

*ISPI Study for AHK Italien*

# **Under Pressure: Europe, Italy and Germany in a Weaponised Global Economy**

Giovanni Maria Della Gatta, Giuliana Sarcina,  
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*Under pressure: Europe, Italy and Germany in a weaponised global economy*  
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**Deutsch-Italienische  
Handelskammer**  
Camera di Commercio  
Italo-Germanica

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# EXECUTIVE SUMMARY

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For nearly thirty years, Italian and German manufacturing benefited from a relatively stable international environment. Weak domestic demand could be offset by exports, while energy and intermediate goods could be sourced abroad with reasonable confidence that supplies would remain available. In recent years, however, that setting has changed substantially. Chinese manufacturers have become strong competitors in markets where European firms had long been well established, the loss of Russian gas has exposed European industry to much higher energy costs, and the Hormuz crisis has again shown how vulnerable Europe remains to external energy shocks. At the same time, renewed US uncertainty regarding trade policy has made Europe's largest foreign market less predictable, and restrictions imposed by Beijing on critical materials have shown that access to industrial inputs can be affected by political decisions. These pressures have come at a time of weak productivity growth in Europe and wide investment gap with the United States, particularly in digital technologies.

Economic relations have also become more openly political, as governments are increasingly prepared to use access to markets, technologies and essential supplies to influence decisions abroad. We identify 41 episodes of potentially coercive economic pressure affecting the EU between 2018 and 2026, with European companies among the targets in 33 of them, and economic pressure has intensified remarkably since 2024. For businesses, the effects can be very concrete: export licences may be delayed, access to inputs can be restricted and relatively inexpensive components can become bottlenecks for entire production lines. In the face of these pressures, European economic policy has taken a reactive and defensive stance, focusing on diversification, stockpiling and the reduction of critical dependencies. **Much less attention has been paid to the other side of interdependence: the foreign companies and production systems that rely on European suppliers.**

The paper asks **where Italy and Germany still hold industrial capabilities that foreign customers may find difficult to replace.** Italy and Germany accounted for around **40% of EU industrial production in 2025**, and their manufacturers remain deeply embedded in international production networks. They supply machinery, components and specialised technologies used in factories around the world, often in applications where replacing a supplier involves costs that go well beyond the purchase price of a new piece of equipment. This is because machinery is often embedded within production systems, technical solutions are adapted over time to customers' requirements, and specialised knowledge accumulates inside firms

and along supplier relationships. The paper therefore sheds light on sectors in which Italian and German industrial capabilities may be more important to foreign customers than Europe's overall competitiveness figures would suggest.

The analysis covers **270 products that are important to strategic industries and technologies outside Europe** and compares Germany and Italy's international position with those of China and the United States. The results reveal a clear division of strengths. **China's advantage lies above all in scale**, with particularly strong positions in upstream materials, components and intermediate products. **Italy and Germany stand out especially in capital equipment, production technologies and specialised manufacturing**, where engineering capabilities, know-how and integration into customers' production processes play a larger role. Together, the two countries account for 18% of global exports in the advanced industrial machinery and robotics products covered by the study. Germany is particularly strong in pharmaceuticals and biotechnology, while Italy has important positions in aerospace and defence-related technologies.

In many strategic products, **Italian and German companies sell at a premium compared to the global benchmark**, suggesting that they compete in more specialised, higher-value segments of the market. The two countries are also frequently strong in the same product groups. This pattern of **German-Italian co-specialisation** is particularly visible in advanced industrial machinery and suggests that many of the capabilities identified in the study are embedded in broader industrial ecosystems rather than isolated national strengths.

Our findings suggest that Europe should not see itself simply as caught between the economic power of the United States and China. **Italy and Germany, in particular, still hold industrial capabilities that matter to the rest of the world.** These strengths can support competitiveness, more precisely direct investment, and give Europe greater room to withstand or respond to economic pressure, where foreign customers have few credible alternatives. A better understanding of these positions would therefore strengthen both industrial policy and Europe's capacity to deal with a more coercive international environment.

For companies, the immediate priority is **to identify and protect the capabilities that underpin their strongest market positions.** Firms should know which technologies, skills, suppliers and production assets would be hardest to replace if they were lost, and direct investment accordingly. Critical know-how should be treated as a strategic asset, especially where imitation is a serious risk. Capabilities that have taken years to build can disappear gradually through underinvestment or the loss of specialised skills and, once lost, they may be very expensive to recreate.

The overlap between German and Italian strengths creates room for more focused industrial cooperation. Chambers of Commerce and business associations can help by identifying the firms operating in the same strategic value chains and by showing where technologies, production capabilities or investment needs complement one another. The aim of this exercise should be practical: **to connect companies where cooperation can strengthen an existing industrial advantage or close a specific gap.**

Companies should also look beyond their own strengths and **map the vulnerabilities that could undermine them**. A manufacturer that is difficult for its customers to replace may itself depend on a single supplier, a critical component or a highly concentrated export market. Firms need to know where potential disruptions would hurt most, whether alternatives exist, how quickly they could be activated, and at what cost. This information should then be directly translated into sourcing, investment and market-diversification decisions.

The paper therefore points to a more encompassing way of thinking about economic security. Europe remains exposed to high energy costs, imported critical inputs and political pressure from larger powers, but **Italy and Germany also possess specialised industrial capabilities that support competitiveness and can, in some cases, give Europe more room to act**. A clearer mapping of those capabilities, together with the dependencies that support them, would help companies make better investment and risk-management decisions and give policymakers and business organisations a more accurate view of Europe's position in an increasingly contested global economy.

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# EUROPE IN A WEAPONISED GLOBAL ECONOMY

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For nearly thirty years, foreign demand allowed Italian and German manufacturers to expand despite weak demand in their home markets. Their factories relied on foreign energy and intermediate goods, while a growing share of their output went to customers outside Europe. Crucially, until recently firms could generally assume that access to both necessary supplies and foreign markets would remain stable enough to support long-term investments.

While signs of structural change had already appeared by the late 2010s, the collapse in Russian gas supplies in 2022 marked a decisive inflection point, leaving the European industry paying much higher energy costs. Chinese manufacturers have, meanwhile, become strong competitors, both in China itself and in markets/sectors where European firms had long been well established. At the same time, China's recent restrictions on critical materials have made access to some industrial inputs contingent on decisions taken in Beijing, while Washington's tariffs have made Europe's largest foreign market (and the previous main defender of the "Western liberal order") less predictable.

As both competitive and coercive pressures rise, Europe has responded in a reactive and defensive manner. It has created instruments to counter economic coercion and adopted a more cautious view of global production chains, with greater emphasis on diversified sourcing and stockpiling of critical goods. Far less effort, however, has gone into identifying the manufacturers abroad that rely on European suppliers, or into establishing how difficult those suppliers would be to replace.

This paper therefore asks whether European manufacturing retains underappreciated sources of strength. In particular, in which strategic products do Italy and Germany combine significant global market presence with evidence of differentiated market positioning? These features do not in themselves demonstrate that European suppliers are difficult to substitute, but they can help identify the products and sectors in which potential foreign reliance on European industrial capabilities deserves closer examination.

Italian and German companies make machinery and specialised components that are incorporated into production processes around the world. Even where comparable equipment exists elsewhere, changing supplier may be costly because new machinery has to be integrated into established factories. European suppliers

may also possess technical knowledge acquired through years of adapting their products to customers' requirements. These capabilities may therefore give Europe more room to respond to external pressure than is often assumed.

We focus on Italy and Germany because in 2025 they accounted together for 40% of the EU's industrial production. While weak productivity growth and high energy costs have damaged their competitiveness, this assumed weakness reveals little about the specialised products they export for which alternative suppliers may be limited. We therefore examine 270 goods selected for their importance to strategic industrial and technological activities, using trade data for 2022-2024, and comparing Italian and German export shares and market positioning with those of China and the United States.

The analysis identifies areas in which foreign manufacturers are most likely to depend on Italian and German products, bringing Europe's remaining industrial strengths into a debate that has so far concentrated on its vulnerabilities. It then considers how firms, Chambers of Commerce and business associations can preserve these capabilities and reinforce cooperation between the two countries.

## 1. EUROPE'S DOUBLE SQUEEZE: EXTERNAL PRESSURE AND LOSS OF COMPETITIVENESS

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### EUROPE'S LOSS OF GROUND

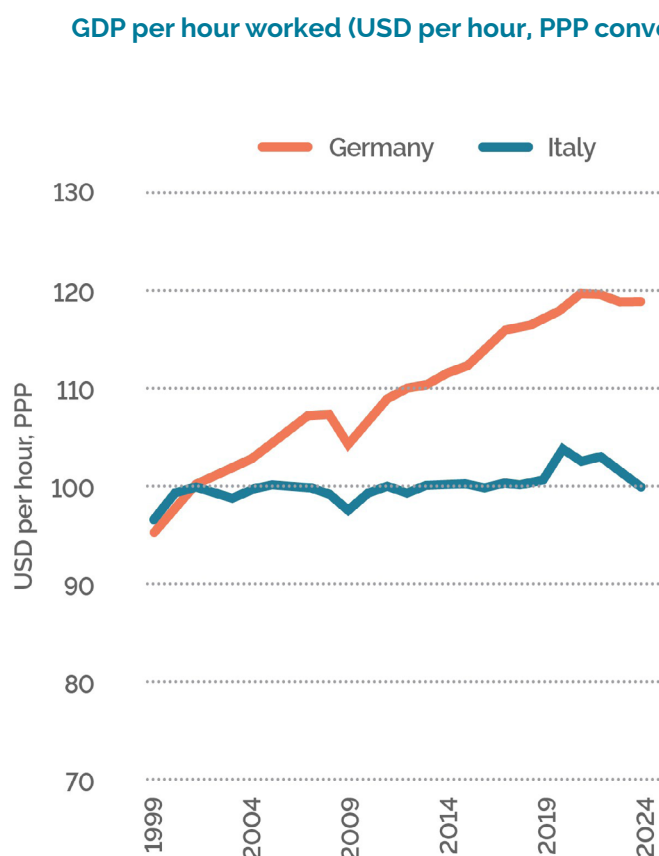
It's common knowledge by now that the European industry is struggling, as it faces more expensive inputs (energy in particular) and stronger competition in sectors where its leadership seemed secure only a few years ago. The United States is pulling further ahead in productivity and digital technologies (with one possibly feeding on the other), while China is gaining even more ground in manufacturing. Meanwhile, the markets and supplies on which European firms depend have become less reliable, as a rising number of countries use existing economic ties to push for political concessions or policy changes. Within this context, Europe's two largest manufacturing economies are facing increasingly similar difficulties.

Of course, as productivity figures show, problems did not start in the recent past but can be traced back to at least a couple of decades. Between 2001 and 2023, output per hour worked rose by just over 20% in the EU, compared with almost 40% in the United States (Figure 1). And while Germany gained around 20% by 2024, Italy ended the period roughly where it began (Figure 2). As the

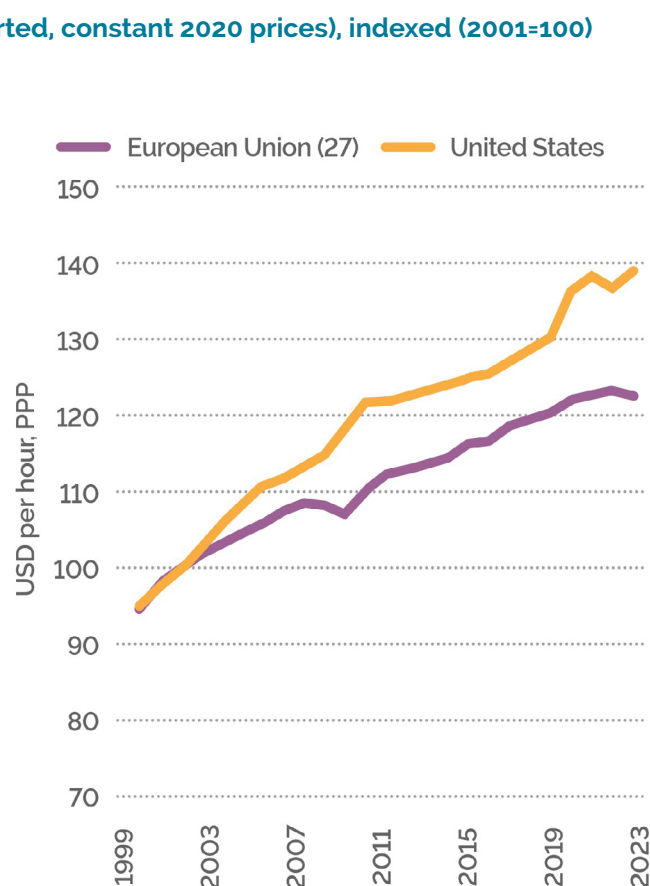
graphs show, much of this divergence predates the recent trade and energy crises. Preliminary OECD estimates in fact suggest that this divergence continued in 2025, when labour productivity grew by 1.4% in the EU, compared with 1.7% in the United States.<sup>1</sup>

America's advantage also owes much to the scale of its digital sector and the depth of its capital markets. According to Stanford's 2026 AI Index, private investment in AI reached \$286 billion in the United States in 2025, compared with \$21 billion in Europe.<sup>2</sup> Successful US technology firms can scale across a large domestic market and draw on deep pools of capital. In Europe, by contrast, fragmented capital markets and barriers to cross-border expansion continue to constrain investment and the diffusion of new technologies, including among firms that adopt rather than develop them, as highlighted by the Draghi report.<sup>3</sup>

**FIGURE 1. PRODUCTIVITY IN GERMANY AND ITALY**



**FIGURE 2. PRODUCTIVITY IN THE EU AND THE US**



Source: authors' elaborations on OECD data

Europe's weak productivity record has made the rise in energy costs particularly damaging for its manufacturers. Firms whose output per hour had already barely improved now had less scope to pay more for electricity and labour without cutting into margins, just as they needed to spend heavily on modernising production and head off growing competition from abroad. Delaying those investments protected cash flow for a while, but this has also prolonged firms' reliance on less efficient plants and processes, especially in sectors that might have needed urgent modernisation to maintain a competitive edge, such as the automotive sector.

