Italy’s Stable Export Advantage Map (2013–2024)

From symmetric RCA (RSCA) to partner absorption, value impact, and market typologies

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About me

I am a Data Science Master's student with a strong professional background in economic data analysis and applied research, combining technical expertise with strategic insight. Prior to entering academia, I spent over five years at the Tehran Chamber of Commerce, where I worked as an Economic Data Analyst, contributing to performance reporting, business environment assessments, survey design, and data-driven advisory services for enterprises and senior decision-makers.

In this role, I led analytical workflows involving data collection, indicator development, quantitative reporting, and visualization, translating complex economic signals into actionable intelligence for policy and business strategy. This experience shaped my ability to approach data not merely as numbers, but as a decision-making asset embedded in real organizational and societal contexts.
Academically, my focus spans data analytics, SQL-based data management, exploratory data analysis, visualization, and Python-driven pipelines (Pandas, NumPy, Matplotlib), with growing engagement in applied machine learning. I emphasize structured problem solving, reproducibility, and clear communication of insights through professional reporting and visual storytelling.

What distinguishes my profile is a multidisciplinary mindset that bridges data engineering, economic reasoning, and practical implementation. I bring strong analytical rigor, attention to detail, and a systems-level perspective to every project, aiming to design solutions that are technically robust, context-aware, and impact-oriented.

Ambition
My ambition is to build an international career in data analytics and applied data science, working on meaningful projects at the intersection of technology, economics, and social systems. I aspire to contribute to organizations that leverage data to inform strategy, improve performance, and drive sustainable innovation.

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Research questions

This study links Italy's product-level competitiveness to its realised export footprint across key destination markets. The analysis is structured around five research questions:

Primary Research Question:

How strong and stable are Italy's revealed comparative advantages in international trade between 2013 and 2024, and how consistently are these advantages reflected across its main European Union export partners?

Secondary Questions:

- Which HS6 product categories represent stable revealed comparative advantages for Italy over time?
- How widely are these stable advantage products exported across Italy's main EU trade partners (Germany, France, Spain, Switzerland, Poland, Belgium, Netherlands, Austria, Romania, and the Czech Republic)?
- To what extent do stable comparative advantage products account for Italy's total export value to each partner country?
- How does partner coverage change when exports are weighted by the intensity of comparative advantage (RSCA) rather than simple product counts?

About data

Dataset: TradeMap – International Trade Statistics (https://www.trademap.org/Index.aspx)

This analysis is based on official international trade data obtained from TradeMap, an online database maintained by the International Trade Centre (ITC). TradeMap is widely used by researchers, policymakers, and international organizations to analyze global trade flows, export structures, and country-level specialization patterns.

The dataset used in this project focuses on Italy's exports at the HS 6-digit product level over the period 2013 to 2024. Each HS6 code represents a narrowly defined product category, which allows the analysis to go beyond broad sectors and examine trade performance at a detailed product level. This level of granularity is essential for identifying where a country's true competitive strengths lie.

For each product and year, Italy's export values are combined with corresponding world export totals from TradeMap. This makes it possible to compute the Revealed Comparative Advantage (RCA) index, which measures whether a product is more important in Italy's export basket than it is in global trade overall. To improve interpretability and comparability, the analysis uses the Revealed Symmetric Comparative Advantage (RSCA), a normalized version of RCA that ranges between −1 and +1.

In addition to global exports, the dataset includes bilateral export flows from Italy to its main European Union partners, namely Germany, France, Spain, Switzerland, Poland, Belgium, the Netherlands, Austria, Romania, and the Czech Republic. This enables the study to assess not only whether Italy has a comparative advantage in specific products, but also how consistently those advantages are reflected across its key export destinations.

Because TradeMap applies standardized product classifications and consistent valuation methods across countries and over time, the data allow for reliable comparisons across years and trading partners. This makes the dataset particularly suitable for analyzing the stability of comparative advantage, the geographical diffusion of competitive products, and the structural patterns underlying Italy's export performance within the European market.

