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De-globalization and Trade Decoupling

Empirical Evidence from Italian Intermediate Goods Trade

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Abstract

The structural slowdown of globalization since the Great Recession has recently been accelerated by major geopolitical disruptions, most notably the US-China trade dispute and the war in Ukraine. While the literature highlights a broader geopolitical trade reconfiguration, empirical research rarely examines single-country intermediate input sourcing. This thesis investigates whether Italy's intermediate goods imports have undergone geographic nearshoring and geopolitical decoupling between 2010 and 2025 using a structural gravity model. The analysis follows three steps: i) constructing a product-level panel merging trade, tariffs, geographic, and geopolitical metrics; ii) conducting exploratory data visualization; and iii) estimating a Poisson Pseudo-Maximum Likelihood specification with partner and product-year fixed effects. Results show that the geographical distance coefficient is negative only in the earliest period and remains statistically indistinguishable from zero throughout, providing no evidence of nearshoring. Conversely, geopolitical distance (UNGA voting-based) exhibits a counterintuitive, statistically significant positive effect, running counter to the decoupling hypothesis. Furthermore, total distance effects on strategic intermediate goods are largely insignificant, except for a marginally significant positive total effect of geographical distance in the most recent period, partly reflecting limited sample size. Overall, Italian intermediate goods sourcing exhibits strong persistence rather than structural decoupling.

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Contents

1 Introduction **1**

2 Literature Review **5**

2.1 The reconfiguration of global value chains 5

2.1.1 From hyper-globalization to de-globalization 5

2.1.2 Nearshoring and reshoring 8

2.1.3 Friendshoring and geopolitical decoupling 10

2.2 Intermediate goods in international trade 12

2.2.1 Definition and classification 12

2.2.2 Strategic and critical goods 14

2.2.3 Empirical evidence on intermediate and strategic goods trade . 14

2.3 The Italian case 17

2.3.1 Italy in the empirical literature on trade reconfiguration 20

2.3.2 Research questions 24

3 Methodology **25**

3.1 Gravity model 25

3.1.1 General equation 25

3.1.2 From theory to estimation: PPML specification 26

3.1.3 Monadic vs dyadic effects 27

3.1.4 Fixed effects 28

3.2 Estimating equation 29

3.2.1 Structural breaks in 2018 and 2022 31

3.3 Testable hypothesis 32

4 Data Collection and Dataset Construction **36**

4.1 Data Source and Variables 36

4.1.1 Geographic and Geopolitical Variables . . . 37
4.1.2 Trade and Tariff Variables . . . 40
4.1.3 Derived Variables . . . 43
4.1.4 Final Panel Construction . . . 43
4.2 Descriptive Statistics of the Panel . . . 45
4.2.1 Binary and Categorical Variables . . . 45
4.2.2 Continuous Variables . . . 47

5 Results and Discussion **49**
5.1 Preliminary Data Analysis . . . 49
5.1.1 Trade Value and Geographical Distance . . . 49
5.1.2 Trade Value and Binary Variables . . . 53
5.1.3 Trade Value and Geopolitical Distance . . . 55
5.2 Econometric estimate . . . 57
5.2.1 Baseline gravity specification . . . 58
5.2.2 Robustness check . . . 66
5.2.3 Strategic vs. Non-Strategic Goods . . . 75
5.2.4 Coefficient stability across the three periods . . . 76

6 Conclusion **79**
6.1 Reflections . . . 79
6.2 Limitations . . . 81
6.3 Future research . . . 82

A Appendix **89**
A.1 Conversion Table for partner countries . . . 89

B Appendix **93**
B.1 In-depth description of data gathering . . . 93
B.1.1 Detailed description of derived variables . . . 93
B.1.2 Missing data manipulation . . . 95
B.1.3 Data Harmonization . . . 96
B.2 Full panel snapshot . . . 97

List of Tables

2.1 Selected strategic commodities and associated HS codes with four and six digits. Extract retrieved from Joint Research Centre (2021). 15

3.1 Expected signs of the regressors 33

4.1 Geographic, Geopolitical and Economic variables as-is 38
4.2 Trade and Tariffs panel 41
4.3 Derived variables from the raw variables 43
4.4 Descriptive statistics of binary variables 46
4.5 Distribution of geopolitical alignment status 46
4.6 Summary of key statistics (continuous variables) 47

5.1 PPML estimates of the determinants of Italian intermediate goods imports with sequential specifications (2010-2025) 62
5.2 Interpretation of the PPML estimates 64
5.3 Pairwise correlations among the dependent variable and the regressors of the baseline specification 67
5.4 Pairwise correlations among gravity regressors 68
5.5 PPML estimates without partner fixed effects (GDP as monadic proxy) 69
5.6 Baseline regression analysis without USA and China 72
5.7 Conservative definition of intermediate goods (BEC4INT > 0.5) 74
5.8 Total effects on strategic goods 75
5.9 Wald tests of coefficient equality across periods 77

A.1 Conversion table for partner countries 89

B.1 Illustration of the BEC concordance procedure for intermediate goods identification (HS 2017 revision) 97
B.2 Extract from the regression panel – partner: The Netherlands 98

List of Figures

2.1 Italy's and the World's Trade Openness Index, computed as (exports + imports) / GDP, in percentage terms (World Bank index NE.TRD.GNFS.ZS). Vertical dashed lines mark major macroeconomic and geopolitical events. Source: elaboration from World Bank (2026) 6

2.2 Simplified illustration of the hierarchical structure of the Harmonized System (Sections, Chapters, Headings, Subheadings). Own elaboration based on World Customs Organization (2018) and TariffNumber (2026). 13

2.3 Evolution of Italian Goods Imports, 2010-2025. Source: Elaboration from data collected (see Chapter 4) 19

2.4 Product composition of Italian intermediate goods imports, 2024. Source: Elaboration from data collected (see Chapter 4) 20

4.1 Intermediate Imports distribution of $ln(1 + Trade)$ 48

5.1 Intermediate goods trade vs. distance 2010-2018-2025. Source: Elaboration from data collected (see Chapter 4). For partner country abbreviations see Table A.1 52

5.2 Zero Trade observations by RTA, Shared Borders and Common Language. Source: Elaboration from data collected (see Chapter 4) 53

5.3 Positive Trade Values by RTA, Border and Common Language. Source: Elaboration from data collected (see Chapter 4) 54

5.4 Trade Value vs geopolitical distance^2. Source: Elaboration from data collected (see Chapter 4) 55

Chapter 1

Introduction

Over the past decades, the organization of international production and trade has been profoundly shaped by globalization. The era of hyper-globalization was characterized by a rapid expansion of cross-border integration, driven by falling trade and freight costs, technological progress, and the entry of emerging economies into the global market. These developments enabled firms to fragment production across borders, giving rise to complex Global Value Chains (GVCs) in which intermediate goods cross borders multiple times at different stages of the production process. Following the Great Recession, however, the pace of globalization slowed down, a phenomenon economists have termed "slowbalization". Rather than signaling an outright retreat from international economic integration, this slowdown raises the question of whether the geographic and geopolitical organization of global production and sourcing may instead be evolving.

After a series of major macroeconomic events, this debate has played a relevant role in the economic literature. In particular, the escalation of the US-China trade war in 2018, the COVID-19 pandemic, and Russia's invasion of Ukraine in 2022 showed the systemic vulnerabilities inside global production networks. Indeed, trade conflicts demonstrated how geopolitical tensions can directly increase trade costs, while the pandemic revealed that international supply chains are fragile when operational disruptions occur. More recently, the war in Ukraine and the sanctions that followed also showed that high economic interdependence can create strategic exposure.

Consequently, these events have pushed both firms and policymakers to reconsider the structure of their sourcing networks. In general, there are three main ways to carry out this restructuring: the return of production to the domestic market (reshoring), the relocation to geographically close countries (nearshoring), or the redirection toward

geopolitically aligned partners (friendshoring). Nevertheless, established international production networks exhibit significant inertia: high sunk costs, long-term supplier relationships and specialized logistical infrastructures suggest that geopolitical shocks do not necessarily translate into an immediate retreat from global trade.

The empirical literature has sought to test whether trade flows reflect these theoretical shifts. Recent studies indicate that rather than undergoing a uniform process of de-globalization, international trade is experiencing a more selective reconfiguration. Some empirical contributions highlight that there are adjustments in supply chains toward geographically closer partners, while others observe the presence of a reallocation toward geopolitically aligned economies. However, this geopolitical realignment does not necessarily mean that the global economy is breaking up into isolated geopolitical blocs. Indeed, China represents an illustrative case: direct bilateral trade reductions with some partners often happen together with indirect dependencies that take place through third countries. Taken all together, a more nuanced and selective restructuring is pointed out by the empirical literature, rather than broad decoupling. However, the existing evidence remains fragmented across countries, sectors and types of goods, and this makes it difficult to assess whether these general trends also apply to intermediate goods imported by individual European economies.

The type of goods that are traded represents another central point in this debate. Intermediate goods play a critical role because they are the operational backbone of global value chains. They comprise raw materials, specialized parts and semi-finished inputs that require more processing before final demand is reached. In fact, if the analysis focuses on intermediate goods, it is possible to capture the real fragmentation of international value chains. This is a broader and more relevant dimension of globalization than trade in final goods alone, especially for large multinational firms. At the same time, due to the presence of specific investments, established logistics networks and long-term contracts, sourcing patterns for intermediate goods show strong persistence, and this makes supplier substitution very costly. For this reason, an important question arises whether intermediate inputs react to geopolitical and economic shocks differently from other end-use categories.

This topic is especially relevant for Italy, which is an economy with deep integration

into international trade and strong dependence on foreign intermediate inputs. Italy has a strategic position inside European and global production networks; therefore, the analysis of its intermediate imports gives an ideal framework to test whether recent shocks have actually changed established sourcing relationships.

Against this background, the main objective of this thesis is to assess how much Italian intermediate goods trade has shifted toward geographically closer or geopolitically aligned partners. Accordingly, the thesis answers the following research question: *To what extent has Italy's sourcing of intermediate goods undergone de-globalization and decoupling between 2010 and 2025?*

To answer this question, the empirical analysis relies on a bilateral product-level panel of Italian intermediate imports between 2010 and 2025. These data are studied at the 6-digit Harmonized System (HS) level, which allows the model to capture the high heterogeneity across individual intermediate products. The empirical framework is grounded in a structural gravity model estimated via the Poisson Pseudo Maximum Likelihood (PPML) estimator to analyze the determinants of Italian bilateral import flows. Alongside geographic distance and geopolitical distance, the model accounts for tariffs, regional trade agreements and a comprehensive set of fixed effects. To examine whether nearshoring and friendshoring dynamics intensified in the wake of major shocks, the sample is divided into three distinct sub-periods: 2010-2017, 2018-2021 and 2022-2025.

The empirical findings do not provide robust evidence of a structural reconfiguration in Italy's intermediate goods sourcing. Regarding geographic distance, there is no statistically significant evidence of nearshoring in the results. For geopolitical distance, there are positive and statistically significant coefficients, which contrasts with the standard theoretical expectation that trade intensity should be higher between geopolitically aligned partners. This counterintuitive finding warrants cautious interpretation, as it may reflect known limitations of the United Nations General Assembly (UNGA) voting metric, which has yielded anomalous results in related literature. Taken together, these findings point to substantial structural persistence in Italy's intermediate goods sourcing rather than a clear process of geographical or geopolitical reconfiguration.

In summary, this thesis contributes an empirical evaluation of whether contemporary

debates on de-globalization, nearshoring and geopolitical decoupling are reflected in the sourcing patterns of Italian intermediate goods. In addition, it investigates whether these dynamics differ between strategic and non-strategic intermediate products, for which the analysis finds no statistically significant evidence of intensified nearshoring or geopolitical decoupling.

This thesis is structured as follows. Chapter 2 reviews the literature related to the topics of analysis and discusses the contribution of this thesis. Chapter 3 discusses the methodology used to carry out the econometric analysis, while Chapter 4 outlines how the data used to create the final panel for the regression analysis were gathered from various sources. Chapter 5 begins with an initial visualization of the collected data and proceeds with the description of the key results obtained from the econometric analysis and the robustness check. Chapter 6 highlights the main takeaways of the thesis and puts forward further insights for future research.

Chapter 2

Literature Review

Before moving to Sections 2.2 and 2.3, which provide more specific insights into the topics dealt with in this thesis, it is necessary to provide the reader with an overview of the literature on the phenomena that give this work its title: de-globalization and trade decoupling. To this end, the literature will be presented by retracing the main stages of this debate, moving from hyper-globalization to slowbalisation and, ultimately, de-globalization.

2.1 The reconfiguration of global value chains

2.1.1 From hyper-globalization to de-globalization

Hyper-globalization refers to the period that spans from 1986 to 2008, prior to the Great Recession (Antràs, 2020). This term is used to identify those years that were characterized by a marked boost in the globalization process (Antràs, 2020). Indeed, as reported in Figure 2.1, which shows the World Trade Openness Index, a traditional metric used to measure the degree of globalization, it is possible to observe that World Trade expressed as a percentage of World GDP increased from 34.6% in 1986 to 60.3% in 2008. The pattern shown in Figure 2.1 for the World's Trade Openness Index is consistent with Antràs (2020)'s findings, with the only methodological difference being that Antràs (2020), in analyzing hyper-globalization between 1986 and 2008, defined the index as half the sum of total world exports and imports over GDP.

Furthermore, to better understand this phenomenon, it is necessary to point out the reasons that favored the spread of globalization. In particular, Antràs (2020) identified

three distinct causes: i) the ICT[1] revolution, which drastically lowered communication and coordination costs, allowing firms to manage geographically dispersed production stages; ii) the decline in trade costs, driven by both policy-induced trade liberalization (such as the GATT[2], the creation of the WTO[3] and China's accession in 2001) and technological advancements in transportation; and iii) major political developments, namely the fall of communism in Eastern Europe and the economic opening of China and India, which together created an unprecedented global labor supply shock. Indeed, the combination of these factors pushed firms in industrialized countries to set up Global Value Chains (GVCs), as it became economically feasible and profitable to coordinate large cross-border flows of both intermediate goods and information.

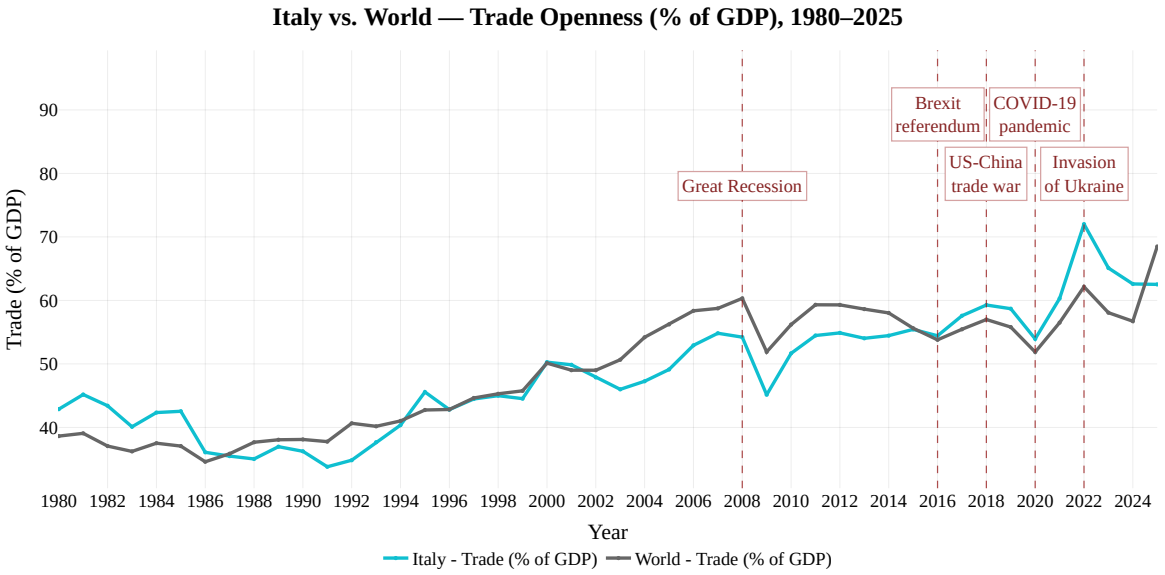


Figure 2.1: Italy's and the World's Trade Openness Index, computed as (exports + imports) / GDP, in percentage terms (World Bank index NE.TRD.GNFS.ZS). Vertical dashed lines mark major macroeconomic and geopolitical events. Source: elaboration from World Bank (2026)

As noted above, this period of rapid expansion slowed down with the Great Recession of the late 2000s (Antràs, 2020). According to Antràs (2020), there is no systematic empirical evidence supporting the claim that the world economy is undergoing a retreat from globalization. Therefore, it is more appropriate to refer to this deceleration as

[1]Information and Communication Technology.
[2]General Agreement on Tariffs and Trade.
[3]World Trade Organization.

"slowbalisation" (Antràs, 2020) rather than "de-globalization", a term that would instead imply a structural and generalized decline in global economic integration.

Economists have identified several mechanisms behind this transition from hyper-globalization to slowbalisation, showing that the very drivers that initially fostered international integration have either matured or partially reversed (Antràs, 2020; D'Ambrosio & Lavoratori, 2025). In particular, it is possible to distinguish between technological, economic, and geopolitical factors.

Regarding technological drivers, Antràs (2020) notes that tech development remains fast, but communication gains for GVC expansion now show diminishing returns. At the same time, advanced tools like automation and 3D printing have not broadly restructured GVCs. This is mainly because multinational enterprises previously invested heavy sunk costs, creating strong "stickiness" across established supply networks (Antràs, 2020; D'Ambrosio & Lavoratori, 2025).

On the economic side, D'Ambrosio and Lavoratori (2025) argue that the incentives to offshore production have been increasingly eroded by rising factor prices in emerging markets, hidden costs (e.g. wage inflation, labor productivity and quality differences) and closing wage gaps (Antràs, 2020; D'Ambrosio & Lavoratori, 2025).

Even though technological and economic factors play a notable role, political and geopolitical developments have exerted the most decisive pressure toward trade fragmentation (Antràs, 2020; Bosone & Stamato, 2024). Between 2010 and 2025, the global economy faced a sequence of severe geopolitical disruptions: the Brexit referendum in 2016[4], the US-China trade tensions initiated in 2018 during the first Trump administration, the outbreak of the COVID-19 pandemic in 2020, and Russia's invasion of Ukraine in 2022.

The COVID-19 pandemic represented a major turning point, exposing the vulnerabilities associated with excessive reliance on distant foreign suppliers (Bosone & Stamato, 2024). Concurrently, escalating US-China trade friction, protectionist industrial policies (such as the US Inflation Reduction Act and the European Chips Act), and the war in Ukraine intensified trade fragmentation, steering supply chains toward politically

[4]The Brexit referendum occurred in 2016, although the United Kingdom remained part of the European Union until late 2020 and definitively left the single market at the end of that transition period.

aligned partners, a process known as "friendshoring," which will be discussed in detail in Subsection 2.1.3.

Nonetheless, as depicted in Figure 2.1, the World Trade Openness Index exhibited cyclical fluctuations rather than a secular collapse across the 2008-2025 period. In line with these dynamics, Conteduca et al. (2024) find that despite the accumulation of recent geopolitical shocks, overall global trade openness has remained remarkably resilient, corroborating the slowbalisation hypothesis over that of de-globalization.

2.1.2 Nearshoring and reshoring

During the period of hyperglobalization outlined in Subsection 2.1.1, the world experienced rapid international trade expansion between the 1980s and the 2000s (Di Stefano et al., 2022). Across those decades, numerous firms restructured their value chains and shifted parts or the entirety of their production overseas to secure cost advantages (Di Stefano et al., 2022). This process, commonly termed offshoring, involved multinational enterprises opening plants in foreign markets primarily to capitalize on lower factor and input costs (Di Stefano et al., 2022).

The subsequent phase of slowbalization altered these conditions. The structural advantages that once justified foreign production began to erode. In particular, as noted in Subsection 2.1.1, rising labor costs across emerging economies, technological progress, and new protectionist trade measures made foreign offshoring substantially less profitable. This dynamic triggered a trend reversal toward reshoring. As highlighted by Canello et al. (2022), reshoring denotes *"the voluntary decision of a firm to partly or fully relocate business operations from previously offshored locations to its home country"*. Firms typically pursue this through two distinct routes: terminating an existing subcontracting agreement with a foreign partner, or divesting from a previously established foreign direct investment (FDI) (Canello et al., 2022).

To protect critical supply lines against systemic shocks, several governments enacted policy incentives to bring manufacturing back home or redirect it toward nearby regional markets (nearshoring) (Di Stefano et al., 2022). For example, in April 2020 the Japanese government introduced dedicated subsidy schemes to stimulate reshoring and supply-base diversification in response to disruptions highlighted by COVID-19 (Di Stefano et

al., 2022). In January 2021, US President Joe Biden signed an executive order expanding domestic federal purchasing under the "Buy American" framework (Di Stefano et al., 2022). Parallel assessments within the European Parliament likewise explored the strategic viability and trade-offs of supporting reshoring across EU member states (Di Stefano et al., 2022).

Despite heightened geopolitical strain and state interventions promoting national manufacturing, broad empirical backing for large-scale reshoring remains limited (Di Stefano et al., 2022). For instance, survey data on Italian manufacturing enterprises with 20 or more employees show that only roughly 2.6% had executed reshoring projects by 2021 (Di Stefano et al., 2022).