At the same time, European income growth has lagged behind that of the United States. Between 2015 and 2025, real GDP per capita increased across the EU but the gap with the United States widened, with Germany and Italy both losing relative ground (Figure 3). For many European manufacturers, exports have meanwhile remained an important source of growth, making access to foreign markets particularly valuable but also in

In fact, some of the external demand that sustained this expansion (from China in particular) has dried up recently, while suppliers in those countries have become formidable competitors. European manufacturers spent years supplying China with the machinery, vehicles and technology needed for its industrial development. However, Chinese firms now increasingly produce those goods themselves and sell them in markets that European exporters long considered their own. In electronics and automotive, the expansion of Chinese exports reflects an advance into sophisticated manufacturing documented by recent ECB research.<sup>4</sup>

## GROWING COMPETITION FROM ABROAD

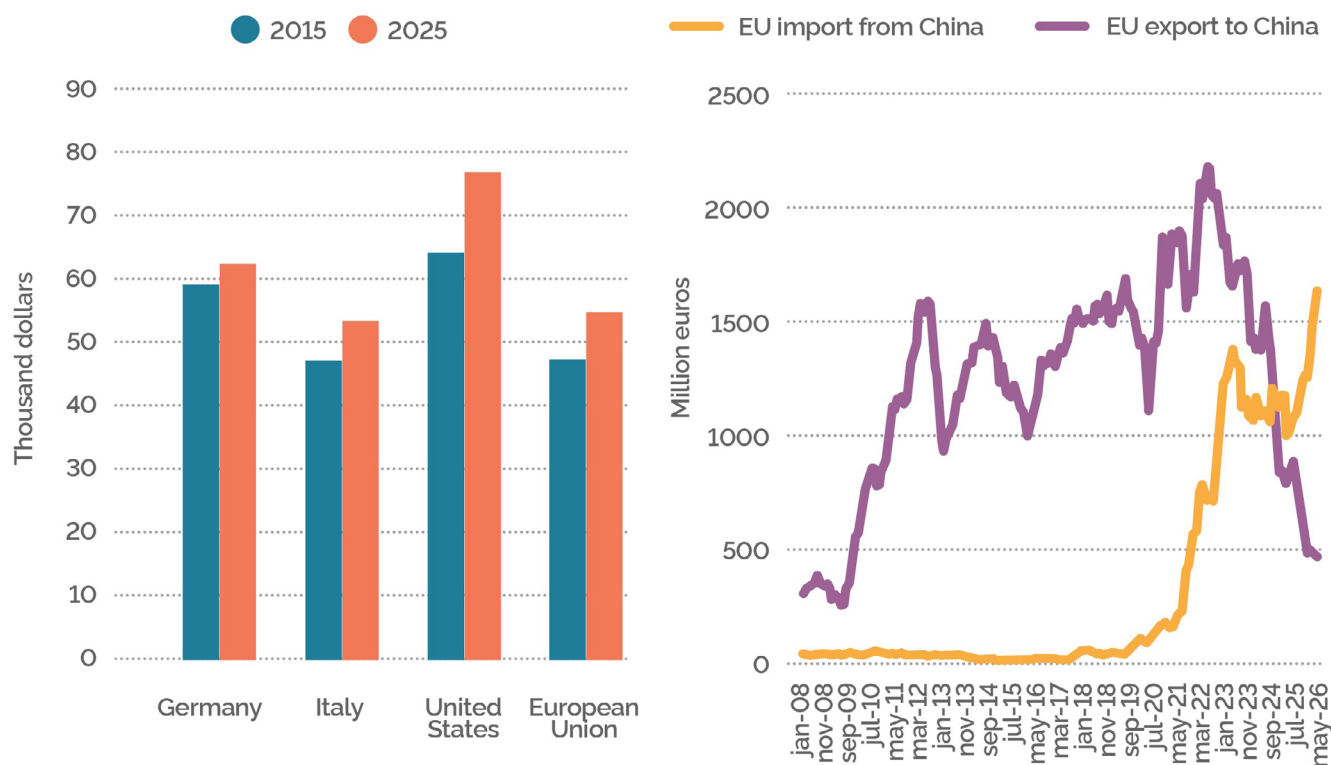
As this competition has intensified, the EU's longstanding surplus in car trade with China has turned into a deficit, with imports rising sharply as European exports have fallen fast from their recent peaks (Figure 4). Some of those imports, however, are cars produced in China by European and other foreign brands, so the reversal also reflects changes in where manufacturing takes place. The consequences therefore extend to component makers and equipment suppliers across Europe, whose orders depend on where carmakers locate production and purchase their inputs.

At the same time, China's industrial policy has amplified the competitive pressure generated by its technological progress. Years of state support have helped manufacturers expand capacity and develop extensive supplier networks. However, with domestic demand remaining weak, producers have increasingly turned to foreign markets to sustain that expansion. In 2025, net exports contributed around one-third of China's 5% GDP growth, while the country's current-account surplus rose to an estimated 3.3% of GDP.<sup>5</sup> Although the government has taken steps to support household consumption, the IMF argues that a much larger shift of resources towards households is needed to reduce China's reliance on investment and exports.<sup>6</sup>

Meanwhile, for Europe the adjustment is complicated by the fact that cheaper Chinese supplies have also helped European companies contain costs and made equipment

**FIGURE 3. REAL GDP PER CAPITA IN 2015 AND 2025**    **FIGURE 4. EU AUTOMOTIVE TRADE WITH CHINA**

PPP, Constant prices 2021



Source: authors' elaborations on OECD and Eurostat data

for the energy transition, from PV panels to EV batteries, more affordable. Average battery-pack prices in China, for example, were 35% below European levels in 2025.<sup>7</sup> European firms have thus benefited as buyers even while European producers of competing goods have struggled to defend their position. For European governments, this makes decisions on whether and how to protect domestic industries particularly tricky, because costs may ultimately outweigh the benefits and because there might be the potential for reprisals by affected third countries. Moreover, once a plant has closed, demand can recover without production returning, because the workers and suppliers needed to restart it may have moved elsewhere. For firms that have meanwhile found suppliers abroad, paying to rebuild that capacity in Europe may simply no longer make economic sense.

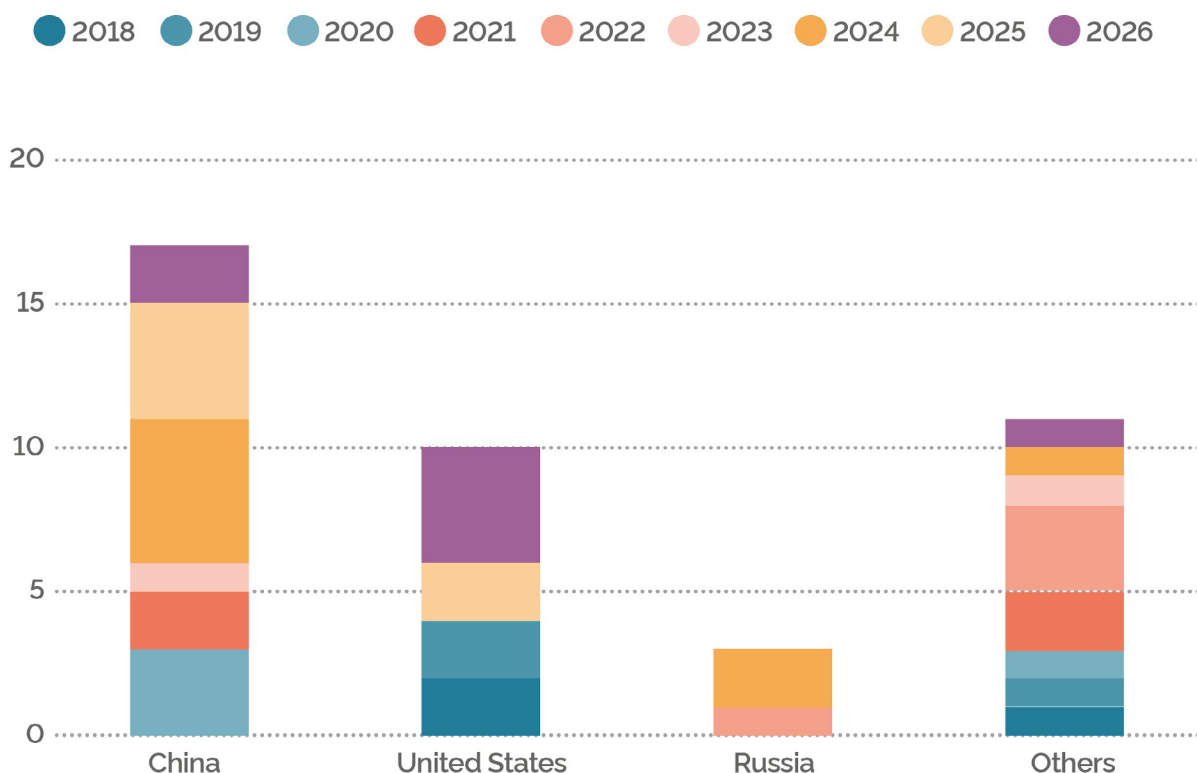
At the same time, European manufacturers have had to make this adjustment while still paying far more for energy than their main competitors, as electricity prices for energy-intensive industries in the EU remained roughly twice those of the United States in 2025 and more than 50% above those of China.<sup>8</sup> Europe's reliance on imported fuels also leaves its industry exposed to disruptions abroad. The Hormuz crisis has brought that exposure to the fore again since March 2026, with substantial Gulf oil production still unavailable and the risk of more disruptions to shipping in the months to come. As the main importers of oil and gas from the Gulf (which are mainly in Asia) have had to compete for alternative cargoes, the effects have reached European firms even where their direct exposure was limited. Moreover, the disruption to gas supplies has undermined expectations that more abundant LNG would bring prices down, adding uncertainty over future energy costs to the disadvantage European manufacturers already face.<sup>9</sup>

While energy shocks have raised the cost of producing in Europe, renewed US tariffs have constrained exports to the EU's largest foreign market, which absorbed 21% of its goods exports in 2025. Under the trade settlement implemented in 2026, the United States retains a tariff ceiling of 15% for most EU exports, whereas the EU has removed its remaining duties on US industrial goods. Even before those terms took effect, uncertainty over future market access had imposed costs of its own. The ECB estimates associate the rise in trade-policy uncertainty in 2025 with an average reduction of around 0.3 percentage points in euro-area GDP growth relative to 2024, and an effect on business investment around three times that on private consumption.<sup>10</sup>

## **RIISING COERCION RISKS**

Over the past few years, governments have increasingly used access to their markets and control over essential supplies to influence decisions taken abroad. Time and again, trading partners have been asked to change a regulation or policy, or even reconsider their relations with a third country, with the threat of economic restrictions giving weight to those demands. For the EU, economic coercion has therefore become another problem to address alongside its loss of competitiveness and growing commercial pressure.

Drawing on publicly documented cases, a forthcoming study by ISPI and other European research institutes for the European Parliament identifies 41 episodes of potentially coercive pressure affecting the EU between 2018 and May 2026, including both threats and measures actually imposed. China accounts for 17 episodes and the United States for 10, meaning that almost two-thirds of the cases involve Europe's two largest economic counterparts (Figure 5).

**FIGURE 5. NUMBER OF ECONOMIC PRESSURE EPISODES BY INITIATING COUNTRY AND YEAR**

Source: authors' elaborations based on ISPI's report for the EP.

