text{world trend component}} + \underbrace{\mathbf{W}_{M,t}(\bar{\mathbf{B}}^{TB}_t + \mathbf{\Phi}_{t-1}\bar{\mathbf{A}}^{TB}_t)}_{\text{trading blocks component}} + \\ + \underbrace{\mathbf{W}_{M,t}\mathbf{\Phi}_{t-1}\widetilde{\mathbf{A}}_t}_{\text{importers component}} \end{aligned} \tag{23}$$

Operationally, if we use the same aggregation as in Equation (23), but we reweigh export growth rates with the previous-period weight of each country within the bloc, we can obtain trading bloc export growth rates.

Let us define $w^{TB}_{m\in TB,t} \equiv \frac{\sum_{n\neq m} X_{m\in TBn,t-1}}{\sum_{m\in TB}\sum_{n\neq m} X_{m\in TBn,t-1}}$, i.e., exports of country-m (at time $t-1$), belonging to trading bloc TB as a share of the exports of all countries belonging to the trading bloc TB, where all these weights sum to one, and insert these weights into the (row) vector $\mathbf{W}^{TB}_{M\in TB,t}$.

Similarly to Equation (23), we can aggregate the Equation (22) per bloc with $\mathbf{W}^{TB}_{M,t}$, and we obtain the *TB-bloc export growth rate* D^{TB}_t where we can identify the different within-bloc shocks:[15]

$$\begin{aligned} D^{TB}_t = \mathbf{W}^{TB}_{M\in TB,t}\mathbf{D}_{M,t} = & \underbrace{\mathbf{W}^{TB}_{M\in TB,t}\widetilde{\mathbf{B}}_t}_{\text{within-bloc exporters shock}} + \underbrace{(\bar{A}_t+\bar{B}_t)\mathbf{W}^{TB}_{M\in TB,t}\mathbf{1}_M}_{\text{world trend shock on the bloc}} + \\ & + \underbrace{(\bar{\mathbf{B}}^{TB}_t + \mathbf{\Phi}_{t-1}\bar{\mathbf{A}}^{TB}_t)}_{\text{trading bloc shock}} + \underbrace{\mathbf{W}^{TB}_{M\in TB,t}\mathbf{\Phi}_{t-1}\widetilde{\mathbf{A}}_t}_{\text{within-bloc importers shock}} \end{aligned} \tag{24}$$

If we define $w_{TB,t} \equiv \frac{\sum_{m\in TB}\sum_{n\neq m} X_{mn,t-1}}{\sum_m \sum_{n\neq m} X_{mn,t-1}}$, i.e. the world weight of the bloc TB, then $w_{m,t} \equiv w^{TB}_{m,t}\cdot w_{TB,t}$. Then, the world export growth rate D_t is a TB-weighted average of the TB export growth rates.

.10 Country Assignment to the Trading Blocs

[15] Since $\sum_{m\in TB} w^{TB}_{m\in TB,t} = 1$, the trading bloc component does not need to be weighted as the weighted sum of deviations from the median will give back the median.