Economists suggest that a primary explanation for the lack of widespread reshoring lies in the stickiness of global value chains (Antràs, 2020; D'Ambrosio & Lavoratori, 2025). Specifically, companies show reluctance to relocate production because they have already incurred substantial sunk costs during past offshoring investments (D'Ambrosio & Lavoratori, 2025). Relocating production activities again generates additional sunk costs; consequently, firms tend to undertake such costly adjustments only when negative shocks are perceived as sufficiently severe and persistent to jeopardize their long-term profitability (Antràs, 2020; D'Ambrosio & Lavoratori, 2025). Furthermore, there are alternatives to the choice to bring production back home, such as geographic supplier diversification and input substitutability. Indeed, they have proved effective to strengthen supply chain resilience without a full domestic relocation (D'Ambrosio & Lavoratori, 2025).

This dynamic helps explain why reshoring remains relatively rare. In fact, it is mostly a form of "survival reshoring" for smaller firms, while larger corporations show a clear preference for nearshoring and friendshoring strategies (D'Ambrosio & Lavoratori, 2025).

Nearshoring serves as an alternative to reshoring: instead of bringing production fully back home, it shifts activities to geographically and culturally close countries (Piatanesi & Arauzo-Carod, 2019). Indeed, recent evidence shows that this strategy is documented more frequently than reshoring itself (D'Ambrosio & Lavoratori, 2025).

At the aggregate level, this firm-level heterogeneity translates into distinct structural

shifts across macro-regions. In this regard, Bontadini et al. (2025) analyze global value chain reconfiguration by examining both input sourcing and output destinations within and across regional blocs. For the European case, they demonstrate that supply chain restructuring follows divergent patterns between upstream and downstream stages (Bontadini et al., 2025). Following the era of hyperglobalization, European economies have increasingly oriented their input sourcing toward nearshoring, while their reliance on extra-European markets for final output remains pronounced (Bontadini et al., 2025). Notably, Germany and Italy alone accounted for 35.5% of the total European value added activated through nearshoring between 2012 and 2018 (Bontadini et al., 2025).

2.1.3 Friendshoring and geopolitical decoupling

As discussed in Subsection 2.1.1, the succession of recent events has made countries more aware of the intrinsic fragility of international value chains and has led to their reconfiguration. While there is little evidence for the reshoring and nearshoring phenomena (Bosone & Stamato, 2024; D'Ambrosio & Lavoratori, 2025), Bosone and Stamato (2024) found some evidence of friendshoring, i.e. the relocation of production processes towards countries more geopolitically aligned with the home country (D'Ambrosio & Lavoratori, 2025).

A traditional metric used to measure geopolitical distance is the UN voting system described by Bailey et al. (2017). The same metric was employed by Bosone and Stamato (2024), who showed that since 2018 trade with geopolitically aligned countries has increased while trade with distant ones has decreased. In particular, Bosone and Stamato (2024), by using the gravity model and the UN voting system of Bailey et al. (2017) as a measure of geopolitical distance, gave a magnitude to the importance of geopolitics on trade, finding that a 10% increase in geopolitical distance provokes a decrease of aggregate bilateral trade flows by 2.5% in 2021 and 2022 (Bosone & Stamato, 2024).

Despite the fact that using the UN voting system is a widely renowned metric for geopolitical distance, some economists showed that it could bring counterintuitive results (Jones et al., 2026), i.e. positive and statistically significant coefficients. Indeed, Jones et al. (2026) argue that other metrics could be used to measure geopolitical risk in

bilateral trade, such as Political and Social Value Distance, which showed the expected negative effect: higher geopolitical risk corresponds to lower trade between countries. One clarification is needed: geopolitical risk and geopolitical distance are not precisely the same trade determinants. The latter indicates the magnitude of political alignment between partner countries and its traditional measure is captured by the UN voting of Bailey et al. (2017) (Bosone & Stamato, 2024; Jones et al., 2026), while the former comprehends a series of broader geopolitical circumstances, such as sanctions, conflicts, financial markets, and political instability (Jones et al., 2026).

In their paper, Bosone and Stamato (2024) provide evidence that international trade has been affected by geopolitical forces since 2018, showing a redistribution of trade away from countries that are not politically aligned.

The year 2018 is chosen as a baseline as it reflects a concrete policy shift. Indeed, early in that year, major tariff hikes were enacted by the Trump administration across targeted sectors and countries, and this placed particular pressure on China (Antràs, 2020). After this escalation, researchers started to examine whether these bilateral policy tensions really led to a broader retreat between competing geopolitical blocs (Altman & Bastian, 2024). As documented by Altman and Bastian (2024), trade ties between the United States and China decreased sharply, but an equivalent decoupling between their allied coalitions has not materialized.

These findings are very similar to the results found by Conteduca et al. (2024), who studied the restructuring of international and European trade flows. Indeed, a pattern of selective decoupling comes out from their analysis, rather than a general break-up of world trade. In fact, this decoupling is mainly concentrated in US-China trade after the 2018 tariffs, in the more recent (2023) drop in EU imports from China for advanced technology products, and in EU-Russia trade after the invasion of Ukraine (Conteduca et al., 2024). Consequently, current trade dynamics reflect targeted realignments along geopolitical fault lines rather than a generalized retreat from global economic integration (Conteduca et al., 2024).

Even though the US and China tariff war is in most cases seen as a threat in the globalization era, some empirical results run counter to this narrative (Fajgelbaum et al., 2024). Indeed, Fajgelbaum et al. (2024) in their paper show that some countries, named

by the authors as *"bystanders"*, benefited from this political situation and increased their exports of the products affected by tariffs toward the US and the rest of the world, while exports toward China remained largely unchanged. The trade war created new net export opportunities for these countries, rather than merely reallocating existing trade flows (Fajgelbaum et al., 2024).

2.2 Intermediate goods in international trade

The purpose of this Section is twofold. First, it offers the reader an overview of the goods at the core of this empirical analysis, namely intermediate goods. Second, it reviews the main findings established in the literature for this specific product category, highlighting how they differ from those associated with other end-use segments.

2.2.1 Definition and classification

International merchandise trade is systematically classified through the Harmonized System (HS), the global commodity taxonomy administered by the World Customs Organization (WCO) (Joint Research Centre, 2021; World Customs Organization, 2018). Contracting parties to the Harmonized System Convention adopt this uniform coding structure. The classification comprises around 5,000 commodity groups structured hierarchically into Sections, Chapters, Headings, and Subheadings. Specifically, Chapters are identified by 2-digit codes, headings by 4-digit codes, and subheadings by 6-digit codes (Joint Research Centre, 2021). The empirical analysis in this study relies on 6-digit product codes, thus operating at the most disaggregated level of granularity. At the 6-digit level, the HS achieves its most detailed degree of international harmonization. Moving beyond this threshold, individual nations append extra digits, such as 8- or 10-digit tariff lines, to suit domestic tariff schedules or specific statistical requirements, breaking direct cross-country comparability (International Trade Administration, 2026). Because UN Comtrade compiles bilateral trade flows at this 6-digit HS baseline (Jones et al., 2026), this study relies on that specific level of granularity. The HS nomenclature is periodically revised to reflect changes in technology and trade patterns, with amendments typically introduced every five years. To illustrate how this hierarchical

structure works in practice, Figure 2.2 presents an example tracing classification paths from Section down to Subheading across distinct product categories.

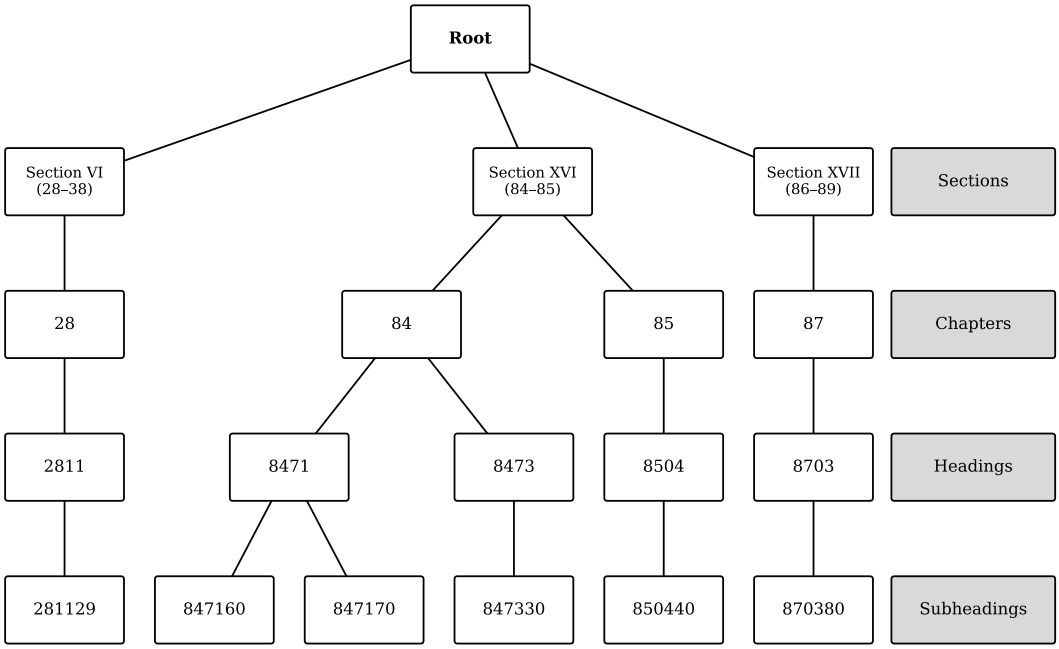


Figure 2.2: Simplified illustration of the hierarchical structure of the Harmonized System (Sections, Chapters, Headings, Subheadings). Own elaboration based on World Customs Organization (2018) and TariffNumber (2026).

While the HS classifies goods according to their physical nature, it does not provide information on their economic end use, that is, whether a product undergoes further transformation, serves capital formation or enters final consumption (Jones et al., 2026). To bridge this gap, the United Nations Broad Economic Categories (BEC) classification maps each HS 6-digit product code into an end-use category (Jones et al., 2026). Under the BEC framework, traded commodities fall into three primary classes:

- **Intermediate goods** include raw materials, parts, components and semi-finished products that require further manufacturing steps before reaching the final user, such as steel coils for automotive assembly or semiconductors for consumer electronics (Jones et al., 2026).
- **Capital goods** include physical fixed assets utilized repeatedly in the production of goods and services, encompassing machinery, industrial tools and transport

equipment (Jones et al., 2026).

- **Consumer goods** consist of finished products intended for direct personal acquisition and consumption by individuals and households (Jones et al., 2026).

2.2.2 Strategic and critical goods

Among the commodity codes described in Subsection 2.2.1, Headings and Subheadings related to strategic commodities were identified by the WCO. Conventional arms and weapons of mass destruction, along with any machinery, software, or components involved in making or launching them, fall under the category of strategic goods. Within this category, items that can serve commercial industries just as easily as armed forces are formally designated as dual-use goods (Nelson, 2021).

Linking these strategic goods to standard trade nomenclatures is not straightforward: primary classification systems, such as national export control lists (e.g. the US Export Control Classification Numbers, ECCNs) and the Harmonized System, were designed with different objectives and therefore do not correlate well, with a single strategic good potentially falling under multiple HS codes and vice versa (Nelson, 2021).

The WCO identified strategic commodity codes assigned to HS Headings and Subheadings in support of the Strategic Trade Control Enforcement Programme (Joint Research Centre, 2021). The Strategic Atlas, which contains all the strategic commodities, was developed by the Joint Research Centre (JRC) to map global trade flows under these codes. An extract of the commodity codes is illustrated in Table 2.1, which contains Headings (4 digits) and Subheadings (6 digits).

2.2.3 Empirical evidence on intermediate and strategic goods trade

After the brief descriptions provided in the previous Subsections 2.2.1 and 2.2.2, it is useful for the subsequent analysis to review the findings established in the literature for intermediate and strategic goods.

Jones et al. (2026) investigate the impact of several trade determinants on trade, differentiating the effect across intermediate, consumer and capital goods. One of their

Table 2.1: Selected strategic commodities and associated HS codes with four and six digits. Extract retrieved from Joint Research Centre (2021).

Strategic commodity	**HS code**
Uranium and thorium ore and concentrates	2612
Enriched uranium, plutonium	284420
Radioactive elements	284440
Heavy water	284510
Micro-organisms and toxins	300290
Explosives	3602
Detonators	3603
Graphite	380110
Carbon fibre	681510
Ceramic crucibles	6903
Glass fibre	7019
Tungsten	8101
Tantalum crucibles	810390
Magnesium	810411
Zirconium	8109

most interesting results is that geopolitical risk indicators, such as Fraser's Economic Freedom Index (EFI), the World Bank's Worldwide Governance Indicators (WGI) and the Political and Social Value Distance index, have a smaller and less significant impact on intermediate goods trade than on consumer goods trade. This result can be interpreted in light of the "stickiness" of global value chains, consistent with intermediate goods trade being embedded in durable supplier linkages (Antràs, 2020).

Moreover, Jones et al. (2026) find that intermediate goods show a different responsiveness to traditional trade determinants compared to consumer and capital goods. Indeed, intermediate goods trade is embedded in complex supply chains where geographic distance exerts the strongest effect, whereas other traditional trade factors, such as sharing a land border, show only a modest positive impact. This suggests that bilateral intermediate trade between contiguous countries is not a given, as flows rely heavily on factors beyond mere contiguity, including transport infrastructure and specialized logistics networks.

Another relevant perspective is provided by Farag and Zaki (2025), who focus on critical minerals, a strategic subcategory, and show that politics actively shapes mineral

trade. Specifically, political misalignment with major powers (the US and China) strongly affects trade in critical minerals, particularly for semi-processed inputs, green-energy materials, and commodities characterized by highly concentrated extraction. Furthermore, geopolitical alignment plays a central role: the division between the "East" (China and Russia) and the "West" (US, UK, and France) significantly structures trade patterns between country pairs (Farag & Zaki, 2025). Lastly, specific minerals, such as nickel, cobalt, vanadium, molybdenum, copper, and aluminium, appear especially exposed to these geopolitical strategies (Farag & Zaki, 2025).

Beyond the bloc-level realignment discussed in Subsection 2.1.3, Conteduca et al. (2024) show that decoupling from China varies significantly across product categories. This distinction is central to how strategic goods are analyzed in this thesis. Advanced technology products (ATP), such as laptops, mobile phones, monitors, communication gear, and semiconductors, drove the drop in China's import share for both the United States (starting in 2018) and the European Union, where a similar decline appeared only in 2023 (Conteduca et al., 2024). In contrast, an opposite trend is followed by goods that are essential for the green transition. Indeed, over the same period, the dependence on Chinese lithium batteries, battery components, solar cells, and electric vehicles grew for both economies, especially for the EU (Conteduca et al., 2024). Therefore, this split shows that decoupling is selective even inside strategic sectors: some product lines move away from China, while other lines become more dependent on it.

Overall, these results show that intermediate trade is mostly protected from geopolitical factors at the aggregate level. However, a completely different trend is observed for strategic goods. In this case, geopolitical vulnerabilities become much stronger and acute.

Building on this evidence, this study focuses on the share of intermediate goods because this specific metric gives important information about globalization. First of all, intermediate goods allow the model to capture the real fragmentation of international value chains.

In the public debate, there is often a lot of discussion about reshoring in sectors like apparel, for example the case of T-shirt production moved abroad. In other sectors, such as the automotive industry, the story is different. Indeed, the final car imported

by a firm is only a small part of the total trade, while the biggest part is made of all the single components and intermediate parts that are imported from different countries. Therefore, intermediate goods are particularly informative because they capture a broader and more relevant dimension of globalization, especially for large multinational firms.

2.3 The Italian case

Before entering into the details of what the literature finds on the effects of slowbalization on Italian trade and intermediate goods, it is worth providing the reader with an overview of the Italian import landscape.

Italy is an active economy on the global stage, engaging in substantial trade flows in terms of both exports and imports with several countries worldwide. For the purpose of this analysis, we will focus specifically on imports.

Data shows that in 2025 national imports increased by 6.0 percent year-on-year, maintaining a strong pace between August and December (+6.3%) (Istat, 2026). It should be noted that imports grew at different rates depending on the specific sector; for instance, the pharmaceutical sector witnessed the steepest increase (+35.5%), followed by machinery (+7.5%) and electrical equipment (+3.7%). This notable increase in pharmaceutical imports should be interpreted carefully, as it is mainly due to the high incidence of multinational firms operating in this industry, meaning these high figures could reflect intra-group exchanges and corporate reorganizations in light of geopolitical events (Istat, 2026). Nonetheless, the surge in pharma imports is the main driver of the overall trade growth with both the United States and China. Imports of pharmaceutical products from China alone registered a remarkable expansion, rising from approximately 680 million EUR to over 7.7 billion EUR.

European countries remain key trading partners, even though Germany lost some market share specifically within the pharmaceutical import segment (-4.7 percentage points).

These 2025 figures capture a recent snapshot of a broader, longer-running process. To place these short-term movements into perspective, the following section traces the

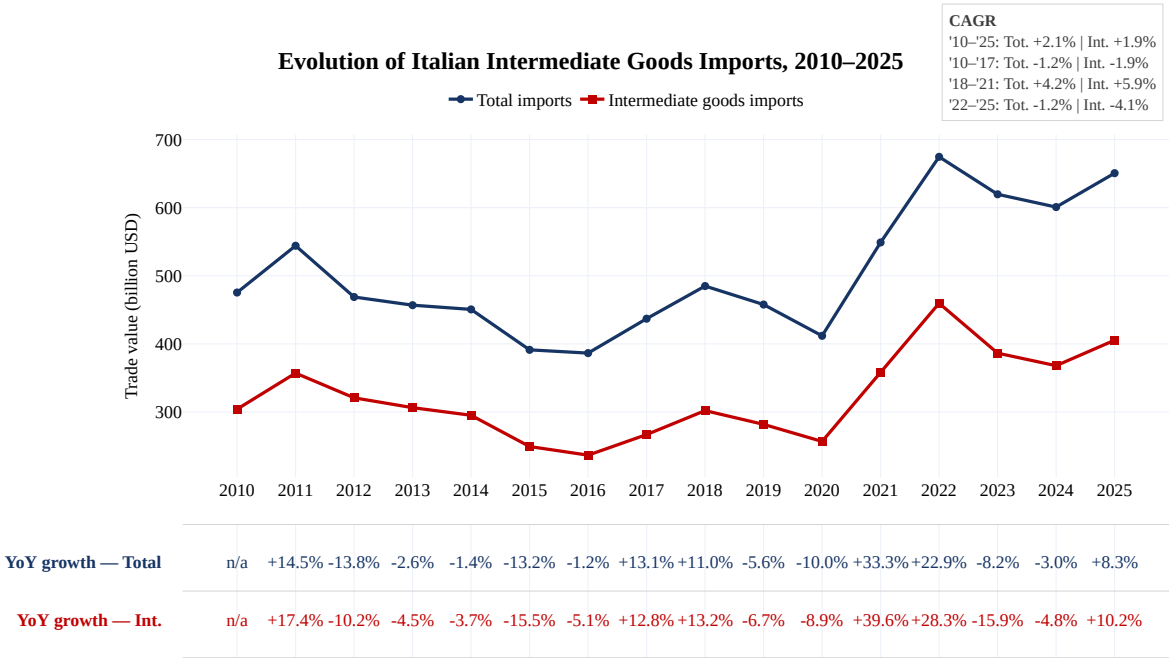
evolution of Italian imports and intermediate goods imports back to 2010, situating these recent shifts within the fuller trajectory of Italy's sourcing patterns over the period under study.

Figure 2.3 shows the evolution of Italian intermediate goods imports from 2010 to 2025, providing an overview of overall trade trends across the period. Looking at the endpoints of the time window, imports recorded a net long-term increase (CAGR[5] of 1.9%), though the series underwent significant ups and downs.

In particular, the series contracted from 2010 to 2017 (CAGR of -1.9%) before entering a period of strong expansion from 2018 to 2022. Following an 8.9% decline during the COVID-19 pandemic in 2020, imports spiked sharply by 39.6% in 2021 and 28.3% in 2022, reaching their series peak. A notable drop occurred in 2023 (-15.9%), followed by a further dip in 2024 (-4.8%) and a partial recovery in 2025 (+10.2%). While this late correction coincides with broader geopolitical and economic uncertainty, the figure alone does not allow for a direct causal attribution to specific events.

Within the same graph, total Italian imports are plotted alongside intermediate trade to enable a direct comparison. The two series follow analogous trajectories, with expansions and contractions occurring in the same periods and comparable long-run CAGRs (1.9% for intermediate goods vs. 2.1% for total imports). However, intermediate goods imports consistently exhibit higher year-on-year volatility, which is especially noticeable during the post-2020 rebound and the 2023 contraction.

[5]Compound Annual Growth Rate.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
YoY growth — Total	n/a	+14.5%	-13.8%	-2.6%	-1.4%	-13.2%	-1.2%	+13.1%	+11.0%	-5.6%	-10.0%	+33.3%	+22.9%	-8.2%	-3.0%	+8.3%
YoY growth — Int.	n/a	+17.4%	-10.2%	-4.5%	-3.7%	-15.5%	-5.1%	+12.8%	+13.2%	-6.7%	-8.9%	+39.6%	+28.3%	-15.9%	-4.8%	+10.2%

Figure 2.3: Evolution of Italian Goods Imports, 2010-2025. Source: Elaboration from data collected (see Chapter 4)

Figure 2.4 shows the product composition of Italian intermediate goods imports, focusing on the top 10 partner countries in 2024[6]. The goal of this picture is to give the reader a sense of both the scale and the product structure of Italy's intermediate goods import requirements. In the Marimekko chart, column widths are proportional to each country's share of total intermediate goods imports (with absolute values reported above each column in billions of US dollars), while the height of each segment represents the product share within that specific bilateral flow.