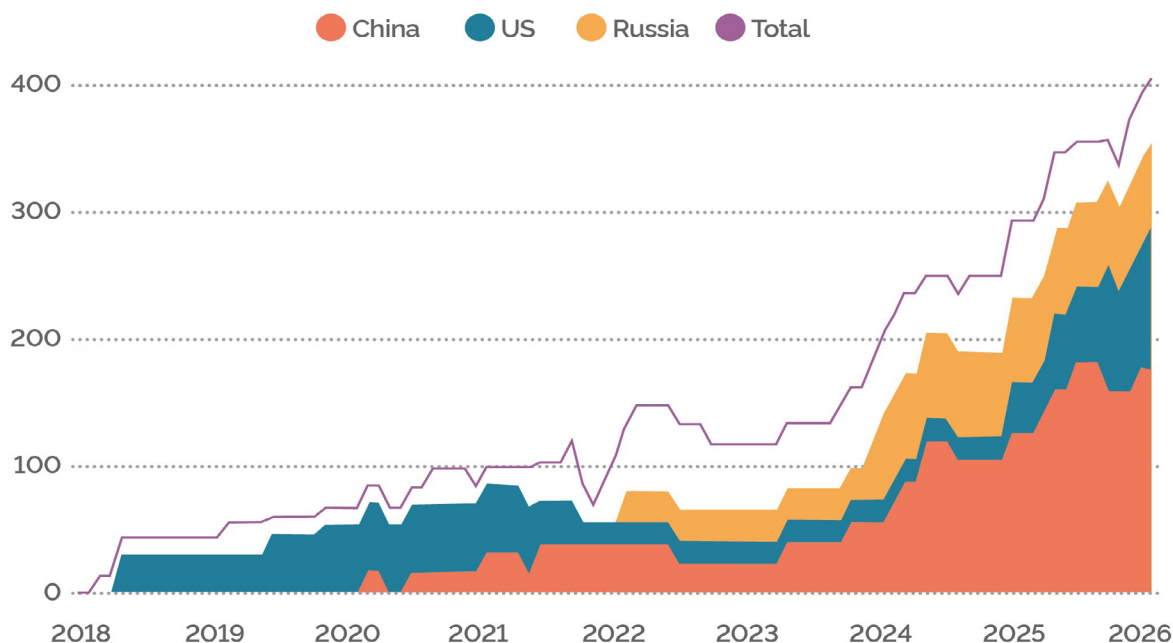
Moreover, these episodes often remain unresolved long enough for new disputes to emerge before earlier ones have ended. By May 2026, 22 of the 41 cases were still ongoing, including 16 involving measures that had actually been imposed. With the study estimating that almost 70% of cases remain active after a year, and more than half after two, Europe increasingly has to deal with several sources of pressure at the same time.

To capture this accumulation, the study's EU Economic Pressure Index combines the scores assigned to ongoing episodes, taking account of the intensity of pressure and evidence of interference in sovereign decisions (Figure 6). Its sharp increase from 2024 reflects the addition of new disputes while many previous ones remained unresolved, although the index measures the pressure exerted on the EU without estimating the economic losses it causes.

Much of this increase comes from China, as restrictions and disputes over trade and strategic supplies have accumulated since 2024, while renewed US pressure in 2025-26 has relied more heavily on tariff threats and demands concerning European regulation. Russia accounts for only three cases, but its use of energy supplies has had consequences far beyond the companies directly involved, showing how a limited number of disputes can still affect the wider European economy when they involve strategic goods.

European businesses appear among the targets in 33 of the 41 cases, with customs blockages or delays in export licences bringing political disputes directly into their operations. In the automotive industry, China's rare-earths restrictions and the Nexperia semiconductor dispute examined in the study show how entire production lines can depend on relatively inexpensive inputs, sometimes sourced several suppliers away from the final manufacturer. The consequences have already reached production lines: after China introduced controls on seven heavy rare-earths in April 2025, some carmakers cut output or temporarily halted operations, while by mid-2026 European prices for gallium, dysprosium and terbium were around five times Chinese levels.<sup>11</sup>

**FIGURE 6. EU ECONOMIC PRESSURE INDEX FROM JANUARY 2018 TO MAY 2026**



Source: authors' elaborations based on ISPI's report for the EP.

## EUROPE'S ROOM TO RESPOND

Europe's loss of competitiveness and growing exposure to economic pressure have reinforced the image of an EU squeezed between Washington and Beijing. However, foreign firms can face the same difficulties in replacing European suppliers, so dependence on European equipment and technology could also give the EU greater room to respond than that image suggests.

ASML, the only commercial supplier of extreme-ultraviolet lithography systems used in advanced chip production, relies on highly specialised optical systems supplied by Germany's ZEISS.<sup>12</sup> Since this capability has developed through decades of cooperation between specialised firms, a competing producer would also have to recreate the expertise and supplier relationships on which those systems depend. Europe may have lost ground in aggregate, but in parts of its industrial base foreign customers still cannot readily replace what it supplies.

So far, however, much of Europe's economic-security work has concentrated on identifying critical dependencies and reducing the risks associated with them. Although the Commission's December 2025 approach gives greater attention to using Europe's existing tools and strengths, the scope for responding to external pressure through its own industrial capabilities deserves more systematic examination.<sup>13</sup> Knowing where others depend on European production would help the EU assess whether it could impose costs in response to coercion, and whether the prospect of those costs could discourage pressure in the first place.

Part 2, therefore, turns to Italy and Germany, which together accounted for 40% of the EU's sold industrial production in 2025, and whose close production ties make them particularly relevant to understanding how much of this potential Europe still retains.<sup>14</sup>

## 2. ITALY AND GERMANY, THE STRENGTH OF INDUSTRIAL INTERDEPENDENCE

### MPI, MEASURING MARKET POSITIONING

The objective of this study is to determine whether, at a time of growing weaponisation of trade dependencies and international economic pressure, Italy and Germany, and by extension the European Union, retain economic and industrial strengths which could help them withstand external economic pressure. In particular, the analysis aims at answering the question *“Do Italy and Germany retain underappreciated industrial capabilities that could strengthen their resilience in an environment of rising economic pressure?”*.

To answer this question, the analysis assesses the international market positioning of Italy and Germany relative to other exporters. While the underlying analysis covers all countries included in the database, the findings focus specifically on comparisons with China and the United States. This serves two purposes: first, the broader analysis provides a global perspective on Italian and German market positioning; second, the comparison with China and the United States helps identify potential sources of economic leverage vis-à-vis the two economic superpowers, both of which have used coercive threats or measures against the EU.

The analysis employs the BACI dataset (*Base pour l'Analyse du Commerce International*), a database produced by the Centre for Prospective Studies and International Information (CEPII), which provides annual data on bilateral trade flows for 200 countries using product-level classification as for the 2022 revision of the Harmonized System (HS 2022), and structured according to the following variables:<sup>15</sup>

- *Year (t)*
- *Exporter (i)*
- *Importer (j)*
- *Product (k)*, identified by a HS6 code
- *Trade value (v)* in thousand USD
- *Quantity traded (q)* in metric tons

For the purpose of this study, the analysis of the product-level trade flows focused on the 2022-2024 period, pooled into a single three-year dataset following a process of data cleaning aimed at removing missing trade values and volumes. This was done in order to use the most recent available information about international trade dynamics and derive insights on countries' latest global market positioning, mitigating year-to-year potential distortions, such as exceptional shipments.

The cleaned dataset was subsequently aggregated by product (*k*) and exporter (*i*) by summing trade values and quantities across destinations and across the 2022-2024 period, before narrowing the scope of the analysis to a universe of 270 strategic products.<sup>16</sup> The choice of focusing on a set of specific product categories is inherently linked to the research question of the study.

The Russian invasion of Ukraine has intensified preexisting processes of weaponisation of economic interdependence,<sup>17</sup> showing significant vulnerabilities arising from external dependencies on critical inputs and strategic technologies. However, when it comes to defining what can be considered “strategic”, different criteria are adopted across the existing literature, reflecting different understandings of economic security, supply-chain vulnerability and geopolitical exposure.

In this context, a useful approach considered for the selection of the “strategic products” universe was the one adopted by the Atlantic Council in an analysis

of 2022 focused on five sectors identified as critical and, therefore, strategic: semiconductors, digital and telecommunications infrastructure, equipment required for green energy transition technologies, active pharmaceutical ingredients, critical inputs and materials.

This approach was complemented with a recent OECD working paper addressing critical trade dependencies and the identification of “strategic products”.<sup>18</sup> In particular, the OECD analysis notes that the identification of products or industries considered critical from an economic perspective is generally carried out across three criteria: economic importance, exposure to supply disruptions, and the availability of alternative sources of supply.

The challenging and variable nature of what constitutes a strategic sector or product is also reflected in a recent IMF analysis that employs the US Census Bureau classification of Advanced Technology Products as a working definition of strategic products in a study on industrial policies and subsidies in strategic sectors.<sup>19</sup> The above-mentioned list includes over 500 products at the 10-digit HS level (US version), grouped into technological classification and spanning across different sectors, such as biotechnology, life sciences, opto-electronics, information and communications, advanced materials, nuclear technology and aerospace.<sup>20</sup>

Building on this background, this paper does not adopt any single existing classification as a ready-made list of strategic products. Rather, the approaches discussed above are used to define the conceptual perimeter of the exercise: goods may be considered strategically relevant when they perform important functions in industrial and technological value chains, are explicitly prioritised in current economic-security policies, or are associated with critical supply chains and external vulnerabilities. This conceptual framework was then operationalised through a separate product-level screening at the six-digit level of the Harmonized System (HS6), consistently with the product disaggregation available in the BACI database.

The screening started from the working HS2022/BACI universe of 5,609 HS6 codes. Products were mapped against contemporary official and corroborating evidence on strategic industries, critical supply chains and external dependencies, with particular attention to the United States and China. Since strategic functions do not map one-to-one onto customs classifications such as HS2022, the screening explicitly took into account both the strength and current relevance of the underlying evidence and the specificity with which a strategic product or function could be associated with an HS6 code.

Each candidate HS6 code was assessed against the underlying evidence on two dimensions: the strength of the evidence that the relevant product or function was strategically important, and the specificity with which that function could be mapped to the HS6 code. This process identified 525 HS6 codes which could plausibly correspond to products of strategic relevance, which were subsequently classified into three evidence categories. P1 includes 122 products for which evidence indicates a relatively specific current criticality, external dependency or

supply bottleneck affecting at least one of either China or the United States. P2 includes 148 products that are explicitly associated with strategic sectors or supply chains in current policy frameworks, but for which the available evidence does not establish a sufficiently product-specific dependency. P3 comprises 255 enabling products or HS6 categories for which the correspondence with the relevant strategic function is too broad or partial to warrant inclusion at this level of aggregation.

In order to restrict the analysis space to products for which there was sufficient evidence of strategic relevance, the baseline strategic-product universe was then set as the union of P1 and P2, comprising 270 HS6 products. The retained products were subsequently grouped into 12 analytical sectors, reported in Annex 1. Crucially, Germany's and Italy's observed trade performance was not taken into account in the construction of this classification: the two countries enter the analysis only after this universe has been defined and frozen.

Following the definition of the 270 strategic products, the cleaned 2022-2024 dataset was restricted to the chosen universe of HS6 codes and aggregated at the exporter-product level ( $i, k$ ). More specifically, for each exporter  $i$  and product  $k$ , volumes exported and values were summed across the three years and across export destinations, obtaining a single observation for each exporter's trade in each of the strategic products over the period considered.

The aggregated observations are the main working variables considered for the analysis. The observations represent the basis for the calculation of a unit value (UV), performed at each exporter-product pair level, as the ratio between the total export value and the total quantity exported, as follows:

$$UV_{ik} = V_{ik} / Q_{ik}$$

where UV is the unit value for export-product pair,  $i$  is the exporter,  $k$  is the product,  $V$  the value traded and  $Q$  the quantity exported.

Once unit values were computed for each exported-product pair, a global UV benchmark was constructed separately for each of the 270 strategic products. In the first place, for each HS6 product, every exporter's share of total world exports over the 2022-2024 period was calculated. Exporters were then ranked according to their unit value from the lowest to the highest and their respective export shares were cumulatively summed. The benchmark unit value for each product was defined as the unit value of the first exporter whose cumulative export share reached or exceeded 50%. The choice of this measure, which can be defined as an "export-share weighted median unit value", was preferred to account for differences in exporters' relevance in the global market while limiting the influence of outlier observations.

In addition, based on the calculation of the product-specific global benchmark, a Market positioning index (hereinafter MPI) was computed for each

country and strategic product. The MPI represents a country-specific value relative to the global weighted median unit value for a specific product, expressed as:

$$MPI_{ik} = UV_{ik} / Benchmark\ UV_k$$

Therefore, an MPI equal to 1 indicates that the exporter's unit value coincides with the benchmark unit value for that given product  $k$ , while values below/above 1 indicate positioning below/above the global benchmark. Although the MPI does not provide a direct measure of product quality or specific factors explaining differences in unit values, an MPI value above 1 could be interpreted as an indication of a stronger market positioning, potentially reflecting factors such as technological complexity, greater differentiation in product characteristics or specialisation in higher-unit-value product varieties.