Methodology

Code & Full Notebook: (https://github.com/mhsrjb73/italy-stable-rsca-analysis)

Tools
The analysis was conducted using Python as the main analytical environment. Data handling and transformations were performed using the pandas library, while all charts and graphical outputs were generated using matplotlib. This toolset allowed for a transparent, reproducible, and fully controlled analytical workflow.

Data Preparation Process
Italy's export data at the HS 6-digit level for the period 2013–2024 were extracted from TradeMap and combined with corresponding world export data. These data were used to compute the Revealed Comparative Advantage (RCA) index for each product and year, which was then transformed into the Revealed Symmetric Comparative Advantage (RSCA) index. Products were classified as stable if they exhibited positive RSCA values in at least three different years, and an average RSCA was calculated for each stable product.

Vis**ualization Pipeline**
The results of the analysis were summarized through a structured set of visualizations. These include comparisons between total and stable export baskets, partner-level coverage indicators, value-based measures, and RSCA-weighted metrics. The visual outputs were designed to clearly support interpretation, comparison across partners, and the identification of structural export patterns.

Design Choices: Palette & Typography

Color Palette

• A neutral and restrained color palette was deliberately chosen to keep the focus on **analytical results** rather than decorative elements.

• Consistent colors are used across charts to represent the same partner countries and indicators, allowing viewers to easily follow comparisons across figures.

• High-contrast color combinations were applied to improve readability, especially in bar charts, scatter plots, and comparative partner-level visualizations.

Typography

• A clean, sans-serif font was selected to ensure clarity and legibility across all slides and visual elements.

• Font sizes and weights were kept consistent to establish a clear visual hierarchy between titles, labels, and analytical annotations.

• The typography choices prioritize analytical clarity and interpretability over stylistic complexity.

Design Goal

• Support a clear, audience-oriented analytical narrative, enabling viewers to quickly understand **patterns in comparative advantage, partner coverage, and export structure** without visual distraction.

Insights from the data

- The analysis shows that Italy’s export structure contains a core set of products with persistent comparative advantage over the period 2013–2024. These products consistently exhibit positive RSCA values across multiple years, indicating that Italy’s specialization is not driven by short-term fluctuations but by structural strengths embedded in its production and export system.

- When these stable products are examined across Italy’s main European Union trading partners, a clear pattern emerges: not all comparative advantages are equally widespread geographically. While some stable products are exported to almost all partner countries, others are concentrated in a smaller number of markets. This suggests that comparative advantage alone does not guarantee broad market penetration, and that partner-specific demand and market structure also play an important role.

- A further distinction appears when exports are evaluated in value terms. In several partner countries, stable products account for a substantial share of Italy’s total export value, even when the number of exported products is relatively limited. This indicates that a smaller set of highly competitive products can generate a disproportionately large economic impact, highlighting the importance of export quality and specialization intensity, not just product variety.

Stable advantage core vs total HS6

- This figure establishes the analytical backbone of the study by separating Italy's **total exported HS6 universe** from the smaller subset that qualifies as the **stable advantage core**. The stability criterion is intentionally strict: it filters out products whose apparent competitiveness is driven by short-lived demand shocks, temporary price effects, or one-off trade events, rather than persistent structural strength.
- The size difference is substantial. The total HS6 set is **roughly 2.5 to 3 times larger** than the stable HS6 core. In practical terms, this means that **only about one out of every three exported HS6 products** exhibits a consistently stable comparative advantage over time, while the remainder reflects more volatile or opportunistic export activity.