For illustrative purposes, the breakdown isolates the top seven product categories by aggregate trade value across these 10 partners combined, grouping all remaining sectors into an "Other" category. Product categories were obtained by aggregating product codes to the two-digit Harmonized System (HS2) level[7].

What emerges from Figure 2.4 is that the top 10 partner countries account for approximately 59.1% of Italy's intermediate goods imports (around $217.4 billion out

[6]The year 2025 was not chosen to avoid potential data incompleteness, as 2024 represents the most recent complete reporting period.

[7]This aggregation relies on an indicative correspondence table matching two-digit HS chapters to broader sectoral descriptions (Exporteers, 2026). While not intended as a strict official classification, this mapping effectively captures the structure of product categories at the two-digit level. Table A.1 reports the correspondence between ISO3 country codes and full partner names.

of $368.0 billion). Germany stands as the primary supplier ($49.5 billion), followed by China ($29.1 billion), France ($27.5 billion) and the United States ($22.6 billion).

The import product distribution is relatively balanced across most leading suppliers, with major partners like Germany, France, and the United States supplying a diversified basket of inputs. However, there are notable exceptions showing extreme concentration: Italy relies heavily on specific partners such as Algeria and Azerbaijan, where intermediate imports are almost entirely dominated by mineral fuels and oils (98.1% and 99.5%, respectively).

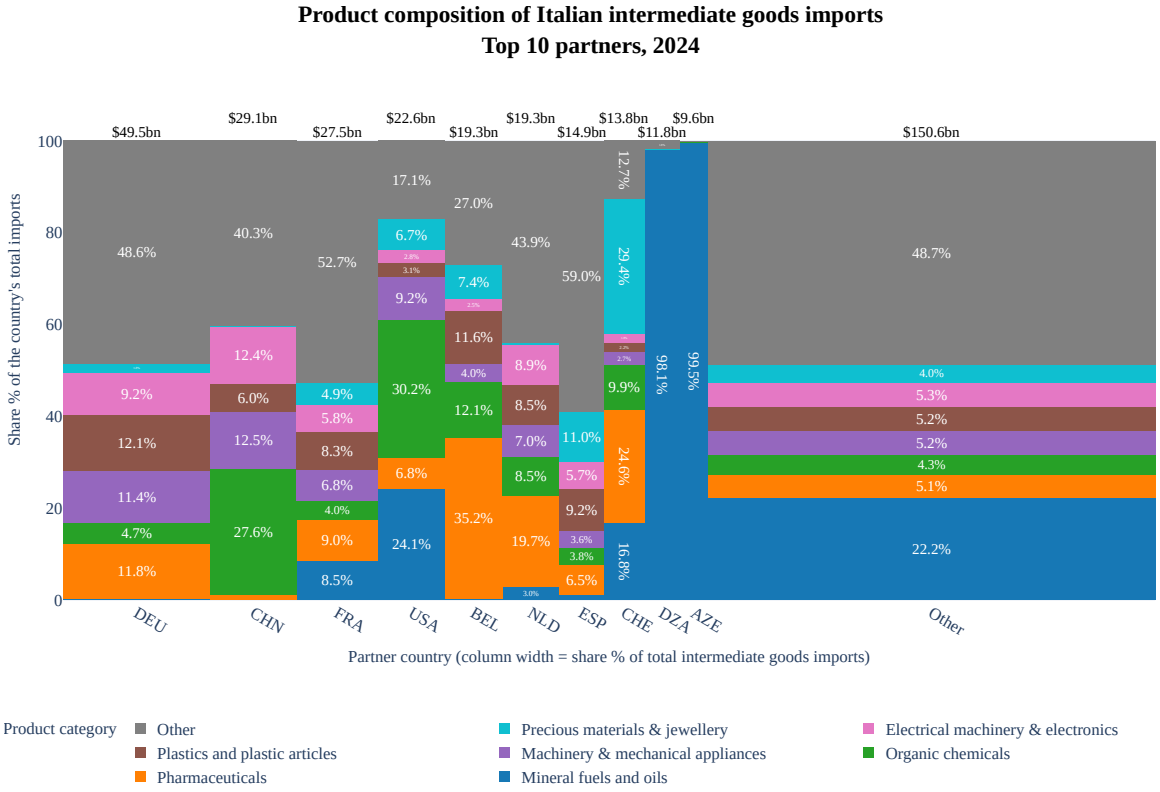


Figure 2.4: Product composition of Italian intermediate goods imports, 2024. Source: Elaboration from data collected (see Chapter 4)

2.3.1 Italy in the empirical literature on trade reconfiguration

Subsection 2.1.1 extensively dealt with the topic of de-globalization and trade reconfiguration. This Subsection instead looks for evidence in the Italian case by reviewing the main findings in literature. Before diving deeper into the details, it is worth noting Figure 2.1, which shows the trade openness index (trade as a percentage of GDP) for

the world and Italy. While the former case has already been discussed, nothing has been said about the latter.

Overall, throughout the years reported in Figure 2.1, there has been an increase in this globalization index in the Italian case as well. Differently from the world index, which showed a steady increase from 1986 until 2008, the Italian series has displayed more downturns and an irregular pattern. Following the Great Recession that occurred in 2009, both series dropped considerably, but their recovery paths were different. In particular, the world index had a partial recovery and then saw new volatility before 2020. At the same time, the situation for Italy was more difficult: the index stayed at a lower and unstable level between 54% and 59%, and it did not return in a stable way to pre-crisis levels until around 2018.

During the 2020 COVID-19 shock, Italy suffered a slightly stronger contraction than the world drop, which reflects the higher trade-to-GDP ratio of the country. Moreover, between 2020 and 2022, the Italian index was subject to its steepest increase in the entire series, as it went from roughly 54% to 72%. There were two main drivers behind this surge: first the rebound after the pandemic, and then the energy and price shocks in 2022 after the invasion of Ukraine. By 2023, the index fell to around 65%. This partial drop shows that some price pressures were only temporary, but part of the increase remained. Finally, over the period 2024-2025, the Italian index stabilized at roughly 62-63%. In contrast, the World index reportedly jumped to about 68% in 2025.

The COVID-19 outbreak caused several damages to firms, which saw their production processes halted and supply chains disrupted (Di Stefano et al., 2022). This situation led many economists to investigate whether there has been a relocation of production to secure supply chains. Di Stefano et al. (2022), in particular, investigated whether there was empirical evidence of a change in the internationalization strategies of Italian Multinational Enterprises (MNEs) provoked by the pandemic. In their analysis, they showed that firms' decisions on relocation were affected only to a limited extent, as COVID-19 was not perceived as a permanent factor. In this sense, Di Stefano et al. (2022) revisits a recurring topic in the literature: the stickiness of global value chains (Antràs, 2020; D'Ambrosio & Lavoratori, 2025). Indeed, since the pandemic was perceived as temporary, this shock did not trigger a change in these decisions (Di

Stefano et al., 2022). Relocation is perceived as costly by firms that have already offshored and sustained sunk costs; hence, only if the benefit deriving from relocation is large enough do firms have the incentive to proceed with nearshoring or reshoring (D'Ambrosio & Lavoratori, 2025; Di Stefano et al., 2022). Taking into account key figures, Di Stefano et al. (2022) showed that only 2.6% of Italian firms with more than 20 employees reshored their production between 2018 and 2020.

Other relevant evidence concerning the Italian offshoring phenomenon is described by Canello et al. (2022). In particular, they investigated the effects of MSE[8] reshoring choices on the reconfiguration of production chains between 2008 and 2015 (Canello et al., 2022). What emerged is that during the time span considered there is evidence of reshoring activity with an average of 145 firms, while the offshoring activity in the same period involved 916 firms (Canello et al., 2022). The sample of firms taken into account in this analysis is limited to Italian MSEs specialized in the clothing and footwear industry (Canello et al., 2022). Furthermore, Canello et al. (2022) found that around 83% of the firms that opt for reshoring sustain costs for domestic outsourcing before and after this activity, meaning that in most cases domestic subcontracting remains despite offshoring. This pattern is consistent with the core argument of Canello et al. (2022), namely that most MSEs adopt a dual sourcing strategy, combining offshore outsourcing with the preservation of local subcontracting networks rather than treating the two as mutually exclusive alternatives; indeed, only 12% of reshoring firms fully internalize the repatriated activity (Canello et al., 2022).

Other evidence of Italy's reshoring activity can be found in D'Ambrosio et al. (2024). The key results can be summarised as follows: within the time period between 2010 and 2015, reshoring was not a common decision; indeed, D'Ambrosio et al. (2024) found that only 8.7% of all offshoring firms are reshorers (1,559 firms out of 17,989). This figure increases if we consider "potential reshorers", reaching 12.7% of offshoring firms (2,292 firms out of 17,989). Before moving forward, one clarification is needed: the authors distinguish between reshorers and "potential reshorers", and the difference lies in the number of criteria, defined by the authors, that the firm satisfies. In particular, the four conditions are i) a decline in narrow offshoring to a specific country; ii) the persistence

[8]Micro and Small Enterprises.

of this decline over time; iii) no offsetting offshoring to other foreign locations; and iv) an increase in domestic capital or labor (D'Ambrosio et al., 2024). Moreover, it seems that most of the firms exposed to reshoring are smaller, younger and less internationally exposed (D'Ambrosio et al., 2024). This does not come as a surprise, as in many cases reshoring is considered by smaller and less productive firms as a way to survive external shocks, and the cost of this adjustment is lower for smaller firms (D'Ambrosio et al., 2024). This asymmetry mirrors the sunk cost logic already discussed above (Antràs, 2020): larger firms exhibit "stickier" location choices because of the fixed investments already committed to offshoring, while for smaller firms the fixed costs of reshoring are comparatively low, making it an accessible adjustment margin (D'Ambrosio et al., 2024).

Across all three studies, reshoring emerges less as a strategic reversal of globalization than as a marginal, cost-driven adjustment confined to a small subset of firms. Taken together, these figures support the same point already made in Subsection 2.1.2: reshoring remains a marginal phenomenon for Italy, which is consistent with the choice of this thesis to focus on nearshoring and friendshoring rather than reshoring.

As already observed in Subsection 2.1.3, the evidence points to a selective trade reconfiguration rather than a uniform retreat from Chinese sourcing.

Conteduca et al. (2024) evaluate whether the apparent drop in European exposure to Chinese manufacturing merely conceals rerouted trade flows. To do so, they analyze granular Italian customs data, taking Italy as an illustrative case for a major EU economy. The empirical strategy relies on distinguishing between the country of provenance and the actual origin of goods. When focusing on critical advanced technology products, their findings show that around 45% of Italian imports nominally dispatched from other EU member states in 2022 were in fact produced in China. Consequently, the decline in direct bilateral imports recorded in official statistics may overlook an indirect dependency (Conteduca et al., 2024).

At the product level, this trend varies widely across categories. Around 85% of laptops imported from EU partners actually are from China, compared to approximately 50% for mobile phones and monitors. These shipments usually pass through the Netherlands, Germany, Ireland, and France, where Chinese multinational corporations

maintain active domestic subsidiaries (Conteduca et al., 2024). This pattern has grown rapidly since 2017, when that share was less than 30% (Conteduca et al., 2024). Indeed, official trade figures support this structural change: between 2022 and 2023, direct EU imports of these goods from China decreased by around 4 percentage points, while trade flows from other member states increased by 2.7 percentage points. Such trends mirror industry surveys indicating that manufacturing firms across Germany, Italy, and Spain have substituted Chinese providers of essential inputs with suppliers located within the European Union (Conteduca et al., 2024).

2.3.2 Research questions

Global integration is slowing down, shifting the debate on value chain resilience toward two main strategies: geographical relocation through nearshoring and political alignment via friendshoring. To assess whether these restructuring strategies are truly taking place, this study focuses on Italian intermediate goods. Accordingly, the thesis addresses the following research question:

To what extent has Italy's sourcing of intermediate goods undergone de-globalization and decoupling between 2010 and 2025?

which can be broken down into the following sub-questions.

- SQ1: *"Has Italy's intermediate goods trade become more geographically concentrated among nearby partners, or does distance continue to play the same role in shaping import flows throughout the period?"*
- SQ2: *"Has Italy's intermediate goods trade become more concentrated among geopolitically aligned partners, or has geopolitical distance played a stable role in shaping import flows throughout the period?"*

Moreover, a second layer of analysis this work aims to address is whether these patterns are more pronounced for strategic goods than for non-strategic ones.

Chapter 3

Methodology

This chapter presents the methodology adopted in the thesis, starting from the foundations of the gravity model and arriving at the estimating equation.

3.1 Gravity model

3.1.1 General equation

One of the models most widely used to assess the determinants of international trade is the gravity model (Bosone & Stamato, 2024). As the name suggests, it draws its main principles from Newton's Law of Universal Gravitation. Indeed, the model states that *"international trade between two countries is directly proportional to their sizes and inversely proportional to trade frictions between them"* (Yotov et al., 2016). When expressed in formula, as reported by Head et al. (2010), it becomes:

$$x_{ijt} = G_t M_{it}^{\text{ex}} M_{jt}^{\text{im}} \phi_{ijt}. \tag{3.1}$$

In this equation, the subscripts i and j refer respectively to the exporter and the importer, while t refers to a specific year. Moreover, the terms in equation (3.1) allow us to anticipate some topics that will be discussed further: i) the monadic effect embedded in M_{it}^{ex} and M_{jt}^{im}, and ii) the dyadic effect expressed by ϕ_{ijt}. This latter term represents the determinants of bilateral trade costs.

3.1.2 From theory to estimation: PPML specification

While Equation (3.1) describes the theoretical relationship between bilateral trade and its determinants, it does not by itself provide estimates of the magnitude of these effects. To quantify how strongly each determinant, such as geographic and geopolitical distance, affects trade flows, and to test the gravity model's predictions, the relationship must be estimated through an econometric test. This requires specifying a regression equation, which in turn depends on the transformation applied to (3.1) and the estimator chosen.

In this work, given the dataset structure that will be discussed later in Section 4.1, we do not apply the log-linearization and the OLS (Ordinary Least Squares) estimator, but the Poisson Pseudo Maximum Likelihood (PPML) estimator. Hence, the gravity equation can be restated as follows:

$$x_{ijt} = \exp\left(\alpha_{it} + \beta_{jt} + \gamma_{ij} + \phi_{ijt}\right) \times \varepsilon_{ijt} \tag{3.2}$$

It is worth giving a brief overview of how Equation (3.1) was converted into Equation (3.2), as most of the concepts will be discussed further in detail in Subsections 3.1.3 and 3.1.4. In particular:

- α_{it} and β_{jt} are dummies for, respectively, exporter-year and importer-year. They contain all the information specific to each country (monadic effect) and substitute M_{it}^{ex} and M_{jt}^{im} from Equation (3.1).
- γ_{ij} is a pair fixed effect, which absorbs everything that remains constant in the dyad Italy-partner country (e.g., geographical distance is included).
- ε_{ijt} is the multiplicative error term, consistent with the PPML specification (Silva & Tenreyro, 2006).
- $\exp(\cdot)$ is the exponential function, used instead of the logarithm.

Equation (3.2) is not specific to this thesis, even though it is closely related to it. This equation serves as a bridge between the theoretical foundation and the specific estimating equation discussed in (3.3).

The main reason behind the choice of the PPML estimator was the presence of multiple zeros in the dataset, as described in Subsection 4.1.4. Indeed, with this

estimator the information contained in zero-trade observations is not lost, unlike with OLS, which, since it works with logarithms, has some difficulty handling zeros (Silva & Tenreyro, 2006). Moreover, another problem with log-linearization is that, in the presence of heteroskedasticity, it can produce inconsistent results (Silva & Tenreyro, 2006).

3.1.3 Monadic vs dyadic effects

As pointed out in Subsection 3.1.2, the gravity model theory distinguishes two main types of effects: monadic and dyadic effects. As the name suggests, the former concerns attributes of the exporter and the importer that are not related to their bilateral relationship, but to their own intrinsic characteristics (Head et al., 2010). These attributes broadly capture the overall capacity of a country to trade with the rest of the world, independently of who the specific partner is. This category typically includes variables such as GDP and GDP per capita, which reflect a country's economic size (Head et al., 2010).

The dyadic effect, instead, concerns features that are specific to a given pair of countries, and that therefore differ depending on which two countries are considered. Geopolitical and geographic distance are two clear examples of dyadic effects: both are specific to a given dyad, e.g. Italy-Germany, and take a different value for another dyad, e.g. Italy-Spain. GDP and GDP per capita, by contrast, do not depend on the specific country pair: Italy's GDP remains the same number regardless of whether it is being compared to Germany or to Spain, and is therefore monadic rather than dyadic.

It is also worth noting that dyadic effects are not all alike. Some, such as geographic distance, are time-invariant, since the physical distance between two capitals does not change from one year to the next. Others, such as geopolitical distance or bilateral tariffs, are time-varying, since the political alignment or the tariff regime between two countries can change over the sample period (Greaney & Kiyota, 2020; Jones et al., 2026). This distinction has direct consequences for the empirical specification, as will be discussed in Subsection 3.1.4.

In practice, in our specification, monadic effects are treated as fixed effects, that is, as dummy variables, and are absorbed by them. Hence, all information relative to

the exporter and to the importer ends up in α_{it} and β_{jt} respectively, rather than being included as separate regressors. This also implies that country-specific variables such as GDP cannot be added on top of these fixed effects, since they would be perfectly collinear with them, and their effect would already be fully captured by the exporter-year and importer-year dummies (Greaney & Kiyota, 2020). As is evident from the notation, these dummies are time-variant, since they are defined at the country-year level.

3.1.4 Fixed effects

Fixed effects are a statistical method widely used in econometrics to control for unobserved characteristics (Head & Mayer, 2014). In simple terms, fixed effects can be described as the inclusion, in the regression, of a dummy variable for every unit of analysis; this dummy absorbs unobserved confounding factors that change across units but not over time (Blackman, 2013).

Fixed effects are convenient because they let the researcher avoid making strong assumptions about the structure of the underlying model (Head & Mayer, 2014). Concretely, this means that a variable such as GDP does not need to be entered directly as a regressor to capture a country's economic size: the dummy variable already accounts for it, together with any other country characteristic that stays constant within that fixed effect. The bilateral trade cost term, which is the actual focus of this work, can still be estimated consistently even though GDP itself is never included as a regressor (Head & Mayer, 2014).

Unlike most other empirical studies in this literature, such as Bosone and Stamato (2024) and Head et al. (2010), this thesis considers only one importing country, Italy. Hence, for every Italy-partner pair, the information regarding Italy itself does not vary across partners: it only varies over time. For this reason, an importer-year fixed effect collapses into a simple year fixed effect, since there is no cross-sectional variation left to absorb across importers.

Moreover, this work takes this reasoning one step further, and replaces the plain year fixed effect with a product-year fixed effect, since the latter carries strictly more information than the former: it absorbs not only what varies for Italy from year to year, but also what varies for Italy's demand of a specific product from year to year. As the

year fixed effect is nested within the product-year fixed effect, including both would be redundant and only the product-year fixed effect is retained.

The second fixed effect considered is the partner fixed effect: all information that is specific to a partner country and constant over time is captured by this dummy.

To put it simply, during the regression, any variable that is specific to a partner country and constant over time will not appear with its own coefficient. If such a variable were included explicitly, Stata would drop it, since it would be perfectly collinear with the information already contained in the partner fixed effect.

All in all, this thesis opts for a two-way fixed effect structure: product-year and partner fixed effects.

What is ruled out, compared to Bosone and Stamato (2024), is a fully interacted partner-year (i.e., exporter-year) fixed effect. Interacting the partner dummy with the year dummy would absorb geopolitical distance entirely, since geopolitical distance varies exactly at the partner-year level. This would prevent the coefficient of interest from being estimated. As stated in the research question in Subsection 2.3.2, the goal of this work is precisely to estimate the coefficients of geographic and geopolitical distance, in order to fully address the question. In this sense, a fully interacted partner-year fixed effect would make this impossible.

The choice to introduce a product-year fixed effect, instead of a plain year fixed effect, is guided by the same collapsing logic applied to the product dimension (Yotov et al., 2016), and, most importantly, it is needed to answer the second-layer sub-question on strategic goods presented in Subsection 2.3.2.

3.2 Estimating equation

The theoretical discussion developed in Subsections 3.1.3 and 3.1.4 is instrumental to understanding the estimating equation adopted in this thesis.

What follows, and in particular Equation (3.3), aims to update and specify the general PPML gravity equation presented above in Equation (3.2). In its general form, the equation is not tied to any particular research context. In what follows, it is tailored to the research question of this thesis, outlined in Subsection 2.3.2.

$$Trade_{ikt} = \exp\Big(\gamma_i + \mu_{kt} + \beta_1 \ln Dist_i \times Period_t + \beta_2 GeopDist_{it} \times Period_t$$
$$+\beta_3 \ln Dist_i \times Period_t \times Strategic_k + \beta_4 GeopDist_{it} \times Period_t \times Strategic_k \quad (3.3)$$
$$+\beta_5 \ln(1 + Tariff_{ikt}) + \beta_6 RTA_{it}\Big) \times \varepsilon_{ikt}$$

where:

- $Trade_{ikt}$ is the value of intermediate good k imported by Italy from partner country i at time t.
- γ_i is the partner fixed effect: a set of dummy variables, one for each partner country i, that absorb all time-invariant partner characteristics (common language, colonial ties, contiguity, and other unobserved country-specific traits), as discussed in Subsection 3.1.4.
- μ_{kt} is the product-year fixed effect: a set of dummy variables, one for each product-year combination, that absorb any unobserved product-specific shock in year t.
- $\ln Dist_i$ is the natural logarithm of the geographical distance between Italy and partner country i, time-invariant.
- $Period_t$ identifies which of the three sub-periods (2010-2017, 2018-2021, 2022-2025) year t belongs to, based on the structural breaks identified in Subsection 3.2.1.
- $GeopDist_{it}$ is the geopolitical distance between Italy and partner country i at time t.
- $Strategic_k$ is a dummy variable equal to 1 if intermediate good k is classified as strategic, 0 otherwise.
- $Tariff_{ikt}$ is the ad valorem tariff applied by Italy i on product k from partner i at time t, entered as $\ln(1 + Tariff_{ikt})$.