## FINDINGS AND RESULTS

The first clear result of this study qualifies the widespread narrative that European countries are solely vulnerable to economic pressure from the two superpowers, the United States and China. Italy and Germany retain significant positions across a broad range of strategic products and, in many of them, export at unit values above the global benchmark. These characteristics do not by themselves establish that foreign buyers depend on Italian or German suppliers, or that substitution would be difficult. They do, however, identify areas in which such potential dependencies warrant closer examination and in which existing industrial capabilities could contribute to greater economic resilience and, under specific conditions, strategic leverage.

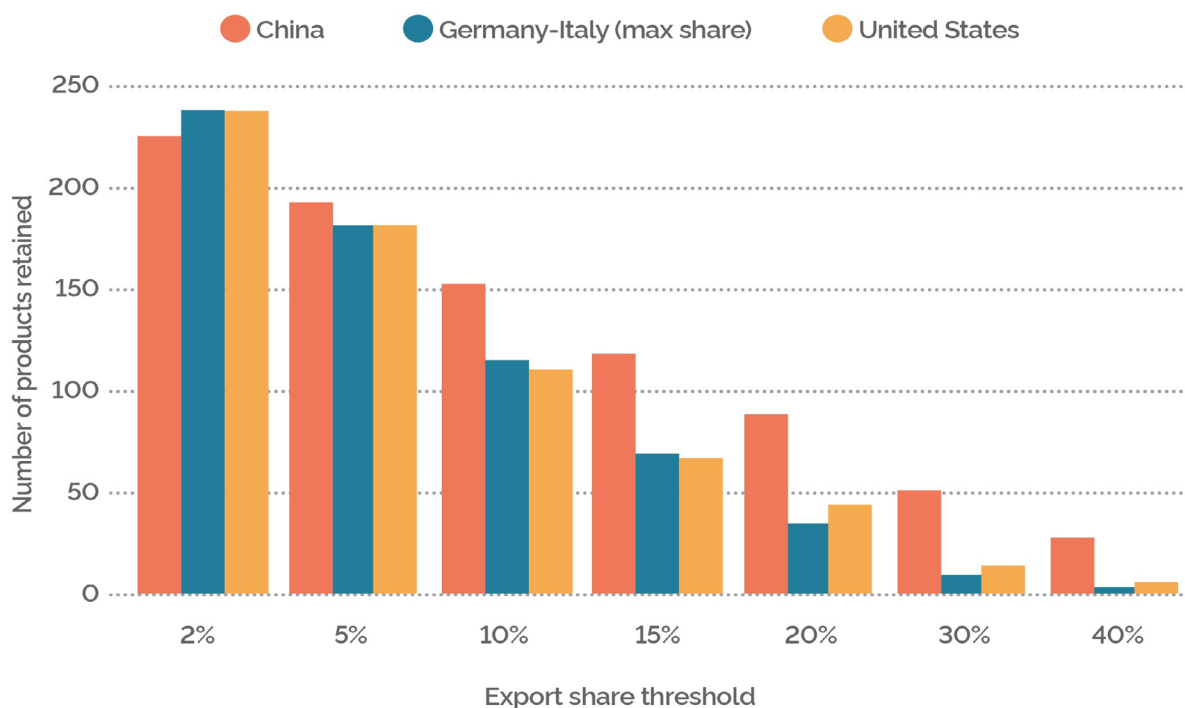
As major powers show declining restraint in weaponizing strategic economic interdependencies, it is essential to identify areas where foreign counterparts rely on Italian and German products. Such dependencies are potential sources of leverage, especially when substitution is costly and requires time. This mapping exercise can serve to protect Italy and Germany's strategic industrial advantage, and to understand areas where the two European countries have greater room to respond to attempts at economic coercion. In the end, this would bolster strategic readiness, which would in turn increase the EU's bargaining power and create the incentives to deter and deescalate trade disputes.

In order to qualify the relative position of Germany and Italy vis à vis the US and China, this study proceeds in several steps. First, it analyses the relative export share of each country along the 270 strategic products. Then it moves on to calculate the share of products for which each country exhibits a Unit Value above the product-specific benchmark, as detailed in the previous section. This allows us to better understand in which segment of the market each country is positioned.<sup>21</sup> Going beyond market presence and value comparison, the analysis also takes into account value chain positioning and sectoral aggregates before concluding with a discussion on the specific products that represent the main strengths for the two European countries.

As shown in Figure 7, in terms of overall participation in global exports (2% threshold), both the German-Italy aggregate and the United States provide more strategic products than China (in terms of number of products), highlighting the breadth of their productive capabilities across sectors and the degree of development of their economies. But as export-share threshold increases, the picture changes, as China retains more products than both the US and Italy-Germany aggregate. While Western countries show activity in more sectors, China accounts for at least 30% of the world supply for almost 20% of the products included in our shortlist, and for at least 40% in more than 10% of them.

This first result reflects both strategies and legacies of the different development trajectories that these economies followed. Mature industrial economies, such as the Western countries considered, developed highly diversified productive capabilities over multiple waves of industrialisation, resulting in significant export capacity for a broad range of strategic products. Meanwhile, China's rapid industrialisation took place within an already established global industrial system allowing to acquire know-how, adopt foreign technologies, develop supplier capabilities, and

**FIGURE 7. NUMBER OF PRODUCTS RETAINED AT INCREASING EXPORT SHARE THRESHOLDS**



Source: authors' elaborations.

progressively move into more sophisticated stages of production. Such a process was reinforced by policies aimed at accelerating technological upgrading and developing domestic industrial capabilities in strategically important sectors. Of course, China's ability to establish itself as a major supplier of many strategic products also reflects structural characteristics, most importantly scale.

Structural constraints, in fact, prevent countries such as Italy and Germany from reaching the industrial capacity, in terms of scale, of larger and more populous economies in each sector and for each product. However, they might not need to do so to maintain a critical role in the global economy. Indeed, China's strength in terms of export share does not translate equally into above-benchmark unit-value positioning. As shown in Table 1, Chinese exports rarely record an MPI strictly above 1, even among products in which China holds large global export shares. At the same time, a growing proportion records an MPI equal to the benchmark as higher export-share thresholds are applied, reflecting China's central role in determining the global weighted median for many products in which it is a dominant exporter.

This suggests that the current position of Italian and German manufacturers in global value chains remains more resilient than a simple dependence narrative would imply. Even though the MPI calculated is not directly a measure of "quality", it captures above-benchmark unit-value positioning in their exports. In those segments of the market, the main competitor of the two EU member states seems to be the US and, as mentioned in the first section, in such cases rising energy costs and lower capital availability in Europe could deepen the divide. At the same time, China's ability to build such a large industrial base must be closely monitored especially now that it is seeking to complement its significant manufacturing capacity and technological acquisition/upgrading with greater technological autonomy and advanced manufacturing capabilities. This means moving the country up the value chain, toward domains in which European and US companies traditionally held strong positions.

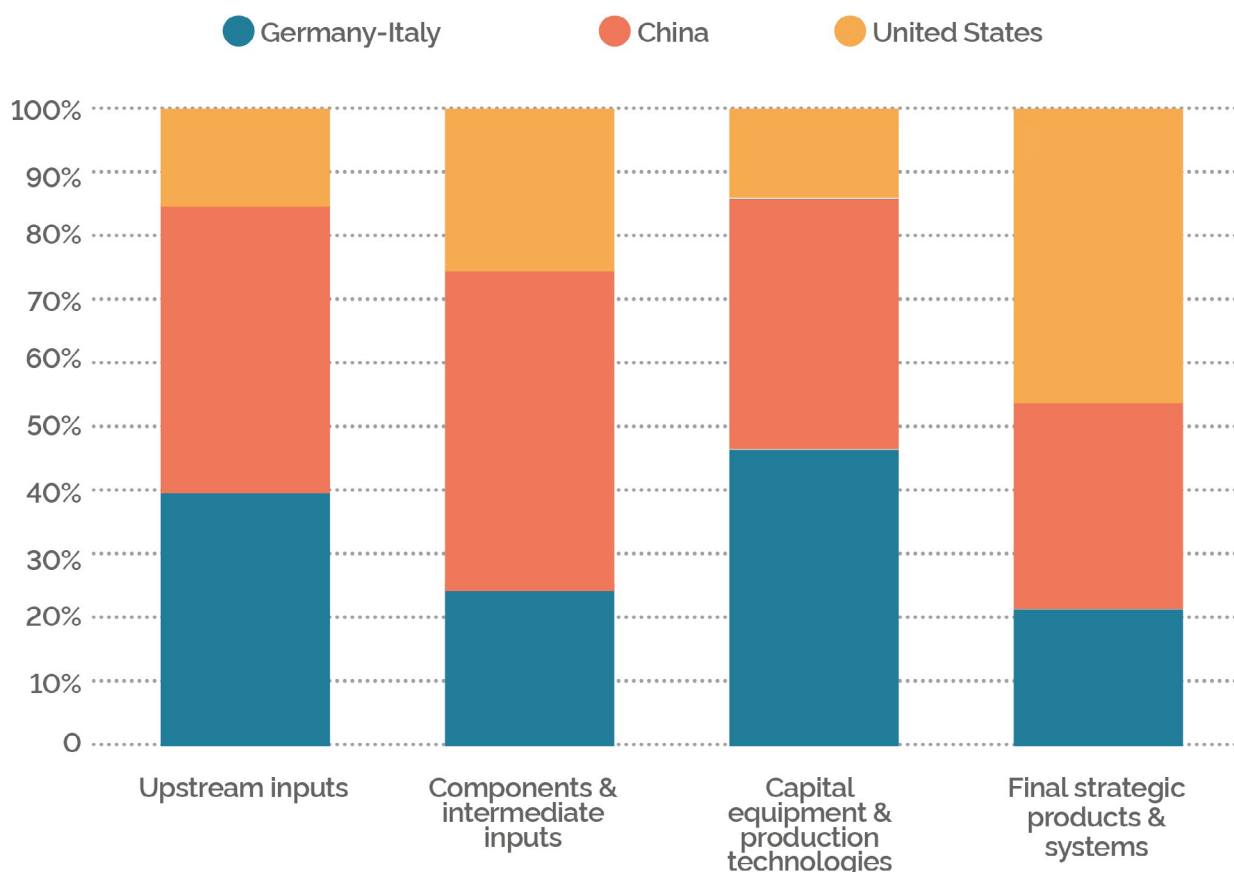
The consequences of this upward shift could undermine the relative advantage enjoyed by Western manufacturers such as Italy, Germany and the US. Figure 8 compares the three actors' relative export-share leadership across four value-chain segments. For each product, leadership is assigned to whichever of Germany-Italy, China or the United States records the largest export share among the three, irrespective of whether another country outside the comparison has an even larger share. China most frequently leads the three-way comparison in upstream inputs and, especially, components and intermediate inputs. Germany and Italy perform particularly strongly in capital equipment and production technologies, while the United States leads the comparison in the largest share of final strategic products and systems.

The ability of German and Italian companies to retain significant export shares in critical segments of the value chain, despite the structural constraints and investment challenges discussed above, should not be summarily dismissed. At the same time, these positions might already be under pressure and may face increasing competition in the future from actors that up until now didn't pursue them, China and the US included.

**TABLE 1. SHARE OF PRODUCTS RETAINED AT INCREASING EXPORT SHARE THRESHOLDS WITH MPI= 1 AND MPI>1**

| Export share threshold |               | China | Germany-Italy | USA |
|------------------------|---------------|-------|---------------|-----|
| <b>2%</b>              | <i>MPI</i> ≥1 | 22%   | 69%           | 74% |
|                        | <i>MPI</i> >1 | 5%    | 51%           | 64% |
| <b>5%</b>              | <i>MPI</i> ≥1 | 23%   | 73%           | 75% |
|                        | <i>MPI</i> >1 | 4%    | 50%           | 63% |
| <b>10%</b>             | <i>MPI</i> ≥1 | 27%   | 80%           | 78% |
|                        | <i>MPI</i> >1 | 3%    | 49%           | 60% |
| <b>15%</b>             | <i>MPI</i> ≥1 | 32%   | 83%           | 84% |
|                        | <i>MPI</i> >1 | 3%    | 46%           | 57% |
| <b>20%</b>             | <i>MPI</i> ≥1 | 40%   | 86%           | 89% |
|                        | <i>MPI</i> >1 | 2%    | 40%           | 55% |
| <b>30%</b>             | <i>MPI</i> ≥1 | 63%   | 100%          | 93% |
|                        | <i>MPI</i> >1 | 2%    | 11%           | 36% |
| <b>40%</b>             | <i>MPI</i> ≥1 | 86%   | 100%          | 80% |
|                        | <i>MPI</i> >1 | 0%    | 0%            | 0%  |

Source: authors' elaborations.

**FIGURE 8. RELATIVE EXPORT SHARE LEADERSHIP BY VALUE-CHAIN SEGMENTS<sup>22</sup>**

Source: authors' elaborations.