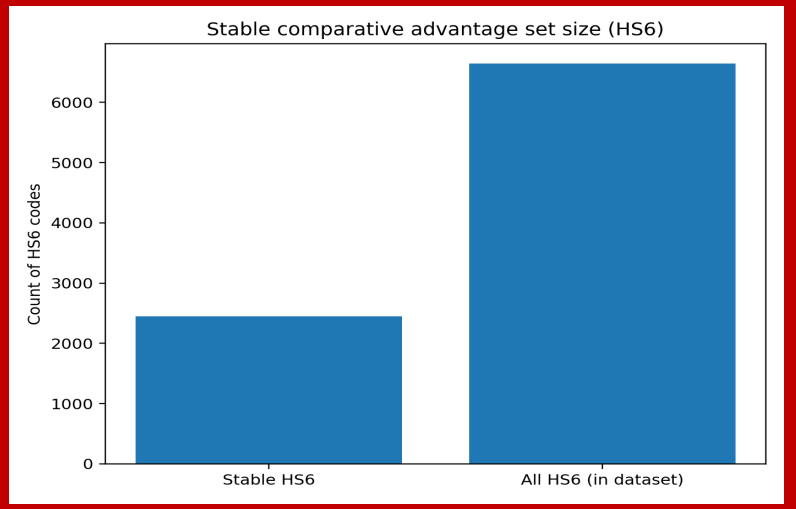


Figure 1

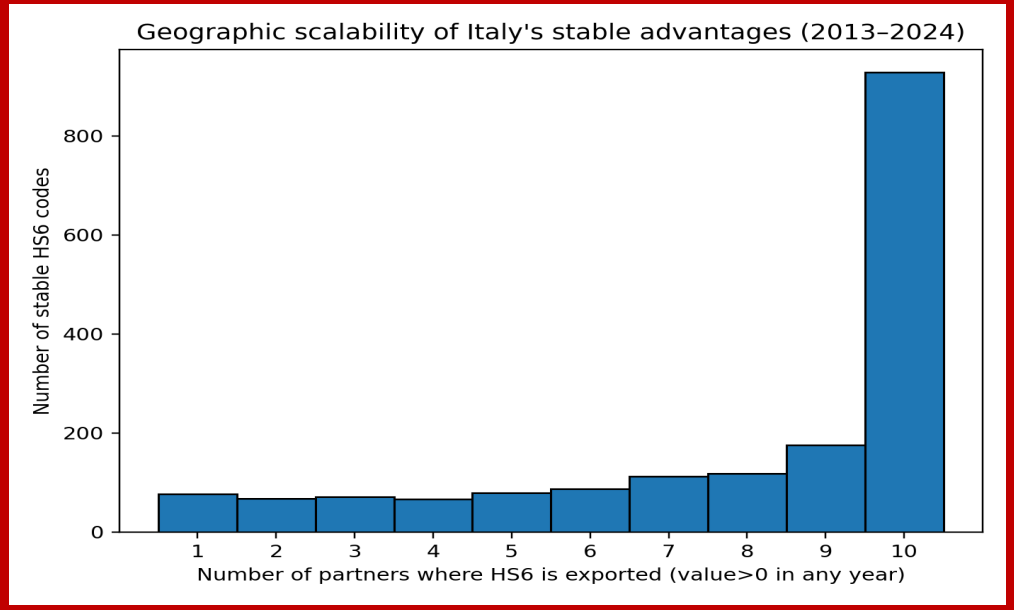
"Stable advantage core vs total HS6 (2013–2024)"
based on product-level export data (HS6) from **Trade Map**, covering Italy's exports over 2013–2024.
Stable products are identified using **Symmetric Revealed Comparative Advantage (RSCA)** computed from Italy vs World exports.
Source: **Trade Map (International Trade Centre — ITC)**.

KEY INSIGHT — Stability filtering shifts the story from "what Italy exports" to "what Italy exports with persistent competitiveness."