Table 5: Geopolitical Classification

US Bloc	CHN Bloc	Western Aligned	Western Aligned	Non-Western Aligned
Aruba	Belarus	Albania	Paraguay	Afghanistan
Australia	Cambodia	Antigua and Barbuda	Peru	Algeria
Austria	China	Argentina	Philippines	Angola
Bahamas	Cuba	Barbados	Romania	Armenia
Belgium	Eritrea	Belize	Samoa	Azerbaijan
Bermuda	Hong Kong Special Administrative Regi..	Benin	Senegal	Bangladesh
Canada	Iran	Bhutan	Seychelles	Bosnia and Herzegovina
Croatia	Kazakhstan	Bolivia	Sierra Leone	Brunei
Cyprus	Laos	Botswana	Singapore	Burkina Faso
Czechia	Myanmar	Brazil	South Africa	Burundi
Denmark	Nicaragua	Bulgaria	Sri Lanka	CAR
Estonia	North Korea	Cabo Verde	Suriname	Cameroon
Faroe Islands	Russia	Chile	Thailand	Chad
Finland	Syria	Colombia	Timor-Leste	Comoros
France	Turkmenistan	Costa Rica	Tonga	DR Congo
French Polynesia	Venezuela	Dominica	Trinidad and Tobago	Djibouti
Germany	Zimbabwe	Dominican Republic	Tunisia	Egypt
Gibraltar		Ecuador	Tuvalu	Equatorial Guinea
Greece		El Salvador	Ukraine	Eswatini
Greenland		Fiji	Uruguay	Ethiopia
Iceland		Gambia	Vanuatu	Gabon
Ireland		Georgia	Zambia	Guinea
Israel		Ghana		Guinea-Bissau
Italy		Guatemala		Haiti
Japan		Guyana		Iraq
Latvia		Honduras		Jordan
Lithuania		Hungary		Kuwait
Luxembourg		India		Kyrgyzstan
Malta		Indonesia		Lebanon
Mexico		Ivory Coast		Libya
Netherlands		Jamaica		Macao SAR
New Caledonia		Kenya		Malaysia
New Zealand		Kiribati		Mali
Norway		Lesotho		Mauritania
Poland		Liberia		Mozambique
Portugal		Madagascar		Niger
Slovakia		Malawi		Oman
Slovenia		Maldives		Pakistan
South Korea		Mauritius		Papua New Guinea
Spain		Moldova		Qatar
Sweden		Mongolia		Rwanda
Switzerland		Montenegro		Saudi Arabia
UK		Morocco		Serbia
USA		Namibia		Solomon Islands
		Nauru		Somalia
		Nepal		South Sudan, Republic of
		Nigeria		Tajikistan
		North Macedonia		Tanzania
		Panama		Togo
				Turkey
				UAE
				Uganda
				Uzbekistan
				Vietnam
				Yemen

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Table 6: Bonadio et al. (2025) Classification

US Bloc	CHN Bloc	Unaligned
Austria	Afghanistan	Albania
Bahamas	Angola	Algeria
Bangladesh	Aruba	Argentina
Croatia	Belarus	Armenia
Cyprus	Bhutan	Australia
Denmark	Bolivia	Azerbaijan
Egypt	Brazil	Bahrain
Equatorial Guinea	Burkina Faso	Barbados
Eritrea	Burundi	Belgium
Ethiopia	Canada	Belize
Faroe Islands	Chad	Bosnia and Herzegovina
Fiji	China	Botswana
Germany	Colombia	Brunei
Ghana	DR Congo	Bulgaria
Greenland	Dominica	CAR
Guinea-Bissau	Dominican Republic	Cambodia
India	Ecuador	Cameroon
Japan	El Salvador	Chile
Latvia	French Polynesia	Costa Rica
Libya	Gabon	Czechia
Lithuania	Guatemala	Estonia
Mali	Guinea	Finland
Mauritania	Honduras	France
Montenegro	Israel	Gambia
Netherlands	Ivory Coast	Georgia
Nicaragua	Kuwait	Greece
Norway	Kyrgyzstan	Hong Kong
Samoa	Lesotho	Hungary
Singapore	Malaysia	Iceland
Somalia	Malta	Indonesia
South Korea	Nepal	Iran
South Sudan, Republic of	New Caledonia	Iraq
Sweden	New Zealand	Ireland
Syria	North Korea	Italy
Thailand	Panama	Jamaica
Togo	Papua New Guinea	Jordan
Turkey	Russia	Kazakhstan
Tuvalu	Rwanda	Kenya
USA	Saudi Arabia	Laos
Uganda	Sierra Leone	Lebanon
Ukraine	UAE	Luxembourg
Uruguay	Sri Lanka	Madagascar
Uzbekistan	Tajikistan	Malawi
Vanuatu	Trinidad and Tobago	Maldives
	Turkmenistan	Mauritius
		Mexico
		Moldova

Table 7: Bonadio et al. (2025) Classification (continued)

US Bloc	CHN Bloc	Unaligned
		Mongolia
		Morocco
		Mozambique
		Myanmar
		Namibia
		Niger
		Nigeria
		North Macedonia
		Oman
		Pakistan
		Paraguay
		Peru
		Philippines
		Poland
		Portugal
		Qatar
		Romania
		Senegal
		Serbia
		Seychelles
		Slovakia
		Slovenia
		South Africa
		Spain
		Suriname
		Switzerland
		Tanzania
		Tonga
		Tunisia
		UK
		Venezuela
		Vietnam
		Yemen
		Zambia
		Zimbabwe