- RTA_{it} is a dummy variable equal to 1 if Italy and partner country i are members of a regional trade agreement at time t, 0 otherwise.

- ε_{ikt} is the multiplicative error term.

As can be seen from Equation (3.3), the importer's subscript does not appear explicitly. This is because Italy is by construction the sole importer throughout the dataset. The subscript i therefore refers exclusively to the exporting partner country, and no separate importer index is required.

Moreover, with reference to Equation (3.3), it is worth distinguishing between the dependent and the independent variables. In particular, the only dependent variable is $Trade_{ikt}$, while all the other variables appearing in the equation are independent variables. Lastly, it should be noted that not all the variables in Equation (3.3) are time-variant. Indeed, besides $Trade_{ikt}$, only μ_{kt}, $Period_t$, $GeopDist_{it}$, $Tariff_{ikt}$, and RTA_{it} vary over time, whereas γ_i, $\ln Dist_i$, and $Strategic_k$ remain constant throughout the sample period. Rather than introducing interaction terms across time windows, tariffs and RTA indicators enter as pooled parameters across the entire sample; Section 6.2 elaborates on this specification choice.

The objective of the analysis is to estimate the coefficients β_u $(u = 1, \ldots, 6)$ reported in Equation (3.3), together with the fixed effects γ_i and μ_{kt}. In practice, these coefficients are estimated in Stata using the `ppmlhdfe` command (Correia et al., 2020), which implements the PPML estimator in the presence of high-dimensional fixed effects; the two sets of fixed effects are absorbed using the `absorb()` option.

3.2.1 Structural breaks in 2018 and 2022

As mentioned in Subsection 3.2, the regression is conducted taking into account three reference periods: 2010–2017, 2018–2021, and 2022–2025.

At first glance, this tripartition may not seem evenly distributed, but it was made deliberately. The main reason behind this choice is that the ultimate aim is to address the main research question, which looks for evidence of de-globalization and trade decoupling for Italian intermediate goods, read in light of the historical events that occurred between 2010 and 2025.

The first half of the time window was not characterized by major shocks, compared to what happened from 2018 onward. Indeed, the three time windows correspond to specific recent historical events: i) 2018 marks the beginning of the US-China tariffs, imposed under Section 301, a provision of the US Trade Act of 1974, during the first mandate of President Donald Trump (Fajgelbaum et al., 2024). This episode is documented as a large escalation of bilateral tariffs that triggered a global reallocation of trade flows, with third countries adjusting their export patterns in response (Fajgelbaum et al., 2024); ii) 2022 coincides with the outbreak of the Russia-Ukraine conflict and the consequent sanctions imposed by European countries on Russia after the invasion. Both episodes are consistent with the growing impact that recent geopolitical tensions, including the US-China trade friction and Russia's invasion of Ukraine, are found to have had on global supply chains (Jones et al., 2026), and with the sharp realignment in geopolitical alignment that they produced, as captured by the UN voting-based ideal-point measure (Bailey et al., 2017).

3.3 Testable hypothesis

The econometric analysis seeks to address the following question: *"Does the variable have a systematic effect on import values?"* This question is restated for each of the independent variables included in Equation (3.3).

In practice, this entails conducting a hypothesis test in which the null hypothesis is tested against a two-sided alternative hypothesis[1]. Formally, for each coefficient β_u, $u = 1, \ldots, 6$, the hypotheses are specified as follows:

$$H_0 : \beta_u = 0 \qquad \text{against} \qquad H_1 : \beta_u \neq 0. \tag{3.4}$$

That said, drawing on the existing literature, it is possible to formulate expectations regarding the signs of the coefficients. These expectations are subsequently assessed in Section 5.2. All testable hypotheses, together with the rationale underlying each of them, are reported in Table 3.1.

[1]The choice of a two-sided alternative reflects the fact that, *a priori*, the analysis does not test whether the effect is positive or negative, but rather whether it is statistically different from zero.

Table 3.1: Expected signs of the regressors

Coeff.	Variable	Expected sign	Motivation
β_1	$\ln Dist_i \times Period_t$	Negative in every period; increasing in magnitude (2018-2021 > 2010-2017; 2022-2025 > 2018-2021)	Also according to the definition of the gravity equation reported in (3.1), the higher the distance, the lower the trade between two countries. This occurs because it is riskier to rely on a supplier from the other side of the world (global crises, shocks, supply chain disruptions, etc.). What should be considered before producing abroad and then importing is that it is not only the labor cost savings on the margin that matter, but also a series of other costs that outweigh this benefit (D'Ambrosio & Lavoratori, 2025). Among these are additional shipping costs, a higher probability of disruptions in global supply chains due to geopolitical risks, tariff costs and exchange rate instability, among others (D'Ambrosio & Lavoratori, 2025)

Continued on next page

Table 3.1 – continued from previous page

Coeff.	Variable	Expected sign	Motivation
β_2	$GeopDist_{it} \times Period_t$	Negative in every period; increasing in magnitude from 2018 onward, and further from 2022	Geopolitical distance is expected to have a negative impact on trade because of the concept of friendshoring. Bosone and Stamato (2024) show that in recent years, particularly starting from 2018, international trade has been affected by geopolitical forces, giving rise to the friendshoring phenomenon, i.e., the relocation of production to a geopolitically closer country
β_3	$\ln Dist_i \times Period_t \times Strategic_k$	Negative (differential effect for strategic goods)	The rationale behind this hypothesis is that for strategic goods, the issue of distance and the fragility of global supply chains is even more pronounced than for non-strategic intermediate goods
β_4	$GeopDist_{it} \times Period_t \times Strategic_k$	Negative (differential effect for strategic goods)	Farag and Zaki (2025) carry out an analogous study, focused specifically on critical minerals and find that trade in these goods is indeed influenced by geopolitics, with the effect becoming more pronounced starting from 2016 (Farag & Zaki, 2025). The underlying idea is that, since these are intermediate strategic goods, they are more sensitive to shifts in geopolitical forces, leading importing countries to be more cautious on this front

Continued on next page

Table 3.1 – continued from previous page

Coeff.	Variable	Expected sign	Motivation
β_5	$\ln(1 + Tariff_{ikt})$	Negative, but expected to be not strongly significant	The relationship between trade and tariffs has been widely studied in the econometric trade literature. In particular, Bosone and Stamato (2024) find that tariffs have a negative but weak impact on trade, and that they have not been an important determinant of trade flows over the last decade. It is therefore expected a negative sign for β_5, but not a particularly strong one
β_6	RTA_{it}	Positive	The behavior of trade in the presence of Regional Trade Agreements has been extensively studied. Bosone and Stamato (2024) find that trade agreements exert a positive effect on trade flows throughout the whole period, with the effect increasing over time; consistent evidence is found in Greaney and Kiyota (2020)

Chapter 4

Data Collection and Dataset Construction

The goal of this Chapter is to describe how the panel used in the empirical analysis was built. Subsection 3.1.1 introduced the gravity model as the empirical framework adopted in this thesis. This Chapter explains how that framework was implemented in practice: which data were required and how they were assembled to create the dataset used in the empirical analysis. In particular, it is organized into two Sections: Section 4.1 deals with the process of data gathering that constituted a large proportion of the work, as the dataset was built from scratch by merging together several panels, while Section 4.2 deals with the descriptive analysis of data collected.

4.1 Data Source and Variables

To answer the research question proposed in Subsection 2.3.2, two complementary types of data were necessary: the geographic, economic and geopolitical determinants of trade, and the trade and tariff data themselves. The final dataset was therefore built by combining two panels: one collecting the geographic and geopolitical determinants, the other the trade and tariff data. The two panels are presented separately and merged only once both have been described. Moreover, starting from the data collected in these two panels, additional variables, denominated "derived variables", were created.

4.1.1 Geographic and Geopolitical Variables

The first stage of data collection focused on variables of a geographic, geopolitical, and, in part, economic nature. This stage served two purposes: to collect data to be used as-is, and to use a subset of these variables to derive additional variables for a more in-depth analysis, as described in Subsection 4.1.3.

The choice of variables was guided by the estimating equation (3.3) and the general formulation of the gravity model. In its structural form, bilateral trade between two countries is modeled as a function of the economic size of the two countries, commonly proxied by GDP, and of the trade costs between them. These costs increase with geographic distance and decrease with factors that facilitate exchange, such as a common border, a shared language, a colonial history or involvement in a common trade agreement. The geographic and geopolitical variables collected at this stage correspond directly to these trade-cost components, while GDP and GDP per capita proxy for the economic mass of the trading partners. This correspondence between the structure of the gravity model and the variables collected is what determined the scope of this first stage of data gathering.

Table 4.1 reports the geographic and geopolitical variables collected as-is from their original online sources. The variables are organized into four groups.

- **Identification variables**: variables used to identify and distinguish each country and to merge this dataset with the trade panel;
- **Regional trade agreements**: dummy dyadic variables indicating whether a trade agreement is in force between Italy and the partner country in a given year;
- **Geographic variables**: a set of geographic measures defined for each country pair, or dyad, that is, Italy versus every other country;
- **Economic variables**: GDP and GDP per capita of the partner country.

Table 4.1: Geographic, Geopolitical and Economic variables as-is

Variable	Description	Source
Identification variables		
`Reporter`	ISO 3166-1 alpha-3 code of the reporting country; fixed to Italy (ITA) throughout the panel	WITS country codes (World Integrated Trade Solution (WITS), n.d.)
`Partner`	ISO 3166-1 alpha-3 code identifying the partner country in the dyad (see Table A.1)	WITS country codes (World Integrated Trade Solution (WITS), n.d.)
`PartnerName`	Full name of the partner country (see Table A.1)	WITS country codes (World Integrated Trade Solution (WITS), n.d.)
`Year`	Year of observation (2010-2025).	N.A.
Regional trade agreements - RTA (dummy variable)		
`rta`	Dummy equal to 1 if any regional trade agreement is in force between Italy and the partner in that year, 0 otherwise	Larch RTA Database (Larch et al., 2024)
Geographic variables (CEPII GeoDist)		
`contig`	Dummy equal to 1 if Italy and the partner share a land border	CEPII GeoDist (Mayer & Zignago, 2011)

Table 4.1 – continued from previous page

Variable	Description	Source
`comlang_off`	Dummy equal to 1 if Italy and the partner share an official language, or a language spoken by at least 20% of the population in both countries	CEPII GeoDist (Mayer & Zignago, 2011)
`colony`	Dummy equal to 1 if the two countries were ever in a colonial relationship at any point in their history	CEPII GeoDist (Mayer & Zignago, 2011)
`dist`	Geodesic distance in km between the capitals of each country	CEPII GeoDist (Mayer & Zignago, 2011)
Ideal points (UN General Assembly voting)		
`idealpoint`	Ideal-point estimate based only on final-passage votes on resolutions, following the Bailey-Strezhnev-Voeten methodology (Bailey et al., 2017). Available for 1946-2025	Voeten (2009)
Economic variables (WDI)		
`gdp`	Gross domestic product of the partner country, in constant 2015 US dollars	WDI (The World Bank, 2026)
`gdppc`	Gross domestic product per capita of the partner country, in constant 2015 US dollars	WDI (The World Bank, 2026)

These variables differ in the way they are structured, and this distinction is relevant for the construction of the panel. Some variables are dyadic and time-invariant: they take a single value for each country pair, Italy and a given partner, and this value is applied uniformly across the whole time horizon. The geographic variables fall into this category.

Other variables are dyadic and already include a time dimension in their original source. This is the case for regional trade agreements, where the source database reports, for each partner country, the specific agreement in force and the years in which

it is in force.

Finally, some variables are defined at the country level (monadic) rather than at the dyad level. GDP and GDP per capita fall into this category: they report economic information for each partner country individually, not for the Italy-partner pair.

4.1.2 Trade and Tariff Variables

For the purposes of this research, a second dataset was required in addition to the geographic and geopolitical panel. Trade and tariff data play a central role in the analysis, and the data-gathering process can be summarized in four main steps, consistent with the core themes of the thesis.

1. **Trade data collection.** Import values for Italy vis-à-vis all other countries were retrieved from the WITS platform World Bank (n.d.), which in turn sources its trade data from United Nations (n.d.). Trade values were collected at the 6-digit (HS6) level of product detail.

2. **Tariffs.** Tariff data were retrieved from WITS World Bank (n.d.) and subsequently merged with import panel. Tariffs are reported at the same 6-digit level of detail as the trade data, for every partner country.

3. **Intermediate goods.** They were identified by applying a filter over a predetermined set of product codes under the BEC taxonomy[1];

4. **Strategic goods.** The same procedure was followed using a list of codes identifying strategic goods at the four and six-digit level. Strategic goods codes were gathered from three datasets available on Joint Research Centre (2018, 2021, 2026).

Table 4.2 summarizes the main variables in the trade and tariffs panel.

[1]Both "pure" intermediate inputs and dual-use goods were considered in the analysis. Items lacking any intermediate use share, such as capital items or consumer products, were omitted. For further details see Appendix B.1.3

Table 4.2: Trade and Tariffs panel

Variable	Description	Source	Additional information
`ReporterName`	Reporting country of the trade and tariff observation	N.A.	Fixed to Italy throughout the panel, since the analysis covers only Italian imports
`Year`	Reference year of the trade observation	World Bank (n.d.)	Tariff year is the closest available to Year (see the Appendix B.1), while for 2024–2025, tariffs are forward-filled from 2023
`PartnerName`	Full name of the partner (exporting) country	World Bank (n.d.)	See Table A.1 for the full country list
`ProductCode`	Six-digit product code under the Harmonized System nomenclature	World Bank (n.d.)	The HS revision underlying the code varies by extraction year; no re-concordance to a single HS vintage is applied at this stage
`TradeValuein1000USD`	Value of Italian imports originating from the partner country under the given 6-digit product category, expressed in thousand US dollars	World Bank (n.d.)	Treated as the backbone of the panel: one row is retained per PartnerName-ProductCode-Year combination
`preferential`	Simple average of preferential tariffs (Duty Type = PREF) at the 6-digit level, in percentage points, i.e., the reduced rate applying under a trade agreement in force between the EU and the partner	WITS TRAINS Ad Valorem (World Bank, n.d.)	Matched to the trade observation via the nearest-year rule (See Appendix B.1)

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Table 4.2 – continued from previous page

Variable	Description	Source	Additional information
`mfn`	Simple average of Most-Favoured-Nation applied tariffs (Duty Type = MFN) at the 6-digit level, in percentage points	WITS TRAINS Ad Valorem (World Bank, n.d.)	Matched to the trade observation via the nearest-year rule (See Appendix B.1)
`ahs`	Simple average of effectively applied tariffs (Duty Type = AHS) at the 6-digit level, in percentage points, i.e., the rate actually in force (preferential where applicable, MFN otherwise)	WITS TRAINS Ad Valorem (World Bank, n.d.)	Matched to the trade observation via the nearest-year rule (See Appendix B.1)
`intermediate`	Dummy variable equal to 1 if the HS6 code is classified as an intermediate good, 0 otherwise	BEC taxonomy Revision 4 and 5 (United Nations Statistics Division, 2016a, 2016b)	Items were qualified as intermediate whenever they exhibit a positive intermediate use share (`BEC4INT` > 0 under BEC Rev.4, or an end use tag containing "INT" under BEC Rev.5)
`strategic`	Dummy variable equal to 1 if the HS6 code appears in the list of strategic goods, 0 otherwise	Joint Research Centre (2018, 2021, 2026)	Codes reported at both the 6-digit and the 4-digit heading level are retained, with 4-digit codes matched to all corresponding 6-digit subcodes. Three Strategic Trade Atlas editions are considered (Joint Research Centre, 2018, 2021, 2026)

Note: So far, only a broad definition for intermediate goods is considered; a robustness check assessing how the results change if a more conservative definition is applied is carried out in Subsection 5.2.2.

4.1.3 Derived Variables

As mentioned in Subsection 4.1.1, a subset of the raw variables was used to derive additional variables for a more in-depth analysis. A detailed description of how these variables were constructed is provided in Appendix B.1, while Table 4.3 reports a brief overview of the derived variables.

Table 4.3: Derived variables from the raw variables

Variable	Description
`tariff`	It is defined as the minimum available value among **preferential**, **mfn**, and **ahs** for the given observation[2]
`geop_dist_l1`	One-year lagged geopolitical distance between Italy and the partner country. Geopolitical distance is defined as the absolute difference between the two countries' UN General Assembly ideal points
`align_status`	Categorical variable classifying each partner country, in each time period, as *Aligned*, *Neutral*, or *Not aligned* with Italy. The classification is based on terciles of the partner's average lagged geopolitical distance within each period (see Appendix B.1 for further details)

As frequently happens when downloading data from online sources, not all variables were complete for the entire observation period: for some variables the whole series within the 2010-2025 time period was not present, while in other cases only a few observations were missing. The issue of missing values for the variables is treated in detail in Appendix B.1.2.

4.1.4 Final Panel Construction

Once the data-gathering for the two panels was completed, the next step was the creation of a single, full dataset that combined the two of them. This step was needed

[2]It was constructed to maximise coverage: **ahs** alone is missing for a large share of traded product codes, so **tariff** falls back on whichever of the three duty types is available, taking the lowest value as a proxy for the effectively applied rate.

not only to have a complete picture of Italy's import reconfiguration along both the geographic and geopolitical dimensions, but also to ease the analytical part that would follow.

Merging these two datasets was possible because every observation could be accessed through a key given by the 6-digit product code, the partner country, and the year.

Hence, in the final panel, every observation (i.e., every line) represents a dyad where the reporter country is fixed, Italy, and the other is any partner country in the world, at a given product and year. For each observation, a series of information is provided: the 6-digit product code, the geographical distance, the geopolitical distance, the import trade value (in thousands USD), the tariff applied by Italy to the partner country on imported goods[3], the flags for intermediate and strategic goods, and other flags such as shared land orders, shared language, and the presence of RTA.

Before moving to the regression analysis in Stata, a final data preparation step was required. The trade value series compiled up to this stage only included product–partner pairs with strictly positive recorded flows. However, following standard gravity literature (e.g., Head and Mayer (2014); Silva and Tenreyro (2006)), restricting the analysis to positive trades would bias the estimates by omitting the extensive margin. Under the assumption that unrecorded bilateral trade flows represent true zero-trade flows rather than missing observations, the dataset had to be expanded to account for all potential product, partner, and year combinations.

To implement this expansion, the full dataset of product, partner, and year combinations was constructed manually as follows. For each nomenclature revision window, the product codes restricted to intermediate goods (`Intermediate == 1`) were cross-joined with the full list of trading partners using the Stata command `cross`. Then, expanding across the corresponding years using the command `expand`, the three period categories were appended together using the command `append`. Following this operation, import values that had no matching trade value were imputed as zero. After this step, the dataset reached a number of observations equal to 11.9 million.

[3]When tariffs raw data were retrieved from World Bank (n.d.), the selected reporter country was the European Union, as data related to Italy only were not available. Since Italy is part of the EU, that is, it applies the EU Common External Tariff, the same tariffs are applied by Italy on imported goods from non-EU partners.

Given the prevalence of zero-trade flows in the resulting panel, the estimating equation presented in Equation (3.3) is estimated via the Poisson Pseudo Maximum Likelihood (PPML) estimator.

Moreover, in accordance with the estimating equation (3.3), it was necessary to compute the natural logarithms of distance and tariff, creating the variables `ln_dist` and `ln_tariff`[4], respectively. Lastly, the variable `period` was created to divide the years into three periods: 2010-2017, 2018-2021, and 2022-2025.

To give the reader a sense of the structure of the final database, a snapshot of the import panel is provided in the Table B.2 of the Appendix.

4.2 Descriptive Statistics of the Panel

The goal of this section is to provide a preliminary analysis of the collected data. This section presents descriptive statistics for two main reasons. First, it helps to understand the structure and distribution of the panel before the regression analysis starts. Second, it makes it possible to detect anomalies, outliers, and structural gaps in the data.

In particular, since the import panel contains both binary and continuous variables, the analysis is split into two parts. In this way, the descriptive statistics are presented for each type of variable separately.

4.2.1 Binary and Categorical Variables

The descriptive statistical analysis for the binary variables is provided in Table 4.4. Unlike the continuous variables, for which traditional statistics such as the mean, median, etc. are studied, in this case, since binary variables only take values equal to 0 or 1, it would be meaningless to present the same type of table. This is the reason why Table 4.4 is used instead, which illustrates the number of observations for each variable, the frequency with which the variable takes a value equal to 1, and the percentage this frequency represents out of the total number of observations.

[4]Despite its label, the variable `ln_tariff` is defined as ln(1 + Tariff) instead of ln(Tariff), as tariffs take a value of zero for a noticeable share of observations, where the standard logarithm is undefined. Across the thesis, `ln_tariff` and ln(1 + Tariff) refer to the identical measure and appear interchangeably.

This analysis was conducted on the regression panel, i.e. the dataset that is zero-filled and restricted to intermediate goods only.