Figure 2

How widely stable advantages reach partner markets

- This figure examines how Italy's **stable comparative advantage products (HS6)** are distributed across trading partners, focusing on whether these products are absorbed by a narrow or broad set of markets. Each bar represents the number of stable HS6 products exported with positive values to a given number of partner countries.
- The distribution reveals a clear **concentration pattern**: while Italy possesses a sizable core of stable HS6 products, only a subset of them is exported consistently to many partners. A large share of stable products appears in **two to four markets**, indicating that many competitive strengths remain **partner-specific rather than globally diffused**. This suggests that stable competitiveness does not automatically translate into universal market penetration.
- At the upper end of the distribution, fewer HS6 products achieve **wide partner coverage**, being exported consistently across most or all partners. These products represent Italy's **most internationally transferable strengths**, combining technological capability, quality, and adaptability to diverse market requirements.
- **Overall, the figure highlights a dual structure: a broad stable core with uneven international reach, and a smaller elite group of products with genuinely global absorption.**



"Distribution of Stable HS6 Products Across Trading Partners (2013–2024)" based on Italy's stable comparative advantage products (HS6) identified through RSCA > 0 persistence over the period 2013–2024.
The figure shows how many partner countries import each stable HS6 product with positive export values, capturing the breadth of market absorption.
Source: Trade Map (International Trade Centre — ITC), author's calculations.

Most of Italy's stable export advantages are concentrated in a limited number of partner markets, while only a smaller subset achieves broad international diffusion.

The common export core by partner thresholds

- This figure aggregates the information from Figure 2a by applying **coverage thresholds**, showing how many stable HS6 products are exported to at least **3 partners**, **5 partners**, or **all partner countries**. The thresholds provide a clearer structural view of how widely Italy's persistent export strengths are shared across markets.
- The results indicate a **progressive filtering effect**. A substantial number of stable HS6 products reach at least three partners, suggesting that Italy's competitive base is not purely bilateral. However, as the threshold increases to five partners and then to full coverage, the number of qualifying products declines sharply. This drop highlights the increasing difficulty of sustaining competitiveness across multiple heterogeneous markets simultaneously.
- Products that meet the **"all partners"** threshold represent Italy's most robust export capabilities. These goods are not only stable over time but also resilient across different regulatory environments, demand structures, and competitive landscapes. In contrast, products failing to pass higher thresholds may still be competitive but rely on **specific trade relationships, geographic proximity, or specialized demand niches**.