While value chain positioning provides insights about relative strengths and vulnerabilities in terms of potential bottlenecks or operational “vulnerabilities” along the value chain, for the purpose of this study it was deemed useful to also aggregate the 270 strategic products in 12 analytical strategic sectors in order to capture the export share for each of the three actors in focus. Table 2 below shows that they are not only participating but represent between 26% to 56% of global export of strategic products.

While the lowest share is found in “critical raw materials and advanced materials”, the highest (energy and electrical equipment) is largely dominated by China, which accounts for 44% of global exports in the sector. Taken together, Italy and Germany retain important export shares in “electric mobility and transport technologies” and “advanced industrial machinery and robotics” (28% and 18% respectively). This last sector is particularly interesting because it seems to highlight the same

**TABLE 2. EXPORT SHARE BY STRATEGIC SECTOR<sup>23</sup>**

| Strategic sector                            | Germany-Italy export share | China export share | United States export share |
|---------------------------------------------|----------------------------|--------------------|----------------------------|
| Advanced industrial machinery & robotics    | 18%                        | 19%                | 9%                         |
| Aerospace & defence-related technologies    | 12%                        | 4%                 | 25%                        |
| Critical raw materials & advanced materials | 7%                         | 11%                | 8%                         |
| Digital & communications technologies       | 3%                         | 25%                | 8%                         |
| Electric mobility & transport technologies  | 28%                        | 18%                | 7%                         |
| Electrical & energy equipment               | 8%                         | 44%                | 4%                         |
| Medical technologies                        | 17%                        | 13%                | 21%                        |
| Nuclear & energy technologies               | 13%                        | 4%                 | 16%                        |
| Pharmaceuticals & biotechnology             | 16%                        | 2%                 | 15%                        |
| Precision, optical & scientific instruments | 16%                        | 9%                 | 17%                        |
| Semiconductors & electronics                | 3%                         | 21%                | 5%                         |
| Specialty chemicals                         | 10%                        | 9%                 | 9%                         |

Source: authors' elaborations.

pressures on the German and Italian manufacturing sector that were discussed above, as in 2022-2024 China held a higher export share than the two European countries combined (19%). The US, on the other hand, shows the highest export shares in sectors such as “aerospace & defence related technologies” and “medical technologies”, respectively 25% and 21%. The largest gaps in China’s favour, excluding critical raw materials and advanced materials, are found in digital and communications technologies and in semiconductors and electronics. China

accounts for sizeable export shares across these broad sectors, although the unit-value analysis indicates a markedly different pattern from that of Italy, Germany and the United States. This combination of scale and broad sectoral presence makes Chinese supply particularly important across a wide range of applications. When alternative sources are limited, such concentration can expose European manufacturers to supply disruptions.

At a more granular level, the product-by-product analysis shown in Figure 9 provides a picture of both distinct and shared strengths of Italy and Germany across the strategic products considered in this study. The most striking pattern is the concentration of products for which both countries record unit values above the global benchmark, while relatively few products fall in the quadrant where both are positioned below it. As the export-share threshold increases, Germany retains a larger number of above-benchmark products than Italy, while at the same time the two countries display distinct areas of specialisation, with particularly strong German positions in pharmaceuticals and biotechnology and Italian ones in aerospace and defence-related technologies.

Many of these products, including “welding machines and apparatus”, fall in the “advanced industrial machinery and robotics” category, a sector in which Italy and Germany together account for 18% of global exports within the 270-product universe considered in this study. The coexistence of above-benchmark positioning in many of the same strategic products points to a notable degree of German-Italian co-specialisation. This helps identify product groups in which closer firm-level analysis could reveal complementary technologies, supplier relationships or specialised capabilities, and therefore potential opportunities for industrial cooperation.

In conclusion, the indicators developed in this study show that Italy and Germany remain important actors in selected segments of global value chains. They are not necessarily the largest exporters across the strategic products considered, but in many cases their exports are positioned above the global unit-value benchmark. This suggests a degree of market differentiation that may reflect technological complexity, specialised know-how, product characteristics or other attributes valued by buyers.

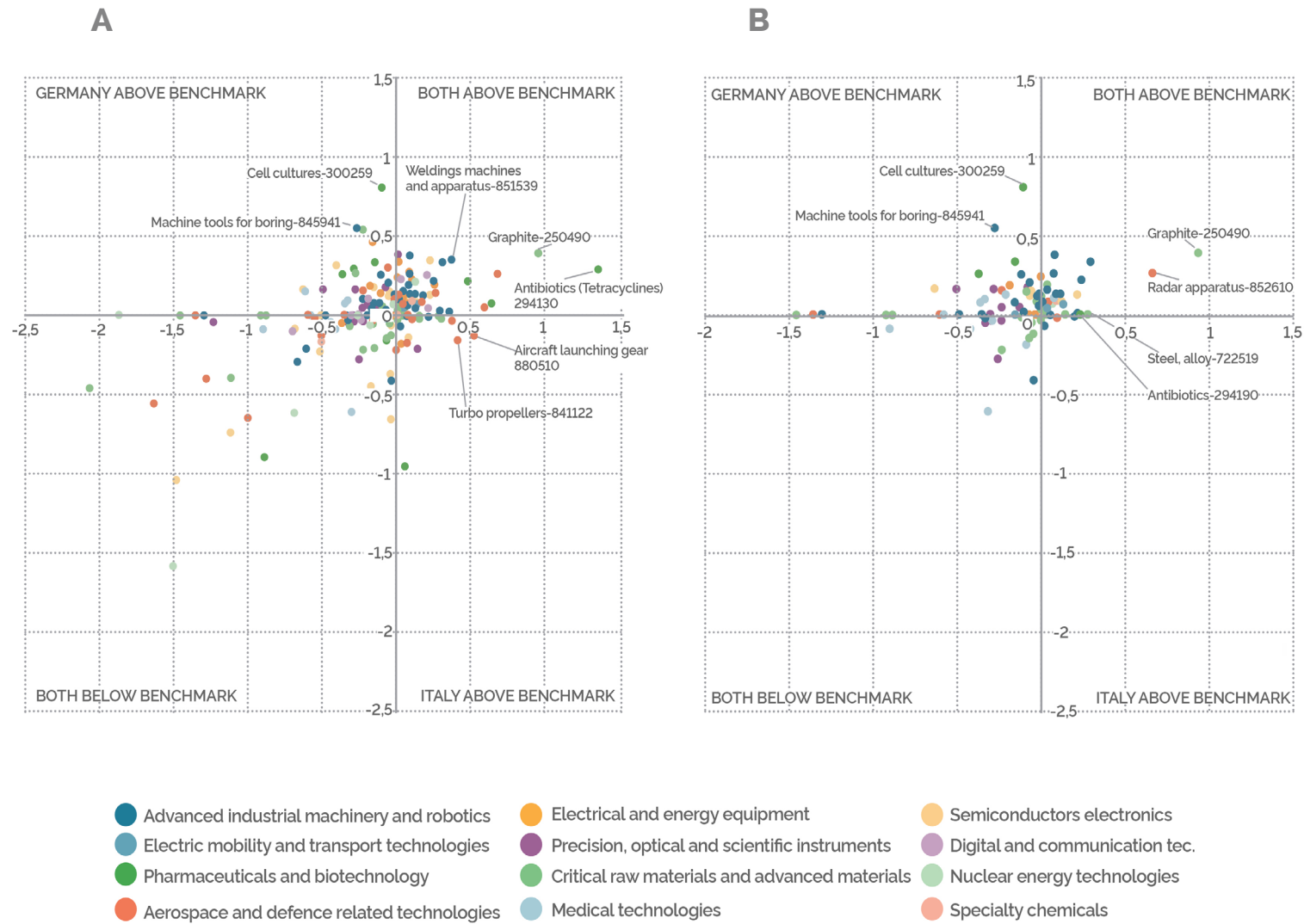
While the MPI should not be interpreted as a direct measure of product quality or substitutability, above-benchmark unit values may point to market segments in which replacement is potentially more costly or time-consuming, especially where products are highly specialised or embedded in established production processes.

These findings are particularly relevant given the structural constraints faced by Italy and Germany relative to larger competitors such as China and the United States, including smaller scale, higher energy costs and more limited access to capital. At the same time, several of the areas in which the two countries retain strong positions are characterised by high engineering intensity, technological specialisation and, in some cases, energy- or capital-intensive production. Their

competitive position therefore depends not only on manufacturing capacity, but also on specialised skills, technical know-how and after-sales services such as maintenance and integration. Preserving these capabilities will require sustained investment in human capital, technological upgrading and the industrial ecosystems that support them.

More broadly, the comparative framework developed in this study can serve as a basis for further analysis of upstream and downstream dependencies. Mapping first-, second- and eventually third-tier suppliers and customers would make it possible to assess more directly where Italian and German capabilities may generate strategic leverage, and where they remain exposed to external vulnerabilities. In an environment in which both the United States and China have shown a greater willingness to use trade restrictions and strategic supplies as instruments of economic pressure, such mapping could strengthen preparedness and help identify credible options for response and deterrence.

**FIGURE 9. GERMANY AND ITALY MARKET POSITIONING INDEX (MPI, LOGGED), EXPORT-SHARE THRESHOLDS  $\geq 2\%$  (A) AND  $10\%$  (B)**



Source: authors' elaborations.

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# LESSONS FOR BUSINESSES AND BUSINESS ASSOCIATIONS: TURNING STRENGTHS INTO ACTIONS

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The empirical analysis in Part 2 points to three practical implications, in particular to address the most critical question for Italy and Germany: where to go from here? Such implications are straightforward, but not always easy to implement. First, Italy and Germany should protect the specialised capabilities underpinning their strongest strategic market positions. Second, the concentration of German and Italian strengths in several of the same sectors creates a case for deeper mapping at the firm and sectoral level, and cooperation across the two industrial ecosystems. Third, strong export positions should not be used to play down remaining upstream vulnerabilities, because these vulnerabilities may constrain Italian and German firms precisely when their strong export positions become strategically important.

## *Lesson 1: Protect and consolidate existing strategic capabilities*

The first key lesson emerging from the analysis of Germany and Italy's market positioning for the selected set of strategic products is that strengthening resilience to external economic pressure does not necessarily require building new industrial capabilities from scratch. The analysis suggests that Germany and Italy already retain significant positions in a number of strategic products, particularly in areas such as industrial machinery, aerospace and defence-related technologies, and other specialised manufacturing segments.

Firms should therefore identify and protect the technological know-how, specialised skills, supplier relationships and production capabilities that underpin their strongest positions. Depending on the technology and the risk of imitation, this may also involve organisational choices aimed at limiting the transfer of critical know-how across production locations.<sup>24</sup>

These existing strengths could acquire greater strategic relevance, and potentially translate into economic leverage, where German or Italian firms supply inputs, enabling technologies or products that could be difficult to substitute. The empirical results point to the sectors where such economic leverage could be more likely to emerge, while acknowledging that pure market positioning or export performance alone are not sufficient indicators to determine substitutability of existing capabilities, or the extent to which these can translate into effective economic leverage.

**Key takeaway:** For businesses, it would be crucial to treat existing market positions as strategic assets, whose capabilities and underlying industrial ecosystems need to be defended and maintained. When it comes to action, businesses should map their critical technologies, specialised skills and production capacity underpinning their strongest strategic market positions, identifying areas that need to be preserved or expanded with the aim of maintaining these positions over time.

### ***Lesson 2: Connect existing industrial capabilities and ecosystems through business facilitators, such as Chambers of Commerce***

The second lesson follows directly from the first one, as it envisages actions that could be seen as natural follow-ups to the identification and protection of existing strategic capabilities. Indeed, this paper's findings highlight that greater resilience could be achieved by strengthening business-level connections across the German and Italian industrial ecosystems.

In this regard, the role of business associations becomes especially crucial as their mission as facilitators places them in a unique position to connect firms and expertise across the two countries. Chambers of Commerce could use the strategic sectors and products identified in this study to select a limited number of “priority” value chains for bilateral mapping. Within these areas, they could identify relevant firms, distinguish competitors from potential suppliers and technology partners, and organise targeted exchanges around concrete industrial needs. This would allow cooperation initiatives to focus on identifiable gaps or complementarities rather than on broad sector-level matchmaking.

These activities also necessarily rely on improving firm-level information collection and sharing through the system of Chambers of Commerce, which could use these insights to provide more targeted and strategically informed matchmaking services, connecting firms on the basis of their specific capabilities, synergies, and needs.

**Key takeaway:** Businesses should establish regular firm-level mapping of critical supply-chain and export-market dependencies, identifying single-source exposures, difficult-to-substitute inputs and highly concentrated destination markets. Chambers of Commerce could provide support in this process through the creation and dissemination of standardised, comparable and confidential information collection and sharing mechanisms, as well as periodic vulnerability assessments, in order to help firms identify potential bottlenecks and develop alternative sourcing and strategies before disruptions occur.