One piece of information that can be derived from the table is that strategic goods represent only 4.92% of the observations. This may represent a limitation for the secondary research question this paper addresses, namely whether the effect of trade decoupling and de-globalization is stronger on strategic goods. Another aspect that can be considered is that Italy has an RTA in place for 47.32% of the observations, which is considerably higher than the shares observed for the other proximity-related dummies: contiguity (2.75%), common official language (1.38%), and colonial relationship (0.92%).

Table 4.4: Descriptive statistics of binary variables

Variable	Obs.	Freq. (= 1)	Percent (%)
RTA	11,947,054	5,652,764	47.32
Contiguity	11,947,054	328,818	2.75
Common Official Language	11,947,054	164,409	1.38
Colonial Relationship	11,947,054	109,606	0.92
Strategic Good	11,947,054	587,292	4.92

Note: sample restricted to intermediate goods (estimation zero-filled panel). For reference, intermediate goods represent 57.94% of total observed Italian imports in the underlying non-zero-filled Comtrade data.

While Table 4.4 focuses on the binary variables of the data collected, Table 4.5 is about the only categorical variable of the entire dataset, i.e. the Alignment Status. This variable is strictly related to the geopolitical distance, as it was assigned to the partner country only after the latter was computed. In this case, since the original dataset for the UN voting system from which the raw data were taken was not complete (Voeten, 2009), there are some missing values.

Table 4.5: Distribution of geopolitical alignment status

Category	Freq.	Percent (%)
Aligned	3,229,748	31.98
Neutral	3,403,247	33.70
Not Aligned	3,466,277	34.32
Total (non-missing)	10,099,272	100.00
Missing	1,847,782	–

4.2.2 Continuous Variables

The statistics reported in Table 4.6 for the continuous variables refer to the zero-filled dataset. Table 4.6 reports the main descriptive statistics: the mean, the standard deviation, the three quartiles (Q1, the median, and Q3), and the minimum and maximum value[5].

Table 4.6: Summary of key statistics (continuous variables)

Variable	Mean	Std. Dev.	Min	Q1	Median	Q3	Max
TV	431.37	23,854.36	0.00	0.00	0.00	0.00	15,110,739
Tariff	0.40	1.89	0.00	0.00	0.00	0.00	174.69
Dist	6,568.36	4,445.72	4.88	3,113.88	6,327.74	8,982.66	18,572.15
GDP	405,000	1,790,000	30.48	6,900	28,000	190,000	23,220,000
GDPpc	15,527.58	20,869.07	253.31	2,156.08	6,075.03	19,698.70	118,382.91
GeoDist	1.17	0.66	0.0002	0.66	1.34	1.60	3.11

Notes: TV = Trade Value, in thousands of USD. Dist = bilateral distance, in km. GDP = Gross Domestic Product, in million USD. GDPpc = GDP per capita, in USD. GeoDist = Geopolitical Distance (UN ideal-point distance).

What clearly emerges from Table 4.6, and is shown more explicitly in Figure 4.1, is the sparsity of the Trade Value (000$) variable. Most observations are concentrated at zero: the first quartile, the median, and the third quartile all take this value, and only the mean and the maximum assume positive trade flows figures. This pattern, i.e. a large mass of zeros combined with a small number of large positive values, is the main reason behind the choice of the Poisson Pseudo-Maximum Likelihood (PPML) estimator over a log-linear OLS, as further detailed in Subsection 3.1.2.

[5]All statistics were computed using Stata's `summarize` command, which by default excludes missing observations from the calculation.

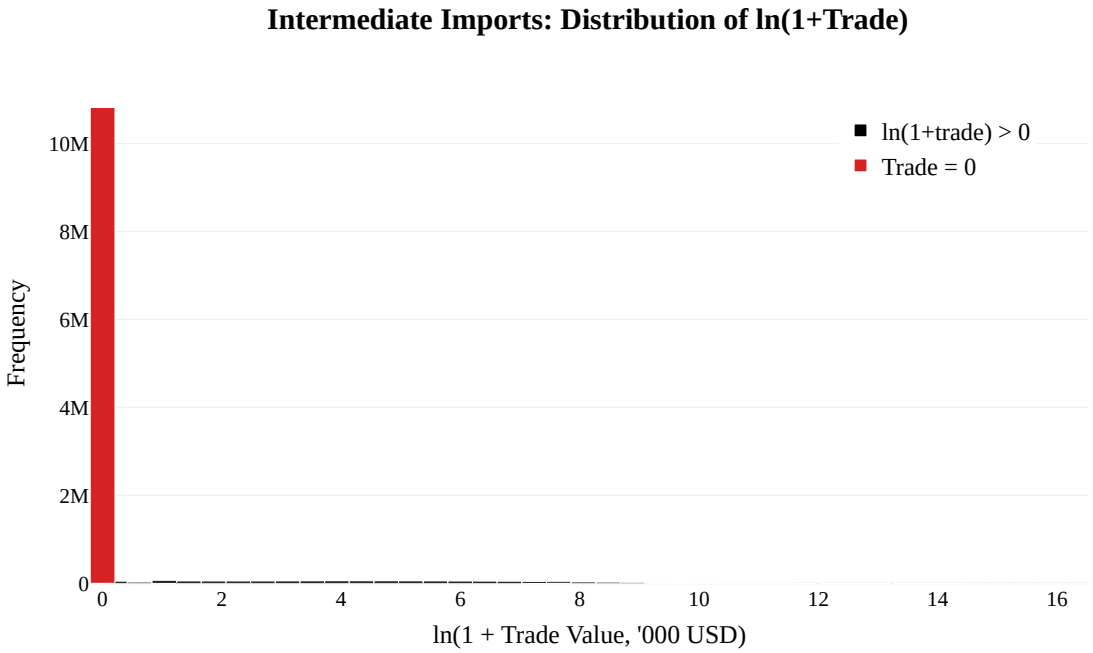


Figure 4.1: Intermediate Imports distribution of $ln(1 + Trade)$

Figure 4.1 shows the distribution of $ln(1 + TradeValue)$. There is extreme right-skewness and zero-inflation in the raw distribution (the mean is 431.37, while the maximum is over 15 million). In fact, if the raw values are divided into bins, almost all positive observations are placed into a single bin. The scale is compressed by the $ln(1 + x)$ transformation, which displays the distribution among positive trade flows more clearly, and at the same time, zero values are still handled correctly.

In Table 4.6, GDP (million USD) shows a different pattern. Here, the high standard deviation reflects the wide dispersion in country size within the sample: the dataset includes both very large economies, such as China and the United States, and very small ones. resulting in a distribution that is highly skewed even though only a negligible number of observations, if any, take a value of zero.

Chapter 5

Results and Discussion

Section 5.1 constitutes a first exploratory analysis useful for identifying patterns that will later be examined in more depth through the gravity model and the analyses on nearshoring and friendshoring.

The figures are organized to address the geographic distribution of Italy's main trading partners, the role of classic gravity trade costs and the relationship between trade and geopolitical distance, before moving to the econometric analysis in Section 5.2.

5.1 Preliminary Data Analysis

5.1.1 Trade Value and Geographical Distance

Figure 5.1 shows the twenty main countries[1] from which Italy imports intermediate goods in the three years considered (2010, 2018, and 2025). Four relevant dimensions of international trade can be visualized at the same time on the bubble chart: the value of imports (vertical axis, expressed as $ln(1 + Trade)$), the geographic distance from Italy (horizontal axis, $ln(Distance)$), the economic size of the partner country (bubble size, proportional to the square root of GDP) and the degree of geopolitical alignment, represented through the color of the observations.

The representation is repeated for three different years to avoid a static picture of Italian trade relations. This choice instead allows the evolution of the structure of supply sources to be observed over time.

[1]The selection of the twenty main trading partners keeps the chart readable and avoids the excessive overlap that would occur if the entire sample of countries were included.

A first element that clearly emerges concerns the notable stability of the Italian trade network. Most of the main partners appear in all three years considered. This shows that the supply relationships of Italian industry are characterized by strong persistence over time. Germany, France, the Netherlands, Belgium, Switzerland, Spain, the United States and China are present throughout the entire time horizon. This suggests that the structure of Italian supply chains is relatively stable and not easily changed in the short run.

The chart also shows a fairly clear distinction between two groups of countries. On one hand, a cluster is observed made up mostly of European economies geopolitically aligned with Italy, characterized by short geographic distances and high levels of trade. On the other hand, countries classified as "Not aligned" are on average more distant and tend to be concentrated on the right side of the chart, while still maintaining trade levels high enough to be among the top twenty Italian trading partners. This configuration suggests that geographic proximity and economic integration continue to be fundamental factors in determining trade flows.

Comparing the three years also makes it possible to observe some changes in the composition of the main suppliers. In particular, Russia appears among the top twenty partners in 2010 and 2018, but is absent in 2025. This evolution is consistent with the deep redefinition of trade relations between the European Union and the Russian Federation following the invasion of Ukraine and the introduction of economic sanctions. Similarly, the United Kingdom no longer appears among the main partners in 2025. This result could reflect, at least in part, the reorganization of trade following Brexit.

One particularly interesting aspect concerns the geopolitical classification of the United States, which in the three years considered do not always belong to the category of aligned countries. This evidence may seem counterintuitive given the traditional perception of relations between Italy and the United States. However, it should be noted that the geopolitical alignment indicator used in this analysis is based exclusively on the similarity of voting behavior in the United Nations General Assembly and does not represent a direct measure of political or military alliances.

The graphical evidence is also consistent with some of the main predictions of the gravity model of international trade. In particular, Plot 5.1 shows that the largest trade

flows are concentrated mainly between countries characterized by short geographic distance, confirming the negative role played by distance on transport costs and, consequently, on the intensity of trade. This relationship is particularly evident in the 2010 chart, where European partners combine both the shortest distances and the highest trade values. At the same time, the constant presence of large economies such as the United States and China is consistent with the importance of economic mass predicted by the gravity model. However, these countries are not the main Italian suppliers in terms of intermediate goods imports. This role is instead held mainly by Germany and France. This suggests that economic size, while relevant, is not sufficient to explain trade flows in the absence of geographic proximity and the strong productive integration guaranteed by the European single market. Finally, the chart shows some cases that deviate from the simplest predictions of the gravity model. Azerbaijan, for example, shows a relatively large geographic distance, a limited economic size compared to the main world economies and a low degree of geopolitical alignment with Italy, yet it is still among the main Italian suppliers of intermediate goods. Its presence can be interpreted as an indication that, for specific categories of production inputs, such as energy raw materials and natural resources (see Figure 2.4), the availability of the good can outweigh the effects of geographic distance and political alignment.

All the observations relative to Figure 5.1 are based on mere data visualisation; indeed, to actually assess the effect of one trade determinant, the econometric analysis is needed.



Figure 5.1: Intermediate goods trade vs. distance 2010-2018-2025. Source: Elaboration from data collected (see Chapter 4). For partner country abbreviations see Table A.1

5.1.2 Trade Value and Binary Variables

Figures 5.2 and 5.3 present a descriptive analysis of the association between some binary variables commonly used in gravity models of international trade (Head & Mayer, 2014; Head et al., 2010) and the value of intermediate goods trade between Italy and partner countries. Specifically, three characteristics are considered: the existence of a Regional Trade Agreement (RTA), the presence of a shared land border and the sharing of a common language. The two graphs analyze two complementary aspects of the relationship between these variables and trade: the first focuses on the probability that a trade flow is zero, while the second examines the intensity of trade, limited to observations with a strictly positive import value. These variables reflect the standard gravity model literature, where they proxy economic and geographic proximity and, more broadly, factors that lower trade costs and favor trade (Head & Mayer, 2014; Head et al., 2010).

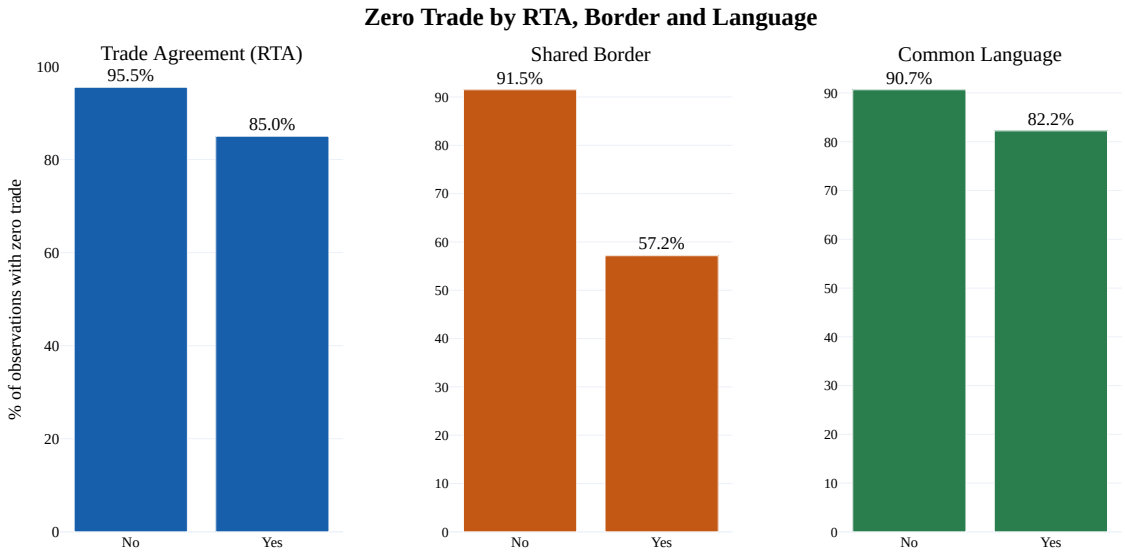


Figure 5.2: Zero Trade observations by RTA, Shared Borders and Common Language. Source: Elaboration from data collected (see Chapter 4)

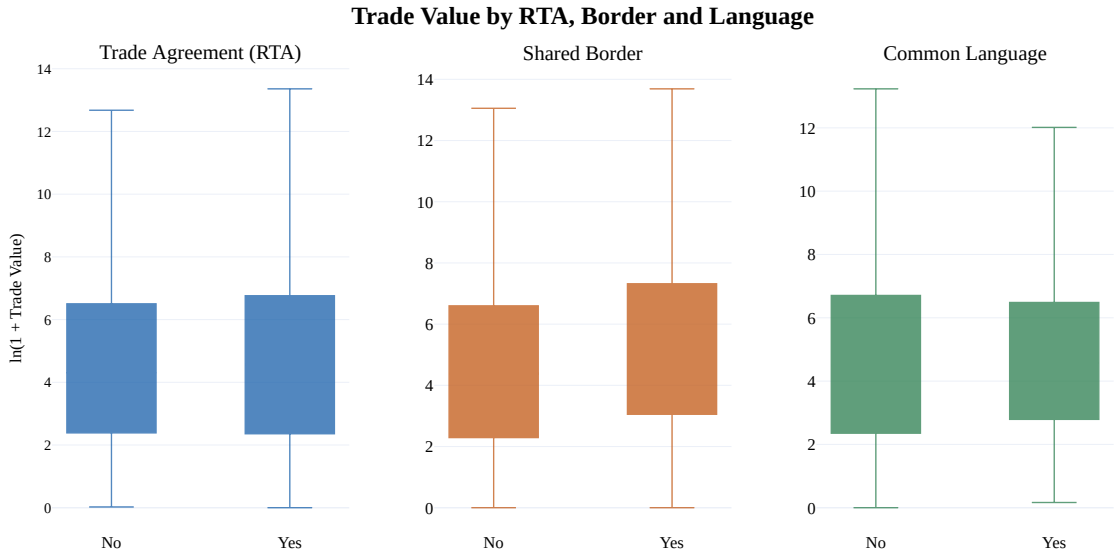


Figure 5.3: Positive Trade Values by RTA, Border and Common Language. Source: Elaboration from data collected (see Chapter 4)

Figure 5.2 reports, for each of the three binary variables considered, the percentage of observations with an import value equal to zero, distinguishing between dyads that have and those that do not have the characteristic. The aim is to provide initial descriptive evidence of the association between these variables and the very existence of a trade relationship. The analysis shows that 95.5% of dyads without a trade agreement have a zero import flow, while this percentage falls to 85.0% for dyads that share a RTA. This result suggests that the presence of a trade agreement is associated with a higher probability that at least some trade flow exists between the two countries.

The clearest effect, however, emerges in the case of a shared land border. About 91.5% of dyads that do not share a border have an import value of zero, while this percentage drops to 57.2% for bordering country pairs. A common language is also associated with a lower incidence of zero flows: the share of observations with zero trade falls from 90.7% to 82.2%. Overall, the graph suggests that all three variables are associated with a higher probability of a trade relationship existing between two countries, with geographic proximity playing a particularly important role.

Figure 5.3 considers only observations with a strictly positive import value and examines how trade intensity varies with the same three binary variables through box plots. Here, the aim is to analyze whether, once a trade relationship is established,

these characteristics are associated with higher levels of trade.

Again, sharing a land border is the variable showing the clearest association with trade value. These dyads show a generally higher distribution of import values than non-bordering dyads. A similar, though less evident, result emerges for RTA, for which the box plot for dyads with an RTA is on average positioned at higher levels than the one for dyads without an agreement. In contrast, for common language no particularly marked differences are observed between the two distributions, with the median for non-common language dyads even appearing marginally higher, suggesting that this characteristic has a more limited effect on trade intensity.

A possible interpretation of this last result is that sharing a common language mainly helps start a trade relationship, as suggested by Figure 5.2. Once the trade relationship is established, however, the value of trade seems to depend more on other factors, than the presence of common language.

5.1.3 Trade Value and Geopolitical Distance

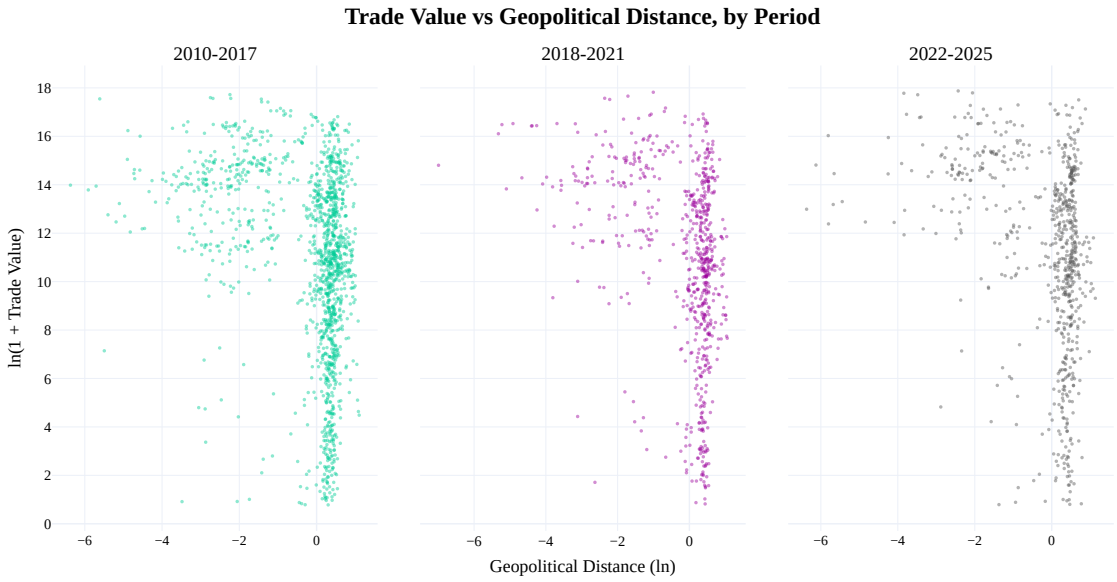


Figure 5.4: Trade Value vs geopolitical distance[2]. Source: Elaboration from data collected (see Chapter 4)

[2]Geopolitical distance is log-transformed solely for graphical clarity to compress the scatter plot scale. In contrast, the empirical model in Equation (3.3) employs the variable in levels, accommodating its bimodal distribution.

Figure 5.4 presents three scatter plots showing the relationship between geopolitical distance, expressed in logarithmic form and the value of Italian intermediate goods imports, also log-transformed. The three plots display the same variables across three distinct periods: 2010-2017, 2018-2021 and 2022-2025. As already noted, 2018 and 2022 correspond to relevant geopolitical shocks, hence the choice of breaking the time window accordingly, in order to verify whether there has been a change in the relationship between geopolitical distance and trade value. Each point in the graph represents a dyad formed by Italy and a partner country in a specific year.

At first glance, it is possible to spot a pattern common to the three periods. Indeed, most observations are concentrated in a relatively narrow range of geopolitical distance values, forming a cloud of points with marked vertical dispersion. This concentration must be interpreted in light of the logarithmic transformation applied to geopolitical distance. Indeed, this mathematical function compresses higher values and therefore reduces the visual distance between observations with geopolitical distance levels above unity.

Moreover, it can be noted that some observations are located on the left side of the graph, and they correspond to lower levels of geopolitical distance. These observations are, in most cases, associated with the highest import values.

The large vertical spread in the data indicates that this descriptive pattern remains weak. In particular, countries with similar levels of geopolitical distance display widely different import values, meaning a simple trend line fits the data poorly. Consequently, this wide variation suggests that geopolitical distance alone cannot account for the differences in trade flows, even if a general link between the two variables exists.

Finally, the comparison across the three panels does not reveal particularly marked changes in the distribution of observations. The overall shape of the point cloud remains substantially similar across the three periods and there is no visually evident evolution in the relationship between geopolitical distance and import value.

5.2 Econometric estimate

After a preliminary visualization of the data collected, the focal part of the thesis, the regression analysis, was carried out to address the research question reported in Subsection 2.3.2.

All regressions and key statistics were estimated in Stata using the `ppmlhdfe` package (Correia et al., 2020), which is specifically designed to handle high-dimensional fixed effects efficiently on a large dataset of approximately 11.9 million observations[3].