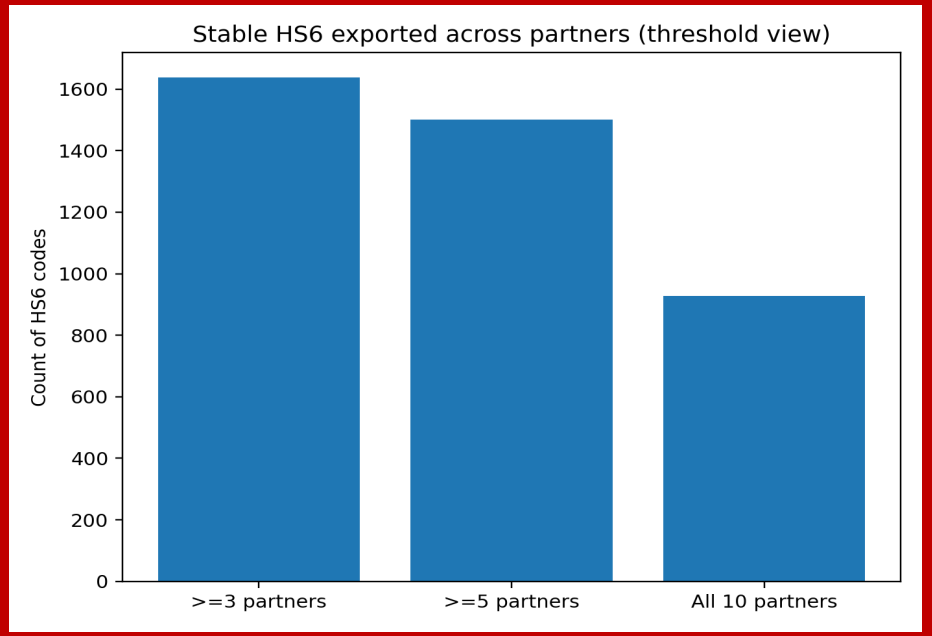


Figure 2b

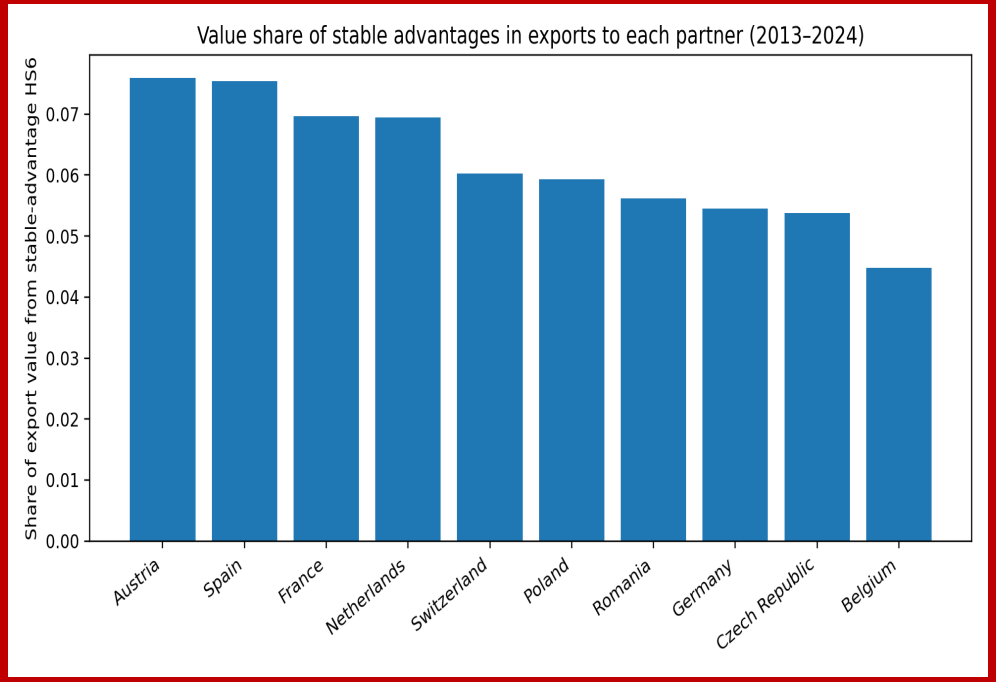
"Partner Coverage Thresholds of Stable HS6 Products (≥3, ≥5, All Partners)" based on Italy's stable comparative advantage product set (HS6), classified by the number of partner countries with consistent positive export flows. Thresholds illustrate the degree of international diffusion of Italy's persistent export strengths, distinguishing niche products from broadly absorbed ones. Source: Trade Map (International Trade Centre — ITC), author's calculations.

Broad partner coverage is achieved by only a limited subset of stable HS6 products, indicating that true international scalability of competitive advantage is rare and highly selective.

Figure 3

Value share of the stable advantage core by partner

- Figure 3 shows the share of Italy's stable comparative advantage products (HS6) in total export value across partner countries over 2013–2024. **Austria and Spain** exhibit the **highest value shares**, indicating that stable products play a relatively stronger role in Italy's export structure to these markets.
- In contrast, **Belgium and the Czech Republic** display the **lowest shares**, suggesting that although stable HS6 products are present, a larger portion of export value is driven by more volatile or market-specific goods. Major partners such as **Germany and France** fall in between, reflecting a diversified trade structure where stable advantages coexist with a broad set of dynamic exports.
- Overall, the figure highlights clear cross-country differences in how Italy's long-term competitive strengths translate into export value.



"Partner Coverage of Stable HS6 Products by Threshold Level (2013–2024)" based on Italy's stable comparative advantage product set (HS6), classified according to the number of partner countries with consistent positive export values over the period. The threshold levels capture the degree of international diffusion of Italy's persistent export strengths, distinguishing narrowly specialized products from those broadly absorbed across multiple markets.
Source: Trade Map (International Trade Centre — ITC), author's calculations.