### ***Lesson 3: Prepare for the unexpected***

The third and last lesson concerns the need to look beyond strong market positions and understand the vulnerabilities and specific exposures that may lie beneath them. The ability of German and Italian firms to produce and compete internationally often depends, in turn, on access to critical inputs, components and services sourced abroad. In an environment in which trade relations are increasingly affected by geopolitical tensions and sudden disruptions, knowledge and awareness of these dependencies become crucial in the effort of building business preparedness.

This requires more than aggregate statistics. Rather, it calls for regular and risk-based firm-level monitoring of supply and export chains. Businesses are often directly exposed to economic coercion and geopolitical disruption, but they are also best placed to identify the dependencies that aggregate trade statistics cannot capture. This includes identifying critical inputs and suppliers, assessing the concentration of key export markets, and determining whether credible alternatives exist, how quickly they could be activated and at what cost.

Firms should periodically identify the inputs, suppliers and destination markets whose disruption would have the greatest operational impact for them, concentrating more detailed analysis on exposures that combine high concentration with difficult substitution. Such information would make it possible to distinguish ordinary commercial dependencies from potential bottlenecks capable of disrupting broader strategic value chains.

Chambers of Commerce and business associations could support this process by developing standardised templates that allow firms to assess their exposures on a comparable basis. Importantly, where information is aggregated across firms, appropriate confidentiality and data-governance safeguards would be necessary to ensure that commercially sensitive information is not disclosed. Aggregated and anonymised results could then be used to identify vulnerabilities shared across sectors or value chains that may not be visible to individual firms.

**Key takeaway:** Building on the strategic sectors identified in the analysis, Chambers of Commerce and business associations could establish sector-specific German-Italian cooperation initiatives, bringing together firms with complementary technologies, production capabilities and specialised know-how. Rather than focusing exclusively on business matchmaking, these platforms could facilitate structured information sharing across the two industrial ecosystems and help identify opportunities for joint industrial projects, technological partnerships and investments aimed at strengthening specific strategic value chains.

## ANNEX - Strategic products and sectors

| HS6 Product code | Description                                                                                                                                                                                                | Strategic sector                            |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 250410           | Graphite: natural, in powder or in flakes                                                                                                                                                                  | Critical raw materials & advanced materials |
| 250490           | Graphite: natural, in other forms, excluding powder or flakes                                                                                                                                              | Critical raw materials & advanced materials |
| 260500           | Cobalt ores and concentrates                                                                                                                                                                               | Critical raw materials & advanced materials |
| 261210           | Uranium ores and concentrates                                                                                                                                                                              | Nuclear & energy technologies               |
| 261220           | Thorium ores and concentrates                                                                                                                                                                              | Nuclear & energy technologies               |
| 280461           | Silicon: containing by weight not less than 99.99% of silicon                                                                                                                                              | Critical raw materials & advanced materials |
| 280530           | Earth-metals, rare: scandium and yttrium, whether or not intermixed or interalloyed                                                                                                                        | Critical raw materials & advanced materials |
| 281111           | Hydrogen fluoride (hydrofluoric acid)                                                                                                                                                                      | Specialty chemicals                         |
| 282200           | Cobalt oxides and hydroxides: commercial cobalt oxides                                                                                                                                                     | Critical raw materials & advanced materials |
| 282520           | Lithium oxide and hydroxide                                                                                                                                                                                | Critical raw materials & advanced materials |
| 283691           | Carbonates: lithium carbonate                                                                                                                                                                              | Critical raw materials & advanced materials |
| 284410           | Uranium: natural uranium and its compounds, alloys, dispersions (including cermets), ceramic products and mixtures containing natural uranium or natural uranium compounds                                 | Nuclear & energy technologies               |
| 284420           | Uranium: enriched in U235, plutonium, their compounds, alloys dispersions (including cermets), ceramic products and mixtures containing uranium enriched in U235, plutonium or compounds of these products | Nuclear & energy technologies               |
| 284430           | Uranium: depleted in U235, thorium, their compounds, alloys, dispersions (including cermets), ceramic products and mixtures containing uranium depleted in U235, thorium: compounds of these products      | Nuclear & energy technologies               |
| 284450           | Spent (irradiated) fuel elements (cartridges) of nuclear reactors                                                                                                                                          | Nuclear & energy technologies               |
| 284690           | Compounds, inorganic or organic (excluding cerium), of rare-earth metals, of yttrium, scandium or of mixtures of these metals                                                                              | Critical raw materials & advanced materials |
| 284920           | Carbides: of silicon, whether or not chemically defined                                                                                                                                                    | Critical raw materials & advanced materials |
| 294110           | Antibiotics: penicillins and their derivatives with a penicillanic acid structure: salts thereof                                                                                                           | Pharmaceuticals & biotechnology             |

|        |                                                                                                                                                                                           |                                 |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| 294120 | Antibiotics: streptomycins and their derivatives: salts thereof                                                                                                                           | Pharmaceuticals & biotechnology |
| 294130 | Antibiotics: tetracyclines and their derivatives: salts thereof                                                                                                                           | Pharmaceuticals & biotechnology |
| 294140 | Antibiotics: chloramphenicol and its derivatives: salts thereof                                                                                                                           | Pharmaceuticals & biotechnology |
| 294150 | Antibiotics: erythromycin and its derivatives: salts thereof                                                                                                                              | Pharmaceuticals & biotechnology |
| 294190 | Antibiotics: n.e.c. in heading no. 2941                                                                                                                                                   | Pharmaceuticals & biotechnology |
| 300212 | Blood, human or animal, antisera, other blood fractions and immunological products: antisera and other blood fractions                                                                    | Pharmaceuticals & biotechnology |
| 300213 | Blood, human or animal, antisera, other blood fractions and immunological products: immunological products, unmixed, not put up in measured doses or in forms or packings for retail sale | Pharmaceuticals & biotechnology |
| 300214 | Blood, human or animal, antisera, other blood fractions and immunological products: immunological products, mixed, put up in measured doses or in forms or packings for retail sale       | Pharmaceuticals & biotechnology |
| 300215 | Blood, human or animal, antisera, other blood fractions and immunological products: immunological products, put up in measured doses or in forms or packings for retail sale              | Pharmaceuticals & biotechnology |
| 300241 | Vaccines, toxins, cultures of micro-organisms (excluding yeasts) and similar products: for human medicine                                                                                 | Pharmaceuticals & biotechnology |
| 300242 | Vaccines, toxins, cultures of micro-organisms (excluding yeasts) and similar products: for veterinary medicine                                                                            | Pharmaceuticals & biotechnology |
| 300249 | Toxins, cultures of micro-organisms (excluding yeasts) and similar products: n.e.c. in item 3002.3                                                                                        | Pharmaceuticals & biotechnology |
| 300251 | Cell cultures, whether or not modified: cell therapy products                                                                                                                             | Pharmaceuticals & biotechnology |
| 300259 | Cell cultures, whether or not modified: other cell cultures not including cell therapy products                                                                                           | Pharmaceuticals & biotechnology |
| 300290 | Toxins, cultures of micro-organisms (excluding yeasts) and similar products                                                                                                               | Pharmaceuticals & biotechnology |
| 370710 | Photographic goods: sensitised emulsions, put up in measured portions or put up for retail sale in a form ready for use                                                                   | Specialty chemicals             |
| 370790 | Photographic goods: chemical preparations other than sensitised emulsions, put up in measured portions or put up for retail sale in a form ready for use                                  | Specialty chemicals             |

|        |                                                                                                                                                                                                                                                           |                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 380110 | Graphite: artificial                                                                                                                                                                                                                                      | Critical raw materials & advanced materials |
| 380120 | Graphite: colloidal or semi-colloidal                                                                                                                                                                                                                     | Critical raw materials & advanced materials |
| 380190 | Graphite or other carbon based preparations: in the form of pastes, blocks, plates or other semi-manufactures                                                                                                                                             | Critical raw materials & advanced materials |
| 381800 | Chemical elements: doped for use in electronics, in the form of discs, wafers or similar forms: chemical compounds doped for use in electronics                                                                                                           | Semiconductors & electronics                |
| 382100 | Prepared culture media for the development or maintenance of micro-organisms (including viruses and the like) or of plant, human or animal cells                                                                                                          | Pharmaceuticals & biotechnology             |
| 382211 | Reagents: diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents whether or not on a backing, whether or not put up in the form of kits: for malaria                                                                  | Medical technologies                        |
| 382212 | Reagents: diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents whether or not on a backing, whether or not put up in the form of kits: for zika and other diseases transmitted by mosquitoes of the genus Aedes     | Medical technologies                        |
| 382213 | Reagents: diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents whether or not on a backing, whether or not put up in the form of kits: for blood grouping                                                           | Medical technologies                        |
| 382219 | Reagents: diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents whether or not on a backing, whether or not put up in the form of kits: n.e.c.in item 3822.1                                                         | Medical technologies                        |
| 382290 | Reagents: diagnostic or laboratory reagents on a backing, prepared diagnostic or laboratory reagents whether or not on a backing, or put up in the form of kits, other than those of heading 30.06: certified reference materials, n.e.c. in heading 3822 | Medical technologies                        |
| 390730 | Epoxide resins: in primary forms                                                                                                                                                                                                                          | Specialty chemicals                         |
| 711011 | Metals: platinum, unwrought or in powder form                                                                                                                                                                                                             | Critical raw materials & advanced materials |
| 711019 | Metals: platinum, semi-manufactured                                                                                                                                                                                                                       | Critical raw materials & advanced materials |
| 711021 | Metals: palladium, unwrought or in powder form                                                                                                                                                                                                            | Critical raw materials & advanced materials |
| 711029 | Metals: palladium, semi-manufactured                                                                                                                                                                                                                      | Critical raw materials & advanced materials |
| 711041 | Metals: iridium, osmium, ruthenium, unwrought or in powder form                                                                                                                                                                                           | Critical raw materials & advanced materials |
| 711049 | Metals: iridium, osmium, ruthenium, semi-manufactured                                                                                                                                                                                                     | Critical raw materials & advanced materials |

|        |                                                                                                                               |                                             |
|--------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 722511 | Steel, alloy: flat-rolled, width 600mm or more, of silicon-electrical steel, grain-oriented                                   | Critical raw materials & advanced materials |
| 722519 | Steel, alloy: flat-rolled, width 600mm or more, of silicon-electrical steel, (other than grain-oriented)                      | Critical raw materials & advanced materials |
| 722611 | Steel, alloy: flat-rolled, width less than 600mm, of silicon-electrical steel, grain-oriented                                 | Critical raw materials & advanced materials |
| 722619 | Steel, alloy: flat-rolled, width less than 600mm, of silicon-electrical steel, other than grain-oriented                      | Critical raw materials & advanced materials |
| 750110 | Nickel: nickel mattes                                                                                                         | Critical raw materials & advanced materials |
| 750120 | Nickel: oxide sinters and other intermediate products of nickel metallurgy                                                    | Critical raw materials & advanced materials |
| 750210 | Nickel: unwrought, not alloyed                                                                                                | Critical raw materials & advanced materials |
| 750220 | Nickel: unwrought, alloys                                                                                                     | Critical raw materials & advanced materials |
| 750300 | Nickel: waste and scrap                                                                                                       | Critical raw materials & advanced materials |
| 750400 | Nickel: powders and flakes                                                                                                    | Critical raw materials & advanced materials |
| 750511 | Nickel: bars, rods and profiles, not alloyed                                                                                  | Critical raw materials & advanced materials |
| 750512 | Nickel: bars, rods and profiles, of nickel alloys                                                                             | Critical raw materials & advanced materials |
| 750521 | Nickel: wire, not alloyed                                                                                                     | Critical raw materials & advanced materials |
| 750522 | Nickel: wire, of nickel alloys                                                                                                | Critical raw materials & advanced materials |
| 750610 | Nickel: plates, sheets, strip and foil, not alloyed                                                                           | Critical raw materials & advanced materials |
| 750620 | Nickel: plates, sheets, strip and foil, of nickel alloys                                                                      | Critical raw materials & advanced materials |
| 750711 | Nickel: tubes and pipes, not alloyed                                                                                          | Critical raw materials & advanced materials |
| 750712 | Nickel: tubes and pipes, of nickel alloys                                                                                     | Critical raw materials & advanced materials |
| 750720 | Nickel: tube and pipe fittings                                                                                                | Critical raw materials & advanced materials |
| 750810 | Nickel: cloth, grill and netting, of nickel wire                                                                              | Critical raw materials & advanced materials |
| 750890 | Nickel: articles thereof n.e.c. in item no. 7508.1                                                                            | Critical raw materials & advanced materials |
| 810411 | Magnesium: unwrought, containing at least 99.8% by weight of magnesium                                                        | Critical raw materials & advanced materials |
| 810419 | Magnesium: unwrought, containing less than 99.8% by weight of magnesium                                                       | Critical raw materials & advanced materials |
| 810430 | Magnesium: raspings, turnings and granules, graded according to size, powders                                                 | Critical raw materials & advanced materials |
| 810520 | Cobalt: mattes and other intermediate products of cobalt metallurgy, unwrought cobalt, powders                                | Critical raw materials & advanced materials |
| 810590 | Cobalt: articles n.e.c. in heading no. 8105                                                                                   | Critical raw materials & advanced materials |
| 811241 | Rhenium and articles thereof: unwrought, powders, waste and scrap                                                             | Critical raw materials & advanced materials |
| 811249 | Rhenium and articles thereof: wrought, other than powders, waste and scrap                                                    | Critical raw materials & advanced materials |
| 811292 | Gallium, germanium, indium, niobium (columbium) and vanadium: articles thereof, unwrought, including waste and scrap, powders | Critical raw materials & advanced materials |