The econometric regression analysis was conducted in four steps.

Firstly, the `ppmlhdfe` command was run to obtain the baseline estimates, including the estimated coefficients (see Equation (3.3)), clustered standard errors, significance levels and goodness of fit statistics. The raw results are reported in Table 5.1. Then, Table 5.2 translates these raw coefficients into readable semi-elasticities, compares expected versus estimated signs and reconciles the empirical findings directly with the research question.

Secondly, various robustness checks were conducted to assess the sensitivity of the baseline specification to alternative modeling choices. In particular, four parallel analyses were carried out, and the key results are reported in Tables 5.3, 5.5, 5.6 and 5.7.

Then, a more in-depth analysis was conducted for strategic goods. The results in Table 5.1 only partially answer whether decoupling and nearshoring are more visible for strategic goods, because the interaction coefficients capture only the differential effect relative to non-strategic products. To assess the total effect on strategic goods, the main and interaction coefficients must be summed using linear combinations (`lincom`). Table 5.8 reports these total effects to fill this gap.

Lastly, another critical point that deserved a deeper examination was whether the differences observed in the estimated coefficients across the three time periods are statistically significant. A visual comparison of point estimates across columns is not sufficient, as numerical variations may simply reflect sampling noise. For this reason, a formal Wald test was performed to test the equality of coefficients across periods and

[3]This figure represents the total number of observations even though the regression was run on a lower number as reported in Table 5.1

ensure robust conclusions. The results of this test are presented in Table 5.9.

In particular, the time horizon of the analysis was divided into three sub-periods, where the watershed years represent key turning points in recent international trade and geopolitics (specifically, the 2018 US-China Section 301 tariffs and the 2022 Russian invasion of Ukraine):

- Period 1 includes years from 2010 to 2017;
- Period 2 includes years from 2018 to 2021;
- Period 3 includes years from 2022 to 2025.

5.2.1 Baseline gravity specification

Table 5.1 summarizes the key PPML estimation results across six specifications:

- (1) Geographic Distance only. This specification omits geopolitical distance in order to isolate the baseline effect of spatial proximity.
- (2) Geopolitical Distance only. This model excludes geographical distance to measure the independent role of political alignment.
- (3) Both Distances without temporal interaction. Both distance metrics are included together to measure their combined baseline impact before time factors are added.
- (4) Geographic Distance × Strategic. Geographic distance is interacted with the strategic sector indicator, while geopolitical distance is excluded.
- (5) Geopolitical Distance × Strategic. Political sensitivity in strategic sectors is tested by interacting geopolitical distance, while geographical distance is left out.
- (6) Full Specification. This final model incorporates both distance metrics, both interaction terms with the strategic indicator and period fixed effects, as detailed in the estimating equation (3.3).

The aim of this commentary is threefold: i) to assess the statistical significance of the estimated parameters across the six specifications; ii) to examine the estimated signs and semi-elasticities of specification (6) directly obtained from the model; and iii) to evaluate what these findings imply for the research question regarding nearshoring and geopolitical decoupling. For this reason, Table 5.1 should be read alongside Table 5.2, which offers a detailed interpretation and links the empirical estimates directly to the research question.

Before the coefficients are examined in detail, a few technical aspects of the dataset deserve attention. First, the final regressions rely on approximately 7.04 million observations, as roughly 5 million rows are dropped from the initial zero-filled sample of about 12 million observations. This reduction occurs because, despite efforts to collect comprehensive data, some partner-product pairs lacked tariff data (accounting for approximately 3.5 million dropped observations), while other dyads had missing values regarding geopolitical distance. As a result, the `ppmlhdfe` command automatically applies deletion, restricting the estimation sample strictly to fully observed rows. Moreover, since these specifications were meant to be comparable to one another, it was necessary to define a common regression sample, free of missing values across all variables used in any specification, so that differences across columns could not be attributed to differences in sample composition, but only to differences in the specification itself.

Turning to the statistical analysis, it is possible to analyse each specification. In specification (1), geographic distance exhibits the expected negative sign in Period 1, meaning that greater spatial distance reduces bilateral trade, as well as in Period 2. However, these coefficients are not statistically significant. For Period 3 ($\beta_{1,3}$), the parameter is omitted due to collinearity: bilateral geographic distance is time-invariant between Italy and each partner, so its baseline effect is fully absorbed by the partner fixed effects, requiring Period 3 to serve as the omitted reference category.

Specification (2) focuses on geopolitical alignment because the goal is to isolate the role of political distance on trade. In this case, there is clearly a positive coefficient that becomes statistically significant over time. The coefficient reaches the 5% level in Period 2 and the 1% level in Period 3. This positive result goes directly against standard friendshoring predictions. In addition, there is no statistical significance for

tariffs and RTAs.

In specification (3), there is a joint evaluation of both geographic and geopolitical distances without any temporal interactions. Because there are no time interactions, geographic distance is completely absorbed by the partner fixed effects, so it is not possible to identify it. On the other hand, geopolitical distance stays positive and statistically significant at the 1% level, while there are only positive and insignificant coefficients for RTAs and tariffs.

Specification (4) adds the interaction between geographic distance and the strategic sector dummy. The reason is that this allows the model to capture the different effect of spatial distance on strategic goods. This interaction term is positive but statistically insignificant across all periods, while the underlying controls for RTAs and applied tariffs continue to show no statistical significance.

Specification (5) isolates the differential effect of geopolitical distance on strategic goods. While the baseline geopolitical distance remains positive and statistically significant, the interaction term displays an inversion of the sign: it is positive in Period 1 but turns negative in Periods 2 and 3. Nevertheless, this differential effect remains statistically insignificant when evaluated in isolation.

Specification (6) represents the full model formulated in Equation (3.3). For geographic distance, the coefficient is negative in Period 1, turns positive in Period 2, and is omitted in Period 3 as the reference category and none of these estimates achieve statistical significance. Conversely, geopolitical distance displays a persistent, statistically significant positive coefficient across all periods ($\beta_{2,1}$, $p < 0.10$; $\beta_{2,2}$, $p < 0.10$; $\beta_{2,3}$, $p < 0.01$). This counterintuitive positive sign aligns with observations in the recent empirical literature noting the limitations of UN voting alignment metrics in capturing actual trade frictions.

Crucially, in specification (6), the interaction terms with strategic goods achieve statistical significance in Period 3 at the 10% level: the geographic distance interaction is positive, while the geopolitical distance interaction is negative ($\beta_{4,3} = -0.371$, $p < 0.10$). This negative differential effect indicates that friendshoring dynamics materialize specifically for strategic intermediate inputs in the post-2022 period.

Comparing the columns shows that the main results are robust. First, the positive

effect and statistical significance of geopolitical distance stay remarkably stable across models. This holds true when geographic distance is omitted in column 2, included without interactions in column 3, or fully included in column 6. This stability confirms the positive baseline result as a robust finding. Second, geographic distance never reaches statistical significance, whether entered alone in column 1 or interacted with strategic goods in column 4. Finally, the differential signal of friendshoring in strategic supply chains emerges only in the full specification. Omitting spatial distance leaves the interaction between geopolitical distance and strategic goods statistically insignificant, as column 5 shows ($\beta_{4,3} = -0.134$). In contrast, in column 6 this effect nearly triples to $\beta_{4,3} = -0.371$ and becomes statistically significant at the 10% level. This shows that the differential effect for strategic goods is not redundant. Instead, it only becomes visible when controlling for both geographic distance and general geopolitical alignment at the same time.

Table 5.1: PPML estimates of the determinants of Italian intermediate goods imports with sequential specifications (2010-2025)

Variable	**Period**	(1)	(2)	(3)	(4)	(5)	(6)
Geographic distance	Period 1	−0.110	—	*om.*[a]	−0.110	—	−0.070
		(0.088)			(0.092)		(0.076)
	Period 2	−0.067	—	n.a.	−0.068	—	0.001
		(0.048)			(0.050)		(0.042)
	Period 3	*(om.)*	—	n.a.	*(om.)*	—	*(om.)*
Geopolitical distance	Period 1	—	0.142	0.239[a],***	—	0.143	0.193*
			(0.113)	(0.067)		(0.117)	(0.100)
	Period 2	—	0.160**	n.a.	—	0.169**	0.148*
			(0.072)			(0.075)	(0.077)
	Period 3	—	0.241***	n.a.	—	0.248***	0.230***
			(0.059)			(0.058)	(0.074)
Geographic distance × *Strategic*	Period 1	—	—	—	0.055	—	0.106
					(0.101)		(0.141)
	Period 2	—	—	—	0.069	—	0.232
					(0.085)		(0.168)
	Period 3	—	—	—	0.050	—	0.257*
					(0.076)		(0.147)
Geopolitical distance × *Strategic*	Period 1	—	—	—	—	0.005	−0.100
						(0.173)	(0.221)
	Period 2	—	—	—	—	−0.164	−0.392
						(0.225)	(0.301)
	Period 3	—	—	—	—	−0.134	−0.371*
						(0.144)	(0.209)
ln(1 + Tariff)		0.057	0.056	0.054	0.058	0.055	0.056
		(0.106)	(0.105)	(0.107)	(0.104)	(0.104)	(0.103)
RTA		−0.069	0.031	0.048	−0.068	0.031	−0.047
		(0.180)	(0.140)	(0.151)	(0.180)	(0.140)	(0.170)
Constant		10.313***	9.675***	9.636***	10.288***	9.675***	9.879***
		(0.484)	(0.135)	(0.133)	(0.482)	(0.135)	(0.419)
Partner FE		Yes	Yes	Yes	Yes	Yes	Yes
Product × Year FE		Yes	Yes	Yes	Yes	Yes	Yes
Clustered SE (Partner)		Yes	Yes	Yes	Yes	Yes	Yes
Observations		7,038,921	7,038,921	7,038,921	7,038,921	7,038,921	7,038,921
Pseudo R^2		0.768	0.768	0.768	0.768	0.768	0.768

Notes: The dependent variable is Italian intermediate goods imports in levels (1000 USD). Robust standard errors clustered at the partner level are reported in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

[a] In Column (3), Geographic and Geopolitical Distance are not interacted with period and enter as single coefficients estimated over the full sample. The estimate is reported in the Period 1 row, with "n.a." in the Period 2 and Period 3 rows of that column. Geographic Distance is omitted due to collinearity with the partner fixed effect once the period interaction is removed.

Table 5.2 converts the estimates from Table 5.1 (column 6) into semi-elasticities to evaluate whether each variable supports or contradicts the nearshoring and friendshoring hypothesis. For strategic goods interactions, the table reports the sign of the differential effect rather than the total effect of Table 5.8.

The baseline geopolitical distance estimate for Period 3 ($\beta_{2,3} = 0.2302$) corresponds to a semi-elasticity of +25.9%, representing the strongest baseline magnitude and the most precisely estimated coefficient ($p < 0.01$).

Geographic Distance is not statistically significant in any period. Consequently, there is no evidence of nearshoring for Italian intermediate imports (SQ1).

Strategic Goods Interactions present the only exception to the aggregate trend. In Period 3, the differential effect between geopolitical distance and strategic goods becomes significant at the 10% level. The corresponding total effect (Table 5.8) turns negative in Periods 2 and 3, although it is not statistically significant. This points to initial signs of friendshoring specifically within critical sectors. By contrast, the interaction with geographic distance stays positive throughout all periods, becoming only marginally significant (at the 10% level) in Period 3.

Tariffs and RTAs are not interacted with time and lack statistical significance. They are included as standard gravity controls.

Table 5.2: Interpretation of the PPML estimates

Regressor	β	Significant?	Semi-elasticity	Expected sign	Estimated sign	Direction relative to RQ[4]	Motivation
Geographic distance (β_1)							
Period 1	$\beta_{1,1}$	No	−6.8%	Negative	Negative	Yes	Sign points toward nearshoring, but it is not distinguishable from zero once partner FE absorb distance.
Period 2	$\beta_{1,2}$	No	+0.1%	Negative	Positive	No	Effect is essentially zero and positive rather than negative.
Period 3	$\beta_{1,3}$	*reference category (absorbed by partner FE)*					
Geopolitical distance (β_2)							
Period 1	$\beta_{2,1}$	Yes (10%)	+21.3%	Negative	Positive	No	These results contradict the friendshoring hypothesis, pointing instead to a known constraint of the UNGA-based metric. In line with this, Jones et al. (2026) report a similar positive and statistically significant coefficient when using an equivalent measure.
Period 2	$\beta_{2,2}$	Yes (10%)	+16.0%	Negative	Positive	No	Away from decoupling; magnitude drops relative to Period 1.
Period 3	$\beta_{2,3}$	Yes (1%)	+25.9%	Negative	Positive	No	Largest and most significant coefficient of the three: geopolitical distance correlates strongly with trade, though with a sign opposite to what the literature finds. Formal Wald tests in Table 5.9 assess whether this relationship shifts significantly over time.
Geographic distance × strategic goods (β_3) (differential effect)							
Period 1	$\beta_{3,1}$	No	+11.2%	Negative	Positive	No	Differential effect only. Total effect on strategic goods (Table 5.8) is +3.6%, not significant ($p = 0.820$); direction opposes nearshoring.

Continued on next page

Table 5.2 – continued from previous page

Regressor	β	Significant?	Semi-elasticity	Expected sign	Estimated sign	Direction rel. to RQ	Motivation
Period 2	$\beta_{3,2}$	No	+26.1%	Negative	Positive	No	Total effect +26.3% (Table 5.8), not significant ($p = 0.175$); same direction as Period 1, larger magnitude.
Period 3	$\beta_{3,3}$	Yes (10%)	+29.3%	Negative	Positive	No	Base effect absorbed by partner FE; only the differential is identified here, equal to the total effect by construction. Now marginally significant ($p = 0.080$) and opposing the nearshoring hypothesis.
Geopolitical distance × strategic goods (β_4) (differential effect)							
Period 1	$\beta_{4,1}$	No	−9.5%	Negative	Negative	No	Total effect on strategic goods (Table 5.8) is +9.8%, not significant ($p = 0.709$); despite the negative differential, the combined effect remains positive, unlike the hypothesized decoupling pattern.
Period 2	$\beta_{4,2}$	No	−32.4%	Negative	Negative	Yes	The total effect is now −21.6% and, although not statistically significant ($p = 0.404$), its sign has reversed relative to the previous specification.
Period 3	$\beta_{4,3}$	Yes (10%)	−31.0%	Negative	Negative	Yes	The differential itself is now significant ($p = 0.076$). The total effect is −13.1% and, while not statistically significant ($p = 0.454$), it has also reversed sign relative to the previous specification, now pointing toward decoupling for strategic goods.
ln(1+Tariff)	β_5	No	+5.8%	Negative	Positive	—	Not significant; included as a standard gravity control.
RTA	β_6	No	−4.6%	Positive	Negative	—	Not significant; included as a standard gravity control.

Notes: β labels refer to the coefficients of the estimating equation (3.3). "Significant?" reports statistical significance from the clustered standard errors in Table 5.1. Semi-elasticities are computed as $e^{\hat{\beta}} - 1$. "Direction relative to RQ" indicates whether the estimated sign points toward de-globalization/decoupling (Yes) or away from it (No).

5.2.2 Robustness check

Before turning to Subsections 5.2.3 and 5.2.4, which investigate the total effect on strategic goods and test whether the differences between coefficients across periods are statistically significant, this section introduces several robustness checks designed to validate the baseline results. These checks assess the sensitivity of the main estimates to regressor collinearity, the fixed effects structure, the exclusion of dominant trading partners and alternative product classifications.

Correlation among the baseline regressors The main goal of this check was to examine the pairwise correlations among all baseline regressors included in the empirical model. To evaluate these dependencies, the Stata command `pwcorr` was implemented across the baseline variables in levels. The period interaction terms were omitted to avoid mechanical distortions driven by the time dummy structure, thereby reflecting the economic relationships across dyads.

The pairwise correlation between geopolitical distance and geographic distance equals 0.445. Contrary to the a priori expectation of a high correlation between spatial and political metrics, this estimate indicates only a moderate association. Consequently, the value falls well below the standard 0.80 threshold commonly used to flag severe multicollinearity.

There is also another case with a comparable magnitude between geopolitical distance and regional trade agreements, which show a negative correlation of -0.442. This negative relationship has a clear economic rationale: countries that share trade agreements with Italy usually maintain closer political ties. While the other pairwise correlations among the remaining covariates are negligible, this result confirms that collinearity is not an issue in the regression sample.

Table 5.3: Pairwise correlations among the dependent variable and the regressors of the baseline specification

	(1)	(2)	(3)	(4)	(5)	(6)
(1) trade value	1.000					
(2) ln_dist	-0.016***	1.000				
(3) geop_dist_l1	-0.014***	0.445***	1.000			
(4) strategic	0.001*	0.000	0.001***	1.000		
(5) ln_tariff	-0.006***	0.126***	0.144***	-0.022***	1.000	
(6) rta	0.007***	-0.263***	-0.442***	0.003***	-0.299***	1.000

Note: Pairwise Pearson correlation coefficients, computed on the intermediate goods regression sample (N $\approx$ 11.9 million zero-filled observations). Significance levels are based on the exact p-values reported by Stata's `pwcorr`: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Given the very large sample size, statistical significance is not informative for most cells.

Specification without Partner Fixed Effects An additional robustness check investigates the empirical specification without partner fixed effects. As detailed in Subsection 5.2.1, the baseline methodology incorporates two high-dimensional fixed effects: partner fixed effects and product-year fixed effects. The former absorbs all time-invariant, partner-specific determinants, while the latter controls for time-varying product-level shocks.

In the baseline setup, perfect collinearity with partner fixed effects prevents the identification of geographic distance's main effect, so the model estimates only its interactions over time. Once partner fixed effects are removed, this collinearity constraint disappears, and the geographic distance parameter can finally be estimated. To control for the economic mass of the exporter in the absence of partner dummies, partner gross domestic product enters the specification as a standard monadic gravity proxy. For brevity, alternative estimates using GDP per capita are omitted, as they yield similar results, but with a lower goodness of fit.

Table 5.4: Pairwise correlations among gravity regressors

	(1)	(2)	(3)	(4)	(5)	(6)
(1) ln_dist	1.000					
(2) geop_dist_l1	0.445***	1.000				
(3) contig	-0.486***	-0.234***	1.000			
(4) comlang_off	-0.465***	-0.143***	0.702***	1.000		
(5) colony	-0.066***	0.079***	-0.016***	-0.011***	1.000	
(6) ln_gdp	-0.275***	-0.125***	0.109***	0.012***	-0.020***	1.000

Notes: (1) ln_dist; (2) geop_dist_l1; (3) contig; (4) comlang_off; (5) colony; (6) ln_gdp. Given the very large sample size, statistical significance is not informative for most cells.
*** $p < 0.01$

Before discussing the regression output, Table 5.4 reports the pairwise correlations among the additional gravity regressors. A relatively strong linear association emerges only between official common language and geographic contiguity ($r = 0.70$). All other pairwise correlations remain below 0.50 in absolute value, demonstrating that severe multicollinearity is absent.

Table 5.5 reports the PPML estimates for the model without partner fixed effects. Unlike the baseline specification, the coefficient for the logarithm of geographic distance becomes negative ($\beta = -1.08$) and statistically significant at the 1% level. However, this apparent emergence of a strong nearshoring effect must be interpreted with caution. Instead of showing nearshoring, there is a clear change in the distance coefficient that likely comes from omitted variable bias. This happens because a single monadic GDP control cannot absorb the unobserved bilateral heterogeneity that was captured by partner fixed effects.

On the other hand, the baseline geopolitical distance turns negative, but there is no statistical significance for this result. In addition, the period interactions for both distance metrics are mostly insignificant, and they show unstable signs over time. For strategic goods, the interaction between spatial distance and strategic sectors in Period 3 remains positive and statistically significant at the 10% level, contradicting the nearshoring hypothesis. Meanwhile, the differential effect for geopolitical distance in strategic goods remains negative ($\beta = -0.430$) and insignificant, preserving the directional pattern documented in the baseline specification.

Finally, Table 5.5 reveals counterintuitive estimates for standard cultural ties. Both

official common language ($\beta = -1.025$, $p < 0.01$) and colonial relationship ($\beta = -0.984$, $p < 0.01$) display negative and statistically significant coefficients, contradicting standard theoretical expectations that shared linguistic and historical links foster bilateral trade. In contrast, partner GDP behaves in line with standard gravity theory: its coefficient is positive, large and statistically significant at the 1% level.

Table 5.5: PPML estimates without partner fixed effects (GDP as monadic proxy)

	TradeValue (000 USD)
ln_dist	-1.080***
	(0.161)
geop_dist_l1	-0.500
	(0.322)
Period 2 × ln_dist	0.053
	(0.077)
Period 3 × ln_dist	0.078
	(0.105)
Period 2 × geop_dist_l1	-0.126
	(0.081)
Period 3 × geop_dist_l1	0.070
	(0.101)
Period 1 × Strategic × ln_dist	0.105
	(0.119)
Period 2 × Strategic × ln_dist	0.210
	(0.145)
Period 3 × Strategic × ln_dist	0.225*
	(0.128)
Period 1 × Strategic × geop_dist_l1	-0.116
	(0.204)
Period 2 × Strategic × geop_dist_l1	-0.494

Continued on next page

Table 5.5 – continued from previous page

	TradeValue (000 USD)
	(0.324)
Period 3 × Strategic × geop_dist_l1	-0.430
	(0.274)
contig	0.016
	(0.200)
comlang_off	-1.025***
	(0.113)
colony	-0.984***
	(0.360)
ln_gdp	0.945***
	(0.071)
ln_tariff	0.134
	(0.112)
rta	-0.411
	(0.485)
Constant	-8.516***
	(2.203)
Product × Year FE	Yes
Partner FE	No
Observations	7,014,482
Pseudo R^2	0.734
Clusters (Partner)	183

Notes: PPML estimates. Standard errors clustered by partner country in parentheses. Dependent variable is trade value in thousands of USD. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Baseline specification without USA and China An additional robustness check re-estimates the full baseline specification excluding the United States and China, the two largest extra-EU trading partners for Italy. Both economies represent potential

outliers in the sample due to their massive economic weight and extensive geographic distance, coupled with high bilateral trade volumes.