Table 8: Economic Classification

USMCA	EU/EFTA	MERCOSUR	ASEAN&Pacific	RoW	US+EU Core	Asia Core
Canada	Albania	Argentina	Australia	Afghanistan	Canada	Australia
Mexico	Austria	Bolivia	Brunei	Algeria	France	China
USA	Belgium	Brazil	Cambodia	Angola	Germany	Hong Kong
	Bulgaria	Chile	China	Antigua and Barbuda	Italy	India
	Croatia	Colombia	Hong Kong	Armenia	Mexico	Indonesia
	Czechia	Ecuador	India	Aruba	Spain	Japan
	Denmark	Guyana	Indonesia	Azerbaijan	UK	Pakistan
	Estonia	Paraguay	Japan	Bahamas	USA	South Korea
	Finland	Peru	Laos	Bangladesh		
	France	Uruguay	Malaysia	Barbados		
	Germany		Myanmar	Belarus		
	Greece		New Zealand	Belize		
	Hungary		Pakistan	Benin		
	Ireland		Philippines	Bermuda		
	Italy		Singapore	Bhutan		
	Latvia		South Korea	Bosnia and Herzegovina		
	Lithuania		Sri Lanka	Botswana		
	Luxembourg		Thailand	Burkina Faso		
	Malta		Timor-Leste	Burundi		
	Netherlands		Vietnam	CAR		
	Norway			Cabo Verde		
	Poland			Cameroon		
	Portugal			Chad		
	Romania			Comoros		
	Slovakia			Costa Rica		
	Slovenia			Cuba		
	Spain			Cyprus		
	Sweden			DR Congo		
	Switzerland			Djibouti		
				Dominica		
				Dominican Republic		
				Egypt		

USMCA	EU/EFTA	MERCOSUR	ASEAN&Pacific	RoW	US+EU Core	Asia Core
				El Salvador		
				Equatorial Guinea		
				Eritrea		
				Eswatini		
				Ethiopia		
				Faroe Islands		
				French Polynesia		
				Gabon		
				Gambia		
				Georgia		
				Ghana		
				Gibraltar		
				Greenland		
				Guatemala		
				Guinea		
				Guinea-Bissau		
				Haiti		
				Honduras		
				Iceland		
				Iran		
				Iraq		
				Israel		
				Ivory Coast		
				Jamaica		
				Jordan		
				Kazakhstan		
				Kenya		
				Kiribati		
				Kuwait		
				Kyrgyzstan		
				Lebanon		
				Lesotho		
				Liberia		

USMCA	EU/EFTA	MERCOSUR	ASEAN&Pacific	RoW	US+EU Core	Asia Core
				Libya		
				Madagascar		
				Malawi		
				Maldives		
				Mali		
				Mauritania		
				Mauritius		
				Moldova		
				Montenegro		
				Morocco		
				Mozambique		
				Namibia		
				Nauru		
				New Caledonia		
				Nicaragua		
				Niger		
				Nigeria		
				North Korea		
				North Macedonia		
				Oman		
				Panama		
				Qatar		
				Russia		
				Rwanda		
				Samoa		
				Saudi Arabia		
				Senegal		
				Serbia		
				Seychelles		
				Sierra Leone		
				Solomon Islands		
				Somalia		
				South Africa		

USMCA	EU/EFTA	MERCOSUR	ASEAN&Pacific	RoW	US+EU Core	Asia Core
				South Sudan, Republic of		
				Suriname		
				Syria		
				Tajikistan		
				Tanzania		
				Togo		
				Tonga		
				Trinidad and Tobago		
				Tunisia		
				Turkey		
				Turkmenistan		
				Tuvalu		
				UAE		
				UK		
				Uganda		
				Ukraine		
				Uzbekistan		
				Vanuatu		
				Venezuela		
				Yemen		
				Zambia		
				Zimbabwe		

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