|        |                                                                                                                                                         |                                             |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| 811299 | Gallium, germanium, indium, niobium (columbium) and vanadium: articles thereof, other than unwrought including waste and scrap and powders              | Critical raw materials & advanced materials |
| 840110 | Nuclear reactors                                                                                                                                        | Nuclear & energy technologies               |
| 840120 | Machinery and apparatus: for isotopic separation, and parts thereof                                                                                     | Nuclear & energy technologies               |
| 840130 | Fuel elements (cartridges): non-irradiated                                                                                                              | Nuclear & energy technologies               |
| 840140 | Nuclear reactors: parts thereof                                                                                                                         | Nuclear & energy technologies               |
| 841111 | Turbo-jets: of a thrust not exceeding 25kN                                                                                                              | Aerospace & defence-related technologies    |
| 841112 | Turbo-jets: of a thrust exceeding 25kN                                                                                                                  | Aerospace & defence-related technologies    |
| 841121 | Turbo-propellers: of a power not exceeding 1100kW                                                                                                       | Aerospace & defence-related technologies    |
| 841122 | Turbo-propellers: of a power exceeding 1100kW                                                                                                           | Aerospace & defence-related technologies    |
| 841182 | Turbines: gas-turbines (excluding turbo-jets and turbo-propellers), of a power exceeding 5000kW                                                         | Nuclear & energy technologies               |
| 841191 | Turbines: parts of turbo-jets and turbo-propellers                                                                                                      | Aerospace & defence-related technologies    |
| 841199 | Turbines: parts of gas turbines (excluding turbo-jets and turbo-propellers)                                                                             | Nuclear & energy technologies               |
| 841410 | Pumps: vacuum                                                                                                                                           | Advanced industrial machinery & robotics    |
| 841480 | Pumps and compressors: for air, vacuum or gas, n.e.c. in heading no. 8414                                                                               | Advanced industrial machinery & robotics    |
| 841490 | Pumps and compressors: parts, of air or vacuum pumps, air or other gas compressors and fans, ventilating or recycling hoods incorporating a fan         | Advanced industrial machinery & robotics    |
| 841989 | Machinery, plant and laboratory equipment: for treating materials by change of temperature, other than for making hot drinks or cooking or heating food | Advanced industrial machinery & robotics    |
| 841990 | Machinery, plant and laboratory equipment: parts of equipment for treating materials by a process involving a change of temperature                     | Advanced industrial machinery & robotics    |
| 842870 | Industrial robots                                                                                                                                       | Advanced industrial machinery & robotics    |
| 843031 | Coal or rock cutters and tunnelling machinery: self-propelled                                                                                           | Advanced industrial machinery & robotics    |
| 843039 | Coal or rock cutters and tunnelling machinery: not self-propelled                                                                                       | Advanced industrial machinery & robotics    |
| 843041 | Boring or sinking machinery: self-propelled, n.e.c. in heading no. 8430                                                                                 | Advanced industrial machinery & robotics    |
| 843049 | Boring and sinking machinery: not self-propelled                                                                                                        | Advanced industrial machinery & robotics    |
| 843143 | Boring or sinking machinery: parts for boring or sinking machinery of subheading 8430.41 or 8430.49                                                     | Advanced industrial machinery & robotics    |
| 845611 | Machine-tools: for working any material by removal of material: operated by laser                                                                       | Advanced industrial machinery & robotics    |

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| 845612 | Machine-tools: for working any material by removal of material: operated by other light or photon beam processes (not laser) | Advanced industrial machinery & robotics |
| 845620 | Machine-tools: for working any material by removal of material, operated by ultrasonic processes                             | Advanced industrial machinery & robotics |
| 845630 | Machine-tools: for working any material by removal of material, operated by electro-discharge processes                      | Advanced industrial machinery & robotics |
| 845640 | Machine tools: for working any material by removal of material: operated by plasma arc processes:                            | Advanced industrial machinery & robotics |
| 845710 | Machining centres: for working metal                                                                                         | Advanced industrial machinery & robotics |
| 845811 | Lathes: for removing metal, horizontal, numerically controlled                                                               | Advanced industrial machinery & robotics |
| 845819 | Lathes: for removing metal, horizontal, other than numerically controlled                                                    | Advanced industrial machinery & robotics |
| 845891 | Lathes: for removing metal, numerically controlled, other than horizontal lathes                                             | Advanced industrial machinery & robotics |
| 845899 | Lathes: for removing metal, other than horizontal or numerically controlled lathes                                           | Advanced industrial machinery & robotics |
| 845921 | Machine-tools: for drilling by removing metal, numerically controlled                                                        | Advanced industrial machinery & robotics |
| 845929 | Machine-tools: for drilling by removing metal, other than numerically controlled                                             | Advanced industrial machinery & robotics |
| 845931 | Machine-tools: for boring-milling by removing metal, numerically controlled                                                  | Advanced industrial machinery & robotics |
| 845939 | Machine-tools: for boring-milling by removing metal, other than numerically controlled                                       | Advanced industrial machinery & robotics |
| 845941 | Machine-tools: for boring by removing metal, numerically controlled boring machines, n.e.c. in heading 8459                  | Advanced industrial machinery & robotics |
| 845949 | Machine-tools: for boring by removing metal, not numerically controlled boring machines, n.e.c. in heading 8459              | Advanced industrial machinery & robotics |
| 845951 | Machine-tools: for milling by removing metal, knee-type, numerically controlled                                              | Advanced industrial machinery & robotics |
| 845959 | Machine-tools: for milling by removing metal, knee-type, other than numerically controlled                                   | Advanced industrial machinery & robotics |
| 845961 | Machine-tools: for milling by removing metal, (not knee-type), numerically controlled                                        | Advanced industrial machinery & robotics |
| 845969 | Machine-tools: for milling by removing metal, not knee-type, other than numerically controlled                               | Advanced industrial machinery & robotics |
| 846012 | Machine-tools: flat-surface grinding machines, numerically controlled                                                        | Advanced industrial machinery & robotics |
| 846019 | Machine-tools: flat-surface grinding machines, other than numerically controlled                                             | Advanced industrial machinery & robotics |

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| 846022 | Machine-tools: grinding machines (excluding flat-surface), centreless, numerically controlled                                                                                                                                                          | Advanced industrial machinery & robotics |
| 846023 | Machine-tools: cylindrical grinding machines (excluding flat-surface and centreless), numerically controlled                                                                                                                                           | Advanced industrial machinery & robotics |
| 846024 | Machine-tools: grinding machines (excluding flat-surface, cylindrical and centreless), numerically controlled                                                                                                                                          | Advanced industrial machinery & robotics |
| 846029 | Machine-tools: grinding machines (excluding flat-surface), other than numerically controlled                                                                                                                                                           | Advanced industrial machinery & robotics |
| 846031 | Machine-tools: sharpening (tool or cutter grinding) machines, numerically controlled                                                                                                                                                                   | Advanced industrial machinery & robotics |
| 846039 | Machine-tools: sharpening (tool or cutter grinding) machines, other than numerically controlled                                                                                                                                                        | Advanced industrial machinery & robotics |
| 846222 | Machine-tools: bending, folding, straightening or flattening machines (including press brakes) for flat products, for working metal, numerically controlled                                                                                            | Advanced industrial machinery & robotics |
| 846223 | Machine-tools: bending, folding, straightening or flattening machines (including presses), for working metal, numerically controlled press brakes                                                                                                      | Advanced industrial machinery & robotics |
| 846224 | Machine-tools: bending, folding, straightening or flattening machines (including presses), for working metal, numerically controlled panel benders                                                                                                     | Advanced industrial machinery & robotics |
| 846225 | Machine-tools: bending, folding, straightening or flattening machines (including presses), for working metal, numerically controlled roll forming machines                                                                                             | Advanced industrial machinery & robotics |
| 846226 | Machine-tools: bending, folding, straightening or flattening machines (including presses), for working metal, numerically controlled bending, folding, straightening or flattening machines (not press brakes, panel benders or roll forming machines) | Advanced industrial machinery & robotics |
| 846229 | Machine-tools: bending, folding, straightening or flattening machines (including press brakes), for working metal, numerically controlled n.e.c. in item 84.62.2                                                                                       | Advanced industrial machinery & robotics |
| 846233 | Machine-tools: shearing machines (excluding presses) for flat products, numerically controlled, other than combined punching and shearing machines, for working metal                                                                                  | Advanced industrial machinery & robotics |
| 846239 | Machine-tools: shearing machines (excluding presses) for flat products, other than numerically controlled, other than combined punching and shearing machines, for working metal                                                                       | Advanced industrial machinery & robotics |

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| 846242 | Machine-tools: punching, notching or nibbling machines (excluding presses) for flat products including combined punching and shearing machines, numerically controlled, for working metal                                                          | Advanced industrial machinery & robotics |
| 846249 | Machine-tools: punching, notching or nibbling machines (excluding presses) for flat products including combined punching and shearing machines, other than numerically controlled, for working metal                                               | Advanced industrial machinery & robotics |
| 846251 | Machine-tools: for working tube, pipe, hollow section and bar (excluding presses), for working metal, numerically controlled                                                                                                                       | Advanced industrial machinery & robotics |
| 846259 | Machine-tools: for working tube, pipe, hollow section and bar (excluding presses), for working metal, not numerically controlled                                                                                                                   | Advanced industrial machinery & robotics |
| 846520 | Machine-tools: for working wood, cork, bone, hard rubber, hard plastics or similar hard materials: machining centres                                                                                                                               | Advanced industrial machinery & robotics |
| 847141 | Automatic data processing machines: comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined, n.e.c. in item no. 8471.30                                                            | Digital & communications technologies    |
| 847149 | Automatic data processing machines: presented in the form of systems, n.e.c. in item no. 8471.30 or 8471.41                                                                                                                                        | Digital & communications technologies    |
| 847150 | Units of automatic data processing machines: processing units other than those of item no. 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units | Digital & communications technologies    |
| 847170 | Units of automatic data processing machines: storage units                                                                                                                                                                                         | Digital & communications technologies    |
| 847521 | Machines: for manufacturing or hot working glass or glassware, for making optical fibres and preforms thereof                                                                                                                                      | Advanced industrial machinery & robotics |
| 847950 | Machinery and mechanical appliances: industrial robots, n.e.c. or included                                                                                                                                                                         | Advanced industrial machinery & robotics |
| 848510 | Machines for additive manufacturing: by metal deposit                                                                                                                                                                                              | Advanced industrial machinery & robotics |
| 848520 | Machines for additive manufacturing: by plastic or rubber deposit                                                                                                                                                                                  | Advanced industrial machinery & robotics |
| 848530 | Machines for additive manufacturing: by plaster, cement, ceramics or glass deposit                                                                                                                                                                 | Advanced industrial machinery & robotics |

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| 848580 | Machines for additive manufacturing: by other than metal, plastic, rubber, plaster, cement, ceramics or glass deposits                                                                                                                                    | Advanced industrial machinery & robotics |
| 848590 | Machines for additive manufacturing: parts                                                                                                                                                                                                                | Advanced industrial machinery & robotics |
| 848610 | Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor boules or wafers                                                                                                                                         | Semiconductors & electronics             |
| 848620 | Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor devices or of electronic integrated circuits                                                                                                             | Semiconductors & electronics             |
| 848630 | Machines and apparatus of a kind used solely or principally for the manufacture of flat panel displays                                                                                                                                                    | Semiconductors & electronics             |
| 848640 | Machines and apparatus of a kind used solely or principally for the manufacture or repair of masks and reticles, assembling semiconductor devices or electronic integrated circuits, or for lifting, handling, loading or unloading items of heading 8486 | Semiconductors & electronics             |
| 848690 | Machines and apparatus of heading 8486: parts and accessories                                                                                                                                                                                             | Semiconductors & electronics             |
| 850421 | Electrical transformers: liquid dielectric, having a power handling capacity not exceeding 650kVA                                                                                                                                                         | Electrical & energy equipment            |
| 850422 | Electrical transformers: liquid dielectric, having a power handling capacity exceeding 650kVA but not exceeding 10,000kVA                                                                                                                                 | Electrical & energy equipment            |
| 850423 | Electrical transformers: liquid dielectric, having a power handling capacity exceeding 10,000kVA                                                                                                                                                          | Electrical & energy equipment            |
| 850431 | Electrical transformers: n.e.c. in item no. 8504.2, having a power handling capacity not exceeding 1kVA                                                                                                                                                   | Electrical & energy equipment            |
| 850432 | Transformers: n.e.c. in item no. 8504.2, having a power handling capacity exceeding 1kVA but not exceeding 16kVA                                                                                                                                          | Electrical & energy equipment            |
| 850433 | Transformers: n.e.c. in item no. 8504.2, having a power handling capacity exceeding 16kVA but not exceeding 500kVA                                                                                                                                        | Electrical & energy equipment            |
| 850434 | Transformers: n.e.c. in item no. 8504.2, having a power handling capacity exceeding 500kVA                                                                                                                                                                | Electrical & energy equipment            |
| 850440 | Electrical static converters                                                                                                                                                                                                                              | Electrical & energy equipment            |
| 850490 | Electrical transformers, static converters and inductors: parts thereof                                                                                                                                                                                   | Electrical & energy equipment            |
| 850511 | Magnets: permanent magnets and articles intended to become permanent magnets after magnetisation, of metal                                                                                                                                                | Electrical & energy equipment            |