This sensitivity check directly addresses the patterns observed in Figure 5.1, where the descriptive bubble chart revealed a non-linear relationship between trade and distance. Because the United States and China combine extreme geographic distance with massive GDP, they could mechanically distort the underlying gravity parameters. Therefore, this analysis evaluates whether the baseline results from Equation (3.3) are driven by the specific trade dynamics of these two dominant economies. Both partner and product-year fixed effects are maintained.

The empirical findings from Table 5.6 reveal that there is a substantial shift in the parameters once these two partners are excluded. For geographic distance, once the United States and China are removed, there is no evidence of any nearshoring patterns. Instead, the coefficients turn positive in both Period 1 ($\beta_{1,1} = 0.029$) and Period 2 ($\beta_{1,2} = 0.038$), but neither is statistically significant. Hence, it is possible to conclude that the absence of nearshoring in the baseline model is not simply driven by US and Chinese trade volumes.

Moreover, there is also a clear change in the results for geopolitical distance. In the full sample, this variable showed increasing significance over time, with the strongest effect in Period 3 ($p < 0.01$). Without the United States and China, this pattern changes completely: geopolitical distance is statistically significant only in Period 1 ($\beta_{2,1} = 0.224$, $p = 0.037$) and loses significance in Periods 2 and 3. Hence, it is possible to say that trade resilience with distant partners after 2022 comes mainly from these two countries, rather than being a general trend across all trade partners.

The most prominent result emerges from the interaction between geopolitical distance and strategic goods. In the baseline specification (Table 5.1, column 6), this interaction coefficient was -0.371 ($p = 0.076$). Excluding the United States and China causes this negative differential effect to nearly double in magnitude to -0.714 in Period 3, while its statistical precision improves from the 10% level to the 5% level ($p = 0.012$).

This finding demonstrates that the massive trade volumes of the United States and China partially dilute the evidence of geopolitical alignment in the full sample. Once they are removed, the friendshoring in strategic supply chains emerges with greater

clarity and magnitude in the most recent period. As in previous specifications, the controls for regional trade agreements and applied tariffs remain positive and statistically insignificant.

Table 5.6: Baseline regression analysis without USA and China

	Period 1 (2010-2017)	Period 2 (2018-2021)	Period 3 (2022-2025)
Geographic Distance			
ln_dist	0.029	0.038	—
	(0.061)	(0.036)	
Geopolitical Distance			
geop_dist_l1	0.224**	0.131	0.156
	(0.107)	(0.102)	(0.124)
Strategic × Geographic Distance			
strategic × ln_dist	0.005	0.146	0.255
	(0.155)	(0.177)	(0.173)
Strategic × Geopolitical Distance			
strategic × geop_dist_l1	−0.216	−0.581	−0.714**
	(0.263)	(0.373)	(0.285)
ln_tariff		0.171	
		(0.119)	
rta		0.133	
		(0.157)	
constant		9.357***	
		(0.337)	
Partner FE		Yes	
Product × Year FE		Yes	
Observations		7,000,670	
Clusters (Partner)		178	
Pseudo R^2		0.768	

Note: Robust standard errors clustered by partner in parentheses. Period 3 × ln(dist) omitted due to collinearity with partner fixed effects. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Conservative Definition of Intermediate Goods (BEC4INT > 0.5) The final robustness check evaluates the sensitivity of the baseline estimates to the classification threshold used for intermediate inputs. In the baseline model, a product was assigned to the intermediate goods category whenever its corresponding BEC intermediate share was strictly positive. Under this broad interpretation, both pure intermediate inputs and dual-use products were included. To confirm that the baseline findings do not rely

on this choice, a stricter check requires the intermediate share to strictly exceed 0.5 for a product to qualify as intermediate (`BEC4INT` > 0.5).

One practical clarification is needed regarding the data across nomenclatures. While the adopted dataset provides continuous intermediate shares for the 2012 and 2017 HS revisions, this information is not available for HS 2022. Because HS 2022 relies on the `BEC5EndUse` scheme, it reports only a discrete indicator rather than a continuous share. Consequently, for products classified under the HS2022 nomenclature, the 0.5 threshold cannot be applied, and goods can only be identified using the discrete classification. Because the HS2022 nomenclature covers the most recent years of the sample (Period 3), part of the estimation sample in this period retains the baseline classification criteria.

Table 5.7 reports the PPML estimates under this conservative intermediate definition. For geographic distance, the coefficients remain negative in Period 1 ($\beta_{1,1} = -0.067$) and Period 2 ($\beta_{1,2} = -0.010$), but neither reaches statistical significance. This confirms that geographic distance shows no measurable nearshoring effect on Italian intermediate imports.

In contrast, the role of geopolitical distance stays remarkably consistent. Under the conservative threshold, geopolitical distance remains positive across all periods and statistically significant in Period 1 ($\beta_{2,1} = 0.167$, $p = 0.078$) and Period 3 ($\beta_{2,3} = 0.241$, $p = 0.001$). Period 3 estimate ($\beta_{2,3} = 0.241$) is nearly identical to the baseline result ($\beta_{2,3} = 0.230$, $p = 0.002$) in terms of magnitude. This demonstrates that the aggregate resilience of trade with geopolitically distant partners is fully robust to a stricter product definition.

However, the interaction terms with strategic goods display notable fragility. In the baseline specification, both the geographic interaction ($\beta_{3,3} = 0.257$, $p = 0.080$) and the geopolitical interaction ($\beta_{4,3} = -0.371$, $p = 0.076$) were marginally significant at the 10% level in Period 3. Under the conservative definition, both interaction terms keep their expected signs but are no longer statistically significant. Specifically, the geographic interaction falls to $\beta_{3,3} = 0.188$ ($p = 0.119$), and the geopolitical interaction weakens to $\beta_{4,3} = -0.261$ ($p = 0.138$). Comparing these specifications highlights a clear difference in how stable the two estimates are. While the counterintuitive positive baseline effect of geopolitical distance is robust across product definitions, the evidence supporting

friendshoring in strategic supply chains is sensitive to classification thresholds.

Table 5.7: Conservative definition of intermediate goods (BEC4INT > 0.5)

Variable	**Period**	(1)
Geographic distance	Period 1	−0.067
		(0.076)
	Period 2	−0.010
		(0.046)
	Period 3	(*om.*)[a]
Geopolitical distance	Period 1	0.167*
		(0.095)
	Period 2	0.108
		(0.080)
	Period 3	0.241***
		(0.075)
Geographic distance × *Strategic*	Period 1	0.158
		(0.126)
	Period 2	0.203
		(0.128)
	Period 3	0.188
		(0.121)
Geopolitical distance × *Strategic*	Period 1	−0.163
		(0.181)
	Period 2	−0.188
		(0.201)
	Period 3	−0.261
		(0.176)
ln(1 + Tariff)		0.037
		(0.119)
RTA		−0.043
		(0.164)
Constant		9.622***
		(0.419)
Partner FE		Yes
Product × Year FE		Yes
Clustered SE (Partner)		Yes
Observations		6,617,421
Pseudo R^2		0.746

Notes: The dependent variable is Italian intermediate goods imports in levels (1000 USD). Robust standard errors clustered at the partner level in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
[a] Period 3 × ln(Geographic Distance) omitted due to collinearity with partner fixed effects.

5.2.3 Strategic vs. Non-Strategic Goods

This Subsection addresses the secondary layer of the research question by examining whether intermediate strategic goods exhibit a distinct sensitivity to distance compared to non-strategic goods. In the baseline gravity specification (Subsection 5.2.1, Table 5.1), the interaction terms between the distance regressors and the strategic goods dummy capture only the *differential* effect relative to the non-strategic baseline. Consequently, those coefficients do not directly reveal the overall magnitude of the distance elasticities for strategic goods.

To quantify these net impacts, further estimates were conducted to calculate the total effects across all three sub-periods[5]:

- Total effect of geographic distance: $\beta_1 + \beta_3$
- Total effect of geopolitical distance: $\beta_2 + \beta_4$

Table 5.8 reports the resulting point estimates, standard errors, p-values and implied semi-elasticities. The pattern differs between the two distance measures: geographic distance yields positive point estimates in all three periods, while geopolitical distance is positive in Period 1 but turns negative in Periods 2 and 3. Although the positive Period 1 estimates run counter to standard gravity predictions, none of these total effects can be interpreted as firm evidence, given their lack of statistical significance.

Table 5.8: Total effects on strategic goods

Regressor	Period	Total coeff.	SE	p-value	Semi-elasticity	Significant?
Geopolitical distance, total effect on strategic goods ($\beta_2 + \beta_4$)						
Period 1	2010–2017	0.093	0.250	0.709	+9.8%	No
Period 2	2018–2021	−0.244	0.292	0.404	−21.6%	No
Period 3	2022–2025	−0.141	0.188	0.454	−13.1%	No
Geographic distance, total effect on strategic goods ($\beta_1 + \beta_3$)						
Period 1	2010–2017	0.036	0.157	0.820	+3.6%	No
Period 2	2018–2021	0.234	0.172	0.175	+26.3%	No
Period 3[a]	2022–2025	0.257	0.147	0.080	+29.3%	Yes (10%)

Notes: Total effects are calculated from the baseline estimation in Table 5.1 following Farag and Zaki (2025). Semi-elasticities are computed as $(\exp(\beta) - 1) \times 100$.

[a] In Period 3, the standalone geographic distance term is absorbed by partner fixed effects, hence the reported estimate corresponds to the interaction term alone.

[5]These total effects in strategic goods were computed using Stata software via `lincom` command

Crucially, only one of the six total effects in Table 5.8 attains significance at conventional thresholds: geographic distance in Period 3 (+29.3%, $p = 0.080$), which is significant at the 10% level. This coincides, by construction, with the differential coefficient reported in column 6 of Table 5.1, since the partner fixed effect absorbs the baseline level of geographic distance in this period. All remaining total effects remain statistically indistinguishable from zero.

This absence of statistical significance stands in contrast to the baseline results for non-strategic goods reported in Table 5.1, where geopolitical distance had a statistically significant positive effect throughout. While non-strategic trade flows appear systematically responsive to geopolitical alignment, the strategic-goods sub-sample, roughly 5% of the estimation panel, yields noisier estimates.

5.2.4 Coefficient stability across the three periods

Lastly, a further analysis was conducted to study coefficient stability across the three sub-periods: 2010-2017 (Period 1), 2018-2021 (Period 2) and 2022-2025 (Period 3). The main motivation behind this step was to establish whether the apparent differences in magnitude observed in Table 5.1 are statistically meaningful or the result of sample variation.

To formally test for structural changes in the parameters, a series of post-estimation Wald tests was carried out, as reported in Table 5.9. Operationally, the Wald test[6] evaluates whether a linear combination of estimated parameters, in this case, the difference between coefficients of different periods, equals zero, utilizing the cluster-robust variance-covariance matrix from the original PPML estimation. Under the null hypothesis, the test statistic follows a χ^2 distribution with one degree of freedom ($\chi^2(1)$), which reflects a single linear constraint per test.

The tests are formulated as two-sided hypotheses comparing the same regressor

[6]Wald tests of coefficient equality are computed via the `test` command in Stata following the PPML estimation of Table 5.1.

across two distinct time windows:

$$H_0 : \beta_{k,t} = \beta_{k,t'}$$

$$H_1 : \beta_{k,t} \neq \beta_{k,t'}$$

For instance, the test evaluates whether the effect of geopolitical distance in Period 1 ($\beta_{2,1}$) is statistically equal to that in Period 2 ($\beta_{2,2}$).

Table 5.9: Wald tests of coefficient equality across periods

Regressor	Comparison	$\chi^2(1)$	p-value	Reject equality?
Geopolitical distance				
Period 1 vs. Period 2	$\beta_{2,1} = \beta_{2,2}$	0.82	0.364	No
Period 2 vs. Period 3	$\beta_{2,2} = \beta_{2,3}$	3.40	0.065	Yes, at 10%
Period 1 vs. Period 3	$\beta_{2,1} = \beta_{2,3}$	0.20	0.656	No
Geographic distance				
Period 1 vs. Period 2	$\beta_{1,1} = \beta_{1,2}$	3.17	0.075	Yes, at 10%

Notes: Comparing Period 1 and Period 3 for geographic distance is not possible, as the partner fixed effects absorb the Period 3 coefficient. For geopolitical distance, although the Period 3 estimate is the largest and most significant, the formal test against Period 1 does not reject equality. Therefore, the observed increase over the full sample period cannot be confirmed statistically as a monotonic rise.

At the 10% significance level (corresponding to a 90% confidence level), Table 5.9 shows that the null hypothesis of coefficient equality is rejected in two cases:

- **Geopolitical distance (Period 2 vs. Period 3):** $\chi^2(1) = 3.40$, $p = 0.065$. The shift between these two periods is statistically significant at the 10% level.
- **Geographic distance (Period 1 vs. Period 2):** $\chi^2(1) = 3.17$, $p = 0.075$. The difference across the first two periods is statistically significant at the 10% level.

An interesting result concerns the direct comparison between Period 1 and Period 3 for geopolitical distance. Even though $\beta_{2,3}$ is the regression's highest estimate, it is not statistically different from $\beta_{2,1}$, as shown by the Wald test ($\chi^2(1) = 0.20$, $p = 0.656$). Thus, the coefficient falls and rebounds rather than showing a steady rise over time. Because the Period 1 estimate remains close to the other two periods, we see an increase from Period 2 to Period 3, but no meaningful change across the whole sample.

Overall, the results show limited evidence toward either nearshoring or friendshoring. Indeed, geographic distance coefficients are not statistically significant across any specification or time period. Therefore, there is no evidence that Italian intermediate goods imports have become more geographically concentrated (SQ1).

In contrast, geopolitical distance shows a counterintuitive pattern from what the decoupling literature predicts. Indeed, the effect is positive and gains statistical significance over time. This indicates that Italy's trade with geopolitically distant partners has strengthened rather than weakened (SQ2). As a robustness check, the model assesses the role of the United States and China, which represent two peculiar trading partners due to their high geographic distance, high economic mass and large trade volumes. Once these two countries are ruled out from the regression, the positive geopolitical effect loses statistical significance in Periods 2 and 3.

The second layer of the analysis focused instead on strategic goods. In this case, results show that total effects remain statistically insignificant throughout the sample. The only exception is the interaction between geopolitical distance and strategic goods in Period 3, which is negative and marginally significant. This interaction strengthens once the United States and China are excluded. In conclusion, Italian intermediate goods sourcing shows strong persistence rather than structural decoupling, with only a sign of friendshoring in strategic goods after 2022.

Chapter 6

Conclusion

This last chapter contains the conclusions of the main findings of the descriptive and econometric analysis carried out in Chapter 5. It is structured as follows: Section 6.1 addresses the research questions presented in Subsection 2.3.2, while Section 6.2 illustrates the intrinsic limitations of the analysis, for the majority of which Section 6.3 presents avenues for future research to cope with them.

6.1 Reflections

The ultimate aim of this work is to analyze whether there is empirical evidence, for Italian intermediate goods, of two core phenomena at the center of the economic debate: de-globalization and trade decoupling. To achieve this goal, the analysis relies on specific research questions, discussed in detail in Subsection 2.3.2 and reported here for convenience. The main research question asks: *"To what extent has Italy's sourcing of intermediate goods undergone de-globalization and decoupling between 2010 and 2025?"*, which is further broken down to better investigate the phenomena into two sub-questions.

- SQ1: *"Has Italy's intermediate goods trade become more geographically concentrated among nearby partners, or does distance continue to play the same role in shaping import flows throughout the period?"*
- SQ2: *"Has Italy's intermediate goods trade become more concentrated among geopolitically aligned partners, or has geopolitical distance played a stable role in shaping import flows throughout the period?"*

Building on the empirical framework estimated across the three periods (2010-2017, 2018-2021, 2022-2025) the answer to the main research question is straight: trade reconfiguration has occurred only to a negligible extent, with no robust evidence of the expected dynamics. Indeed, the geographical distance estimators do have the expected negative sign, but they are not statistically distinguishable from zero, hence we cannot say there is evidence of nearshoring. Conversely, geopolitical distance does have statistical significance, but the sign is not as expected; indeed, it is positive, running against conventional gravity theory. Overall, it is possible to conclude that there is structural persistence, instead of a reconfiguration.

Diving into the detail of SQ1 and SQ2 provides further insights that motivate the answer given to the main research question.

For what concerns SQ1, the observed results go against the initial hypothesis. What has been observed is that instead of moving away from zero, which would indicate a stronger negative impact of distance and a shift toward regionalization, the estimated coefficients move closer to zero over time. Moreover, a formal test to compare Period 1 and Period 3 cannot be carried out, as the geographical distance effect is absorbed by partner fixed effects in Period 3. In the analysis, a formal test was conducted to compare Period 1 and Period 2, and it shows a statistically significant change ($p = 0.075$), but this does not imply evidence of nearshoring because the individual coefficients lack statistical significance. Therefore, for SQ1 there are two main conclusions: first, there is no empirical evidence of nearshoring, and second, a complete temporal comparison across all periods cannot be formally evaluated for geographical distance.

For what concerns SQ2, the econometric results show statistical significance over the three periods, but with a sign that is opposite to the one hypothesized. Indeed, the findings do not support the hypothesis that geopolitical alignment fosters bilateral trade; instead, they run directly counter to this idea. Moreover, a formal test was conducted to compare the coefficients across time. It does not reject the equality between Period 1 and Period 3, but it rejects equality between Period 2 and Period 3 ($p = 0.065$). This result shows that the coefficient does not follow a steady rise across the full sample; instead, it dips and then recovers. Therefore, there is no evidence of geopolitical decoupling, or better, the empirical findings suggest the exact opposite.

Finally, as a second layer of analysis, this work aims to address whether these patterns are more pronounced for strategic goods than for non-strategic ones. For geographical distance, the total effects on strategic goods remain statistically indistinguishable from zero in Period 1 ($\beta = 0.036$, SE $= 0.157$, $p = 0.820$, +3.6%) and Period 2 ($\beta = 0.234$, SE $= 0.172$, $p = 0.175$, +26.3%), but reach significance at the 10% level in Period 3 ($\beta = 0.257$, SE $= 0.147$, $p = 0.080$, +29.3%). This latter estimate coincides with the differential interaction coefficient itself, as the standalone geographical distance term is absorbed by the partner fixed effects Period 3. For geopolitical distance, total effects on strategic goods are not statistically significant in any period: Period 1 ($p = 0.709$, +9.8%), Period 2 ($p = 0.404$, −21.6%) and Period 3 ($p = 0.454$, −13.1%). However, the underlying differential coefficient between geopolitical distance and strategic goods becomes statistically significant at the 10% level in Period 3 ($\beta = -0.371$, $p = 0.076$). This differential result points to an early sign of friendshoring specific to strategic sectors in the most recent period, although the total effect itself is not statistically significant. Moreover, the effect strengthens once the United States and China are omitted from the sample. On the whole, strategic intermediate goods do not display a systematically stronger pattern of nearshoring or decoupling relative to non-strategic goods, with the Period 3 differential offering the sole, and still tentative, signal in that direction. This finding should be interpreted with caution given the limited statistical power, as this sub-sample accounts for only about 5% of the estimation panel.

6.2 Limitations

This study is subject to several limitations. First, regarding the temporal scope of the third period (P3: 2022-2025), data completeness and potential reporting delays pose a primary concern. Because 2024 and 2025 represent the most recent trade years, annual reporting and revision rounds in UN Comtrade may remain incomplete, potentially leading to measurement error. Furthermore, as detailed in Appendix B.1.2, missing tariff observations necessitated forward imputation of 2023 tariff levels to 2024 and 2025 within the World Bank (n.d.) dataset. These data constraints require caution when interpreting estimates for the most recent period.

Second, the empirical analysis shows a counterintuitive result: there is a positive coefficient on geopolitical distance, which is measured through the absolute differences in UN General Assembly ideal points. Standard economic priors predict a negative coefficient, whereby politically closer partners trade more intensively. Similar positive or unstable signs have been documented in recent gravity literature (Jones et al., 2026), suggesting that ideal point differences may act as an imperfect proxy for bilateral geopolitical alignment. Beyond the sign puzzle itself, endogeneity and reverse causality present substantial identification challenges: as noted by Bosone and Stamato (2024), bilateral trade volume itself may systematically influence alignment in UN voting, complicating causal interpretation.

Moreover, a limitation concerning strategic goods relates to their heterogeneity inside this category and the potential aggregation bias of the model. In the methodology used in this paper, there is no distinction between different types of strategic goods, as all of them collapse into a single binary dummy variable, *strategic*. However, as shown by Conteduca et al. (2024), there are no uniform patterns across strategic products. Indeed, a distinction is made by the authors between Advanced Technology Products (ATP) and critical goods for the energy transition to capture their different dynamics. In the same way, critical mineral commodities are disaggregated by Farag and Zaki (2025) based on their specific functional purposes. Therefore, there is a clear trade-off: a single dummy variable ensures tractability in the econometric model, but some divergent trends are probably obscured by this choice.

6.3 Future research

After having outlined the limitations of the analysis, the last section of this thesis identifies some future avenues to address them.