Stable comparative advantage products contribute unevenly to export value across partners, with higher concentration in Austria and Spain and weaker value dependence in Belgium and the Czech Republic.

RSCA-weighted absorption ofItaly’s strongest advantages

- This figure reveals clear differentiation across partner countries once product quality and competitive intensity are taken into account. France and Germany exhibit the highest weighted RSCA coverage, indicating that they absorb a large share of Italy’s *strongest* and most competitive export products, not merely a wide variety of goods. This suggests deep structural integration with Italy’s core export specializations.
- In contrast, partners such as Belgium, the Netherlands, and the Czech Republic display lower weighted coverage despite similar unweighted product counts in earlier figures. This gap indicates that their imports are more concentrated in products where Italy’s comparative advantage is weaker, pointing to shallower or more opportunistic trade relationships rather than absorption of Italy’s enduring export strengths.

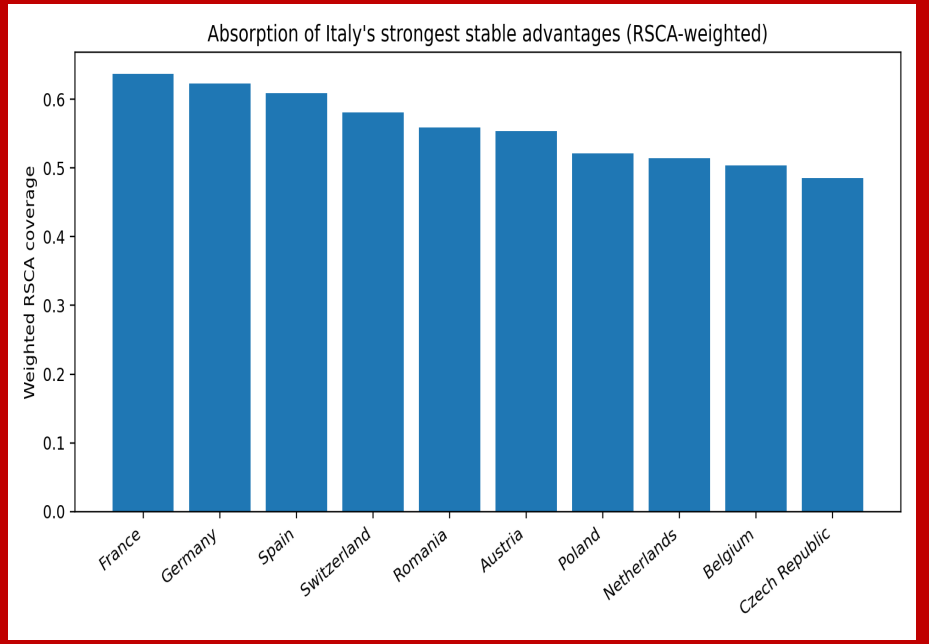


Figure 4

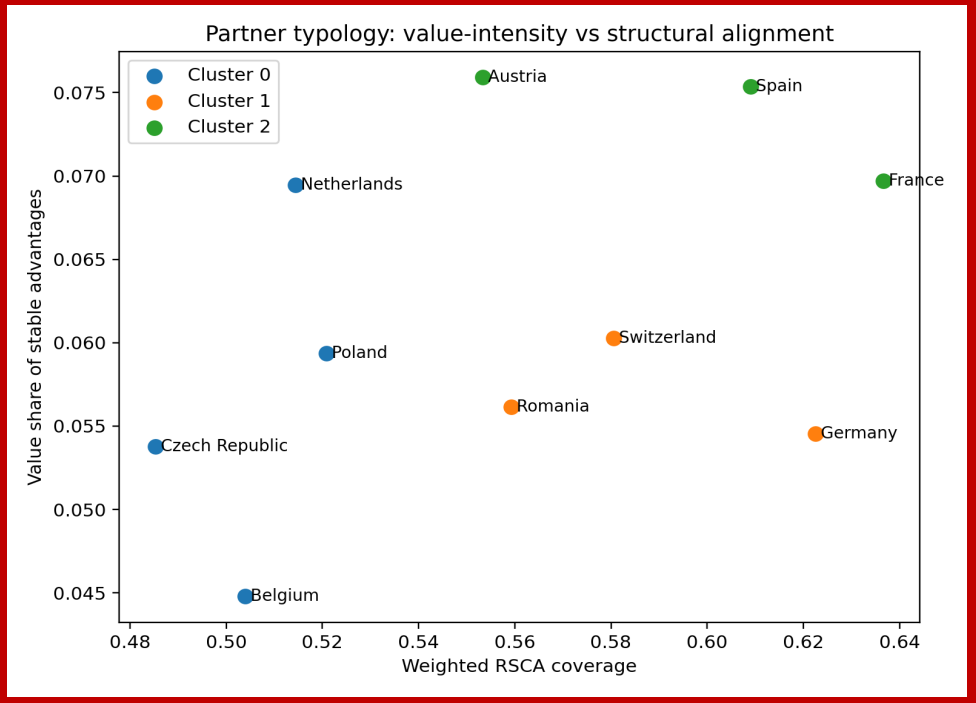
“Weighted RSCA Coverage of Stable HS6 Products by Partner (2013–2024)”
based on Italy’s stable comparative advantage product set (HS6), weighted by the average RSCA intensity of each product.
This figure captures not only how many stable products are exported to each partner, but also the *economic strength* of those products, giving greater weight to sectors where Italy’s comparative advantage is structurally stronger.
Source: Trade Map (International Trade Centre — ITC), author’s calculations.

KEY INSIGHT — When export strength is weighted by comparative advantage, only a few partners remain truly strategic—revealing that Italy’s competitive core is deep, but not widely absorbed.

Partner typology: value depth vs structural alignment

Figure 5

- Figure 5 synthesizes the entire analysis by jointly considering **how much value** stable products generate and **how strong** Italy's comparative advantage is in those products. The clustering reveals three clearly differentiated groups of partner countries.
- France, Spain, and Austria form a high-alignment cluster, characterized by both **higher value shares** and **strong weighted RSCA coverage**, indicating deep absorption of Italy's core competitive sectors. Germany and Switzerland occupy an intermediate position, reflecting diversified trade structures where stable advantages coexist with a broad range of dynamic exports. In contrast, partners such as Belgium, the Netherlands, and the Czech Republic cluster at lower levels of weighted coverage, suggesting that Italy's stable strengths play a more limited strategic role in these markets.
- Overall, the figure shows that Italy's long-term export competitiveness is **not evenly embedded across partners**, but concentrated in a subset of markets with stronger structural alignment.



"Clustering of Partner Countries by Structural Trade Alignment (2013–2024)" based on two dimensions: the share of stable HS6 products in total export value and the weighted RSCA coverage of those products.
The clustering groups partner countries according to both the *economic importance* and the *competitive strength* of Italy's persistent export advantages, revealing distinct patterns of structural trade integration.
Source: Trade Map (International Trade Centre — ITC), author's calculations.

KEY INSIGHT — Italy's stable export strengths translate into strategic depth only in a limited group of partners, while most markets absorb persistence without fully capturing competitiveness.

Interactive Dashboard – Exploring Italy's Stable Export Core

- The dashboard complements static figures by enabling interactive exploration.
- Users can filter partners, thresholds, and RSCA-weighted metrics dynamically.
- This allows validation of insights and examination of alternative perspectives beyond predefined charts.