Firstly, the temporal scope of the third period can be easily adjusted by repeating the analysis in the upcoming years, once revised data become available and additional observations can be collected to further extend the panel. In this way, the issue related to tariff data should be easily solved with new data publications. Specifically, once actual tariff figures are released for the 2024–2025 period, re-estimating the baseline

specification will allow us to test whether the coefficient on ln(1 + tariff) changes substantially compared to the current statistically non-significant result.

While for what concerns the second limitation related to using the UN voting system as a proxy for geopolitical distance, other metrics can be used instead. Indeed, even though they do not measure the identical underlying phenomenon, if we wish to investigate the sensitivity of traded goods to geopolitical friction, alternative indicators could be employed instead, such as the Economic Freedom Index (EFI) and the Worldwide Governance Indicator (WGI), already discussed in Subsection 2.2.3, or the Political & Social Value Distance (PSVD) index (Jones et al., 2026).

Lastly, the remaining issue that should be tested is the reverse causality between geopolitical distance and trade, meaning that stronger bilateral ties in terms of trade could potentially induce more aligned voting patterns in the UN General Assembly, hence a shorter geopolitical distance (Bosone & Stamato, 2024). One avenue that could be undertaken is to compare the estimates based on aggregate trade with those estimates that exclude energy-related products, because Bosone and Stamato (2024) suggest that these latter commodities could represent a tool of political leverage between opposing countries. Moreover, Bosone and Stamato (2024) take into account terrorism incidents between countries as a proxy for the degree of political-system dissimilarity, considering that democratic countries experience a higher number of such incidents compared to authoritarian ones, which affects political alignment without directly driving trade flows. Testing this strategy would help address the endogeneity of the metric adopted, in line with the exogeneity found by Bosone and Stamato (2024) once energy-related trade is excluded.

Moreover, following Conteduca et al. (2024), it could be interesting to introduce a finer distinction within the strategic category itself, allowing differing trends, such as divergences between advanced technology products and critical raw materials, to be clearly captured.

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Appendix A

Appendix

A.1 Conversion Table for partner countries

Table A.1 provides the reference and the conversion for all the Partner countries included in the analysis.

Table A.1: Conversion table for partner countries

ISO3	Country Name	Code	ISO3	Country Name	Code
ABW	Aruba	533	KWT	Kuwait	414
AFG	Afghanistan	004	LAO	Lao PDR	418
AGO	Angola	024	LBN	Lebanon	422
AIA	Anguila	660	LBR	Liberia	430
ALB	Albania	008	LBY	Libya	434
AND	Andorra	020	LCA	St. Lucia	662
ANT	Netherlands Antilles	530	LKA	Sri Lanka	144
ARE	United Arab Emirates	784	LSO	Lesotho	426
ARG	Argentina	032	LTU	Lithuania	440
ARM	Armenia	051	LUX	Luxembourg	442
ASM	American Samoa	016	LVA	Latvia	428
ATG	Antigua and Barbuda	028	MAC	Macao	446
AUS	Australia	036	MAR	Morocco	504
AUT	Austria	040	MDA	Moldova	498
AZE	Azerbaijan	031	MDG	Madagascar	450
BDI	Burundi	108	MDV	Maldives	462
BEL	Belgium	056	MEX	Mexico	484

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Table A.1 – continued from previous page

ISO3	Country Name	Code	ISO3	Country Name	Code
BEN	Benin	204	MHL	Marshall Islands	584
BFA	Burkina Faso	854	MKD	Macedonia, FYR	807
BGD	Bangladesh	050	MLI	Mali	466
BGR	Bulgaria	100	MLT	Malta	470
BHR	Bahrain	048	MMR	Myanmar	104
BHS	Bahamas, The	044	MNG	Mongolia	496
BIH	Bosnia and Herzegovina	070	MNP	Northern Mariana Islands	580
BLM	Saint Barthélemy	652	MOZ	Mozambique	508
BLR	Belarus	112	MRT	Mauritania	478
BLZ	Belize	084	MSR	Montserrat	500
BMU	Bermuda	060	MUS	Mauritius	480
BOL	Bolivia	068	MWI	Malawi	454
BRA	Brazil	076	MYS	Malaysia	458
BRB	Barbados	052	NAM	Namibia	516
BRN	Brunei	096	NCL	New Caledonia	540
BTN	Bhutan	064	NER	Niger	562
BWA	Botswana	072	NGA	Nigeria	566
CAF	Central African Republic	140	NIC	Nicaragua	558
CAN	Canada	124	NIU	Niue	570
CCK	Cocos (Keeling) Islands	166	NLD	Netherlands	528
CHE	Switzerland	756	NOR	Norway	578
CHL	Chile	152	NPL	Nepal	524
CHN	China	156	NRU	Nauru	520
CIV	Cote d'Ivoire	384	NZL	New Zealand	554
CMR	Cameroon	120	OMN	Oman	512
COG	Congo, Rep.	178	PAK	Pakistan	586
COK	Cook Islands	184	PAN	Panama	591
COL	Colombia	170	PCN	Pitcairn	612
COM	Comoros	174	PER	Peru	604
CPV	Cape Verde	132	PHL	Philippines	608
CRI	Costa Rica	188	PLW	Palau	585

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Table A.1 – continued from previous page

ISO3	Country Name	Code	ISO3	Country Name	Code
CUB	Cuba	192	PNG	Papua New Guinea	598
CUW	Curaçao	531	POL	Poland	616
CXR	Christmas Island	162	PRK	Korea, Dem. Rep.	408
CYM	Cayman Islands	136	PRT	Portugal	620
CYP	Cyprus	196	PRY	Paraguay	600
CZE	Czech Republic	203	PSE	Palestina	275
DEU	Germany	276	PYF	French Polynesia	258
DJI	Djibouti	262	QAT	Qatar	634
DMA	Dominica	212	RUS	Russian Federation	643
DNK	Denmark	208	RWA	Rwanda	646
DOM	Dominican Republic	214	SAU	Saudi Arabia	682
DZA	Algeria	012	SDN	Sudan	729
ECU	Ecuador	218	SEN	Senegal	686
EGY	Egypt, Arab Rep.	818	SGP	Singapore	702
ERI	Eritrea	232	SHN	Saint Helena	654
ESP	Spain	724	SLB	Solomon Islands	090
EST	Estonia	233	SLE	Sierra Leone	694
ETH	Ethiopia (excludes Eritrea)	231	SLV	El Salvador	222
FIN	Finland	246	SMR	San Marino	674
FJI	Fiji	242	SOM	Somalia	706
FLK	Falkland Island	238	SPM	Saint Pierre and Miquelon	666
FRA	France	250	SSD	South Sudan	728
FRO	Faeroe Islands	234	STP	Sao Tome and Principe	678
FSM	Micronesia, Fed. Sts.	583	SUR	Suriname	740
GAB	Gabon	266	SVK	Slovak Republic	703
GBR	United Kingdom	826	SVN	Slovenia	705
GEO	Georgia	268	SWE	Sweden	752
GHA	Ghana	288	SWZ	Swaziland	748
GIB	Gibraltar	292	SYC	Seychelles	690
GIN	Guinea	324	SYR	Syrian Arab Republic	760

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Table A.1 – continued from previous page

ISO3	Country Name	Code	ISO3	Country Name	Code
GMB	Gambia, The	270	TCA	Turks and Caicos Isl.	796
GNB	Guinea-Bissau	624	TCD	Chad	148
GNQ	Equatorial Guinea	226	TGO	Togo	768
GRC	Greece	300	THA	Thailand	764
GRD	Grenada	308	TJK	Tajikistan	762
GRL	Greenland	304	TKL	Tokelau	772
GTM	Guatemala	320	TKM	Turkmenistan	795
GUM	Guam	316	TON	Tonga	776
GUY	Guyana	328	TTO	Trinidad and Tobago	780
HKG	Hong Kong, China	344	TUN	Tunisia	788
HND	Honduras	340	TUR	Turkey	792
HRV	Croatia	191	TUV	Tuvalu	798
HTI	Haiti	332	TWN	Taiwan	158
HUN	Hungary	348	TZA	Tanzania	834
IDN	Indonesia	360	UGA	Uganda	800
IND	India	356	UKR	Ukraine	804
IRL	Ireland	372	URY	Uruguay	858
IRN	Iran, Islamic Rep.	364	USA	United States	840
IRQ	Iraq	368	UZB	Uzbekistan	860
ISL	Iceland	352	VAT	Holy See	336
ISR	Israel	376	VCT	St. Vincent and the Grenadines	670
JAM	Jamaica	388	VEN	Venezuela	862
JOR	Jordan	400	VGB	British Virgin Islands	092
JPN	Japan	392	VNM	Vietnam	704
KAZ	Kazakhstan	398	VUT	Vanuatu	548
KEN	Kenya	404	WLF	Wallis and Futura Isl.	876
KGZ	Kyrgyz Republic	417	WSM	Samoa	882
KHM	Cambodia	116	YEM	Yemen, Rep.	887
KIR	Kiribati	296	ZAF	South Africa	710
KNA	St. Kitts and Nevis	659	ZMB	Zambia	894
KOR	Korea, Rep.	410	ZWE	Zimbabwe	716

Appendix B

Appendix

B.1 In-depth description of data gathering

B.1.1 Detailed description of derived variables

This part of the Appendix describes how the derived variables were constructed from the raw data presented in Section 4.1.

Applied Tariff (`Tariff`). For the purposes of the study, and in accordance with the dataset structure, the tariff information inserted into the panel had to be at the 6-digit level. According to World Bank (n.d.), TRAINS information on tariffs for imported goods was only available at the European Union level. As illustrated in Table 4.2, three raw tariff variables were retrieved, `ahs`, `mfn`, and `preferential`, from two separate datasets. The first two came from the dataset on observed trade value with attached TRAINS tariffs, while the latter came from a separate dataset, available on the same website, covering tariffs on both observed and unobserved trade value. These two tariff panels were later merged to create a full list of Partner–Product Code–Year–ahs–mfn–preferential observations. From this panel, the `tariff` variable was constructed as the minimum of preferential, mfn, and ahs.

Working with the two tariff panels was not entirely straightforward, as some inconsistencies emerged. In particular, in the dataset containing mfn and ahs, the year 2016 was missing, while the year 2014 contained twice as many observations as the other years. A specific data cleaning procedure was necessary for the period 2014-2016 due to two main issues: duplicate TariffYear entries in 2014 and missing values in 2016. In the dataset, original tariff figures were directly maintained for 2014 and 2015. However, in the

presence of duplicate records for the same partner-HS6-year combination, preference was given only to the TariffYear closest to the actual trade year. Moreover, an imputation was applied to the year 2016, where data was completely absent. The 2015 tariff was selected for this purpose, while the 2017 value was used whenever the 2015 observation was also not available.

A different issue emerged with EU trading partners, since the original WITS extraction provided no tariff information for these countries. To fix this gap, a zero tariff was assigned to all EU partners, in accordance with the duty-free regime of intra-EU trade. Over the 2010-2025 timeframe, this rule involved two special cases due to changes in EU membership. In the case of Croatia, which entered the EU in 2013, zero tariffs were applied across the entire panel period, because pre-accession tariff data was also missing in the raw extraction; hence, no separate pre-accession series was constructed. For the United Kingdom, instead, the status was split: zero tariffs were assigned up to 2021 as an EU member, whereas its actual non-EU tariffs were retained from 2022 onward following Brexit.

Furthermore, the complete lack of tariff data in 2024 and 2025 represented another obstacle, as these observations would otherwise be lost in the Stata estimations. To preserve these data points in the panel, a forward-filling method was implemented. As a result, the tariff rates recorded in 2023 were directly extended to both 2024 and 2025.

Lastly, another attempt was carried out to cope with missing tariff values and potential drop of observations during the econometric analysis, i.e., a forward fill and backward fill from the nearest available year at the product-partner level.

Geopolitical distance (`geop_dist_fp_l1`). Two main steps were followed to build this variable. In the first step, Italy was separated from the general ideal-points dataset. After that, these Italian values were merged back with each partner country by year. In this way, every partner-year pair contains both the score of the partner and the score of Italy in that specific year. In the second step, the geopolitical distance was calculated directly as the absolute difference between the two ideal points. Furthermore, a one-year lag was applied to this measure. This choice was necessary because economic agents did not have access to current-year information when they made their trade

decisions. Finally, all observations without a lagged value were dropped from the panel, which happened either for the first year of the sample or when ideal-point data was missing.

Alignment status (`align_status`). To make this measure easier to interpret, the lagged geopolitical distance was organized into ordered categories. First of all, the entire panel was split into six multi-year periods. This choice was made to balance the total number of observations across the time window, in line with the approach used by Bosone and Stamato (2024). Inside each period, the lagged log geopolitical distance was computed as an average value for every partner country. After this step, partner countries were sorted into terciles on the basis of this average distance. This ranking was carried out separately within each period. In this way, the classification remained relative to the actual distribution of Italian trade partners in that specific timeframe.

Countries in the bottom tercile (smallest geopolitical distance from Italy) are classified as *Aligned*, those in the middle tercile as *Neutral*, and those in the top tercile (largest geopolitical distance) as *Not aligned*.

B.1.2 Missing data manipulation

Missing data was a major challenge for the ideal-points variable used to measure geopolitical distance. Two distinct cases emerged.

In some instances, a country lacked the entire data series due to non-participation in United Nations General Assembly votes. Taiwan represents the main example here because of its non-member status at the UN. No imputation was possible without any baseline observations.

In other instances, data existed but appeared under an obsolete state label. For example, observations for Serbia were listed as missing across the sample period. However, corresponding voting records were preserved under the designation Yugoslavia. Because this entry represented an outdated country tag rather than missing information, the Yugoslavia series was assigned to Serbia to retain the data[1].

[1]Serbia is the only country treated this way, i.e., approximated by the Yugoslavia series, because in the original database retrieved from Voeten (2009) it is the only country among the former Yugoslav counties not treated as an independent state.

Further data manipulation was required for the geographic variables to address missing values not originally present in the DIST CEPII dataset (Mayer & Zignago, 2011). First, several ISO3 codes were outdated and needed correction: for instance, PSE was recorded as PAL for Palestine, and ROU as ROM for Romania. Second, a number of observations were entirely missing from the dataset and were imputed manually to avoid losing potentially informative dyads. This is the case, for example, of Serbia and Montenegro, which appeared in CEPII only as the former joint entity Yugoslavia. For these imputed countries, the distance from Italy was computed using the distance between Rome and the respective capital cities. Regarding the dummy variables (contiguity, common language, colonial ties), these were set to 0 by default for all imputed observations, with limited exceptions where linguistic ties are evident.

B.1.3 Data Harmonization

During the observation period, the product code nomenclature was revised three times, in line with the five-year update cycle of the Harmonized System (HS), maintained by the World Customs Organization. Three HS versions therefore appear across the panel: HS2012, HS2017, and HS2022.

For the trade and tariff data, no reconciliation across HS versions was performed: each observation retains the product code and nomenclature version in use in the year it was extracted, since trade and tariff values are inherently tied to the classification in force at the time of reporting.

The classification of intermediate goods required a separate strategy. This approach relies on the UN Broad Economic Categories (BEC) concordance files, which correspond to specific Harmonized System revisions (HS2012, HS2017, and HS2022). For further details, see Table B.1.

Instead of converting all panel codes to a single system, the three concordance files were handled separately. It was generated a dedicated intermediate goods list for each revision, which was then mapped to the relevant sample years. The period from 2010 to 2016 is covered by the HS2012 list, the HS2017 list applies to the years between 2017 and 2021 and the period from 2022 to 2025 is covered by the HS2022 list.

Although the HS2007 revision was active in 2010 and 2011, it was not possible to find

an official intermediate goods concordance for this classification. However, consecutive HS revisions modify only a small share of product lines; therefore, the analysis uses the HS2012 list as a practical substitute for these first two years.

Table B.1: Illustration of the BEC concordance procedure for intermediate goods identification (HS 2017 revision)

HS6	Description	End Use	CAP	CONS	INT
010121	Horses; live, pure-bred breeding animals	CAP	1.00	0.00	0.00
010129	Horses; live, other than pure-bred breeding animals	INT	0.00	0.00	1.00
010221	Cattle; live, pure-bred breeding animals	CAP	1.00	0.00	0.00
010229	Cattle; live, other than pure-bred breeding animals	INT	0.00	0.00	1.00
010239	Buffalo; live, other than pure-bred breeding animals	INT	0.00	0.00	1.00
010310	Swine; live, pure-bred breeding animals	CAP	1.00	0.00	0.00
010391	Swine; live, other than pure-bred breeding animals, weighing less than 50kg	INT	0.00	0.00	1.00
010410	Sheep; live	INT	0.00	0.00	1.00

Note: A product is classified as intermediate (INT = 1) if BEC4INT > 0. Only a subset of ten HS6 codes is shown for illustrative purposes.

B.2 Full panel snapshot

Table B.2 presents a sample snapshot of the full panel used in the regression analysis that results from the merge of the geographical and geopolitical data, the trade and tariff dataset. This sample presents Italian imports from the Netherlands for several product categories. This country was chosen here purely for illustrative purposes, as this dyad-year combination provides a compact and representative example of the panel's structure. It should be noted that the Reporter variable is omitted as all the data refer to Italy as Reporter country.

Table B.2: Extract from the regression panel – partner: The Netherlands

Partner	Product code	Year	Trade value (000 USD)	Tariff	Strategic	RTA	Contig	Comlang	Colony	Dist (km)	GDP (bn, const. 2015 USD)	GDP per capita (const. 2015 USD)	Geop_dist_l1	ln(tariff)	ln(dist)	Period	Align_status
NLD	854442	2015	22068.44	0.00	0	1	0	0	0	1297.69	775.7	45794	0.0950	0.00	7.1683	1	Aligned
NLD	854442	2016	23116.86	0.00	0	1	0	0	0	1297.69	794.5	46655	0.1304	0.00	7.1683	1	Aligned
NLD	854442	2017	22568.74	0.00	0	1	0	0	0	1297.69	816.7	47670	0.0896	0.00	7.1683	1	Aligned
NLD	854442	2018	31636.13	0.00	0	1	0	0	0	1297.69	835.1	48463	0.0054	0.00	7.1683	2	Aligned
NLD	854442	2019	24630.20	0.00	0	1	0	0	0	1297.69	854.3	49254	0.0142	0.00	7.1683	2	Aligned
NLD	854442	2020	25083.24	0.00	0	1	0	0	0	1297.69	821.3	47087	0.0125	0.00	7.1683	2	Aligned
NLD	854442	2021	37772.81	0.00	0	1	0	0	0	1297.69	872.8	49781	0.2428	0.00	7.1683	2	Aligned
NLD	854442	2022	39132.24	0.00	0	1	0	0	0	1297.69	916.5	51778	0.0230	0.00	7.1683	3	Aligned
NLD	854442	2023	59473.71	0.00	0	1	0	0	0	1297.69	911.0	50961	0.0335	0.00	7.1683	3	Aligned
NLD	854442	2024	36883.67	0.00	0	1	0	0	0	1297.69	920.8	51175	0.1232	0.00	7.1683	3	Aligned
NLD	854442	2025	62089.94	0.00	0	1	0	0	0	1297.69	937.2	51817	0.1143	0.00	7.1683	3	Aligned
NLD	854449	2010	14896.26	0.00	0	1	0	0	0	1297.69	742.0	44659	0.0689	0.00	7.1683	1	Aligned
NLD	854449	2011	14985.41	0.00	0	1	0	0	0	1297.69	755.2	45240	0.1555	0.00	7.1683	1	Aligned
NLD	854449	2012	13136.74	0.00	0	1	0	0	0	1297.69	747.8	44632	0.1237	0.00	7.1683	1	Aligned
NLD	854449	2013	12083.29	0.00	0	1	0	0	0	1297.69	747.6	44487	0.0968	0.00	7.1683	1	Aligned
NLD	854449	2014	11498.86	0.00	0	1	0	0	0	1297.69	759.6	45042	0.0357	0.00	7.1683	1	Aligned
NLD	854449	2015	11423.37	0.00	0	1	0	0	0	1297.69	775.7	45794	0.0950	0.00	7.1683	1	Aligned
NLD	854449	2016	10214.26	0.00	0	1	0	0	0	1297.69	794.5	46655	0.1304	0.00	7.1683	1	Aligned
NLD	854449	2017	13048.55	0.00	0	1	0	0	0	1297.69	816.7	47670	0.0896	0.00	7.1683	1	Aligned
NLD	854449	2018	15406.78	0.00	0	1	0	0	0	1297.69	835.1	48463	0.0054	0.00	7.1683	2	Aligned
NLD	854449	2019	12900.99	0.00	0	1	0	0	0	1297.69	854.3	49254	0.0142	0.00	7.1683	2	Aligned
NLD	854449	2020	14620.73	0.00	0	1	0	0	0	1297.69	821.3	47087	0.0125	0.00	7.1683	2	Aligned
NLD	854449	2021	17889.04	0.00	0	1	0	0	0	1297.69	872.8	49781	0.2428	0.00	7.1683	2	Aligned
NLD	854449	2022	23271.57	0.00	0	1	0	0	0	1297.69	916.5	51778	0.0230	0.00	7.1683	3	Aligned
NLD	854449	2023	21816.03	0.00	0	1	0	0	0	1297.69	911.0	50961	0.0335	0.00	7.1683	3	Aligned
NLD	854449	2024	13834.99	0.00	0	1	0	0	0	1297.69	920.8	51175	0.1232	0.00	7.1683	3	Aligned
NLD	854449	2025	14520.23	0.00	0	1	0	0	0	1297.69	937.2	51817	0.1143	0.00	7.1683	3	Aligned