Live dashboard available at: https://italy-stable-export-dashboard-4y7vafaes7x9nznqky48sn.streamlit.app/?embed_options=show_toolbar,light_theme,show_colored_line,disable_scrolling,show_padding,show_footer,dark_theme

Key Insights

- This project shows that Italy's export strength is not evenly distributed across all traded products. Out of the full HS6 export universe, only a subset of products exhibits a **stable revealed comparative advantage over time**. This stable core reflects Italy's **structural competitiveness**, rather than temporary successes driven by short-term demand shocks or one-off trade events.
- The partner-level analysis indicates that **European Union countries are the primary destinations of Italy's stable advantage products**. However, the absorption of these products is not uniform across partners. Some countries consistently import a large share of Italy's stable HS6 products, while others concentrate on a narrower subset, revealing differences in market depth and specialization.
- The results further show that **export value and geographic diffusion do not necessarily coincide**. Certain stable products generate high export values but are limited to a small number of partner markets, whereas other products with moderate values display broad international coverage. This highlights a distinction between **value intensity** and **market reach** within Italy's export structure.
- Finally, the weighted RSCA analysis demonstrates that **partners differ not only in how many stable products they import, but also in the strength of the advantages they absorb**. Some markets are more closely aligned with Italy's core competitive strengths, while others capture a thinner layer of its export capabilities. This heterogeneity forms the basis for the final partner clustering and strategic interpretation.

Limitation

- While the analysis provides detailed insights into Italy's export structure across major European partners, several limitations should be acknowledged. First, the assessment relies on observed export values and product-level composition, which capture trade outcomes but do not fully reflect underlying drivers such as firm-level strategies, contractual arrangements, or non-observed trade barriers. As a result, differences in diversification or concentration across partners may partly reflect unobserved structural factors rather than pure competitiveness.

- Second, diversification and concentration indicators are sensitive to temporal fluctuations in demand and sector-specific shocks. Although the analysis explicitly incorporates time-based stability measures, sudden external shocks or short-lived structural changes may still distort the interpretation of export resilience. This implies that diversification observed at a given point in time does not necessarily translate into long-term stability, and some patterns may be contingent on the specific period analyzed.

- Finally, the regime-based classification framework simplifies complex export relationships into discrete categories. While this enhances interpretability and comparability across partners, it inevitably abstracts from within-category heterogeneity. Consequently, partners classified under the same regime may still differ in terms of institutional context, market size, or sectoral specialization. These limitations highlight that the results should be interpreted as structural signals rather than precise predictions, and that export resilience cannot be fully captured by any single metric or classification approach.

Conclusion

The analysis identifies a **stable core of comparative advantage** in Italy's export structure over the period 2013–2024, consisting of HS6 product categories that consistently maintain competitiveness over time. By excluding short-lived or sporadic export successes, the study focuses on the structural foundations of Italy's exports rather than temporary trade fluctuations. Results show that this stable HS6 core represents a **significant share of Italy's export value** across major European partners, confirming that Italy's international trade performance is driven by persistent strengths rather than a wide but fragile product base. However, partner-level comparisons reveal notable differences in how strongly these stable products are absorbed across markets.

Finally, the weighted RSCA analysis highlights that **export destinations differ not only in volume, but in the quality of advantages they absorb**. Some partners concentrate on high-RSCA products, while others rely on a narrower or weaker subset of Italy's stable export portfolio. Overall, the findings suggest that Italy's competitiveness is anchored in durable export capabilities, providing a solid basis for assessing trade resilience and long-term strategic positioning.

References & Data Sources

- **Trade Map – International Trade Centre (ITC)**
  https://www.trademap.org

  Primary source of bilateral trade data at the HS6 level, used to analyze Italy's export flows, partner coverage, and product-level comparative advantage.

- **World Trade Organization (WTO)**

  Methodological background and HS product classification standards.

- **UN Comtrade Database**

  Reference framework for international merchandise trade statistics.

Data source: Trade Map (ITC). Used for academic and non-commercial purposes.
All analysis and visualizations by the author.

Credits and data sources

Author: Mahsa Rajabi Nejad

Data sources: TradeMap product export tables (Italy exports; World exports) and bilateral destination tables (Italy → partner), HS6, 2013–2024.

Methods: RCA and symmetric transformation (RSCA), stability filtering (≥3 years), average RSCA intensity, partner coverage (presence and value>0), stable-core value share, RSCA-weighted absorption, and clustering for partner typology.

Output: Figures generated in Python; PDF composed with ReportLab.