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| 850519 | Magnets: permanent magnets and articles intended to become permanent magnets after magnetisation, other than of metal                                                                                                  | Electrical & energy equipment            |
| 850650 | Cells and batteries: primary, lithium                                                                                                                                                                                  | Electrical & energy equipment            |
| 850760 | Electric accumulators: lithium-ion, including separators, whether or not rectangular (including square)                                                                                                                | Electrical & energy equipment            |
| 850790 | Electric accumulators: parts n.e.c. in heading no. 8507                                                                                                                                                                | Electrical & energy equipment            |
| 851419 | Furnaces and ovens: electric, for industrial or laboratory use, resistance heated: other than hot isostatic presses, for the manufacture of semiconductor devices on semiconductor wafers                              | Semiconductors & electronics             |
| 851432 | Furnaces and ovens: electric, for industrial or laboratory use, other than those functioning by induction, dielectric loss or resistance heated, plasma and vacuum arc furnaces                                        | Advanced industrial machinery & robotics |
| 851439 | Furnaces and ovens: electric, for industrial or laboratory use, other than those functioning by induction, dielectric loss or resistance heated, other than electron beam, plasma or vacuum arc furnaces               | Advanced industrial machinery & robotics |
| 851531 | Welding machines and apparatus: for arc (including plasma arc) welding of metals, fully or partly automatic, whether or not capable of cutting                                                                         | Advanced industrial machinery & robotics |
| 851539 | Welding machines and apparatus: for arc (including plasma arc) welding of metals, other than fully or partly automatic, whether or not capable of cutting                                                              | Advanced industrial machinery & robotics |
| 851761 | Base stations                                                                                                                                                                                                          | Digital & communications technologies    |
| 851762 | Communication apparatus (excluding telephone sets or base stations): machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus | Digital & communications technologies    |
| 852351 | Semiconductor media: solid-state non-volatile storage devices, whether or not recorded, excluding products of Chapter 37                                                                                               | Digital & communications technologies    |
| 852352 | Semiconductor media: smart cards, whether or not recorded, excluding products of Chapter 37                                                                                                                            | Digital & communications technologies    |
| 852359 | Semiconductor media: other than smart cards, whether or not recorded, excluding products of Chapter 37                                                                                                                 | Digital & communications technologies    |
| 852610 | Radar apparatus                                                                                                                                                                                                        | Aerospace & defence-related technologies |
| 852691 | Radio navigational aid apparatus                                                                                                                                                                                       | Aerospace & defence-related technologies |
| 852692 | Radio remote control apparatus                                                                                                                                                                                         | Aerospace & defence-related technologies |

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| 853521 | Electrical apparatus: automatic circuit breakers, for a voltage exceeding 1000 volts but less than 72.5kV                                                                                          | Electrical & energy equipment         |
| 853529 | Electrical apparatus: automatic circuit breakers, for a voltage of 72.5kV or more                                                                                                                  | Electrical & energy equipment         |
| 853530 | Electrical apparatus: isolating and make-and-break switches, for a voltage exceeding 1000 volts                                                                                                    | Electrical & energy equipment         |
| 853540 | Electrical apparatus: lightning arresters, voltage limiters and surge suppressors (for a voltage exceeding 1000 volts)                                                                             | Electrical & energy equipment         |
| 853590 | Electrical apparatus: n.e.c. in heading no. 8535, for switching or protecting electrical circuits, for a voltage exceeding 1000 volts                                                              | Electrical & energy equipment         |
| 853670 | Connectors for optical fibres, optical fibre bundles or cables                                                                                                                                     | Digital & communications technologies |
| 853720 | Boards, panels, consoles, desks and other bases: for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage exceeding 1000 volts | Electrical & energy equipment         |
| 854110 | Electrical apparatus: diodes, other than photosensitive or light-emitting diodes (LED)                                                                                                             | Semiconductors & electronics          |
| 854121 | Electrical apparatus: transistors, (other than photosensitive), with a dissipation rate of less than 1W                                                                                            | Semiconductors & electronics          |
| 854129 | Electrical apparatus: transistors, (other than photosensitive), with a dissipation rate of 1W or more                                                                                              | Semiconductors & electronics          |
| 854130 | Electrical apparatus: thyristors, diacs and triacs, other than photosensitive devices                                                                                                              | Semiconductors & electronics          |
| 854141 | Electrical apparatus: photosensitive semiconductor devices, light emitting diodes (LED)                                                                                                            | Semiconductors & electronics          |
| 854142 | Electrical apparatus: photosensitive semiconductor devices, photovoltaic cells not assembled in modules or made up into panels                                                                     | Semiconductors & electronics          |
| 854143 | Electrical apparatus: photosensitive semiconductor devices, photovoltaic cells assembled in modules or made up into panels                                                                         | Semiconductors & electronics          |
| 854149 | Electrical apparatus: photosensitive semiconductor devices, diodes other than light emitting diodes and photovoltaic cells whether or not assembled in modules or made up into panels              | Semiconductors & electronics          |
| 854151 | Electrical apparatus: photosensitive semiconductor devices, semiconductor-based transducers                                                                                                        | Semiconductors & electronics          |
| 854159 | Electrical apparatus: photosensitive semiconductor devices n.e.c. in heading no. 8541                                                                                                              | Semiconductors & electronics          |
| 854160 | Crystals: mounted piezo-electric                                                                                                                                                                   | Semiconductors & electronics          |

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| 854190 | Electrical apparatus: parts for diodes, transistors and similar semiconductor devices and photosensitive semiconductor devices                                                                                  | Semiconductors & electronics               |
| 854231 | Electronic integrated circuits: processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits                         | Semiconductors & electronics               |
| 854232 | Electronic integrated circuits: memories                                                                                                                                                                        | Semiconductors & electronics               |
| 854233 | Electronic integrated circuits: amplifiers                                                                                                                                                                      | Semiconductors & electronics               |
| 854239 | Electronic integrated circuits: n.e.c. in heading no. 8542                                                                                                                                                      | Semiconductors & electronics               |
| 854290 | Parts of electronic integrated circuits                                                                                                                                                                         | Semiconductors & electronics               |
| 854470 | Insulated electric conductors: optical fibre cables                                                                                                                                                             | Digital & communications technologies      |
| 870360 | Vehicles: with both spark-ignition internal combustion piston engine and electric motor for propulsion, capable of being charged by plugging to external source of electric power                               | Electric mobility & transport technologies |
| 870370 | Vehicles: with both compression-ignition internal combustion piston engine (diesel or semi-diesel) and electric motor for propulsion, capable of being charged by plugging to external source of electric power | Electric mobility & transport technologies |
| 870380 | Vehicles: with only electric motor for propulsion                                                                                                                                                               | Electric mobility & transport technologies |
| 880100 | Balloons and dirigibles: gliders, hang gliders and other non-powered aircraft.                                                                                                                                  | Aerospace & defence-related technologies   |
| 880211 | Helicopters, except unmanned: of an unladen weight not exceeding 2000kg                                                                                                                                         | Aerospace & defence-related technologies   |
| 880212 | Helicopters, except unmanned: of an unladen weight exceeding 2000kg                                                                                                                                             | Aerospace & defence-related technologies   |
| 880220 | Aeroplanes and other aircraft, except unmanned: of an unladen weight not exceeding 2000kg                                                                                                                       | Aerospace & defence-related technologies   |
| 880230 | Aeroplanes and other aircraft, except unmanned: of an unladen weight exceeding 2000kg but not exceeding 15,000kg                                                                                                | Aerospace & defence-related technologies   |
| 880240 | Aeroplanes and other aircraft, except unmanned: of an unladen weight exceeding 15,000kg                                                                                                                         | Aerospace & defence-related technologies   |
| 880260 | Spacecraft: (including satellites) and suborbital and spacecraft launch vehicles                                                                                                                                | Aerospace & defence-related technologies   |
| 880510 | Aircraft launching gear, deck-arrestor or similar gear and parts thereof                                                                                                                                        | Aerospace & defence-related technologies   |
| 880521 | Ground flying trainers and parts thereof: air combat simulators and parts thereof                                                                                                                               | Aerospace & defence-related technologies   |
| 880529 | Ground flying trainers and parts thereof: other than air combat simulators and parts thereof                                                                                                                    | Aerospace & defence-related technologies   |

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| 880610 | Unmanned aircraft: for carriage of passengers                                                                                                                               | Aerospace & defence-related technologies |
| 880621 | Unmanned aircraft: for remote-controlled flight only, for other than for carriage of passengers, with the maximum take-off weight of not more than 250g                     | Aerospace & defence-related technologies |
| 880622 | Unmanned aircraft: for remote-controlled flight only, for other than for carriage of passengers, with the maximum take-off weight of more than 250g but not more than 7kg   | Aerospace & defence-related technologies |
| 880623 | Unmanned aircraft: for remote-controlled flight only, for other than for carriage of passengers, with the maximum take-off weight of more than 7kg but not more than 25kg   | Aerospace & defence-related technologies |
| 880624 | Unmanned aircraft: for remote-controlled flight only, for other than for carriage of passengers, with the maximum take-off weight of more than 25kg but not more than 150kg | Aerospace & defence-related technologies |
| 880629 | Unmanned aircraft: for remote-controlled flight only, for other than for carriage of passengers, with the maximum take-off weight of more than 150kg                        | Aerospace & defence-related technologies |
| 880691 | Unmanned aircraft: for other than remote-controlled flight and other than for carriage of passengers with a maximum take-off weight not more than 250g                      | Aerospace & defence-related technologies |
| 880692 | Unmanned aircraft: for other than remote-controlled flight and other than for carriage of passengers with a maximum take-off weight more than 250g but not more than 7kg    | Aerospace & defence-related technologies |
| 880693 | Unmanned aircraft: for other than remote-controlled flight and other than for carriage of passengers with a maximum take-off weight more than 7kg but not more than 25kg    | Aerospace & defence-related technologies |
| 880694 | Unmanned aircraft: for other than remote-controlled flight and other than for carriage of passengers with a maximum take-off weight more than 25kg but not more than 150kg  | Aerospace & defence-related technologies |
| 880699 | Unmanned aircraft: for other than remote-controlled flight and other than for carriage of passengers with a maximum take-off weight more than 150kg                         | Aerospace & defence-related technologies |
| 880710 | Aircraft and spacecraft: propellers and rotors and parts thereof                                                                                                            | Aerospace & defence-related technologies |
| 880720 | Aircraft and spacecraft: under-carriages and parts thereof                                                                                                                  | Aerospace & defence-related technologies |

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| 880730 | Aircraft and spacecraft: parts of aeroplanes, helicopters or unmanned aircraft n.e.c. in heading no. 8807                                                                                                   | Aerospace & defence-related technologies    |
| 880790 | Aircraft and spacecraft: parts thereof n.e.c. in chapter 88                                                                                                                                                 | Aerospace & defence-related technologies    |
| 900110 | Optical fibres, optical fibre bundles and cables: excluding those of heading no. 8544                                                                                                                       | Precision, optical & scientific instruments |
| 901210 | Microscopes (excluding optical microscopes): diffraction apparatus                                                                                                                                          | Precision, optical & scientific instruments |
| 901290 | Microscopes (excluding optical microscopes): diffraction apparatus: parts and accessories                                                                                                                   | Precision, optical & scientific instruments |
| 901320 | Lasers: other than laser diodes                                                                                                                                                                             | Precision, optical & scientific instruments |
| 901580 | Surveying equipment: articles n.e.c. in heading no. 9015, including hydrographic, oceanographic, hydrological, meteorological or geophysical instruments and appliances (excluding compasses)               | Precision, optical & scientific instruments |
| 901812 | Medical, surgical instruments and appliances: ultrasonic scanning apparatus                                                                                                                                 | Medical technologies                        |
| 901813 | Medical, surgical instruments and appliances: magnetic resonance imaging apparatus                                                                                                                          | Medical technologies                        |
| 901814 | Medical, surgical instruments and appliances: scintigraphic apparatus                                                                                                                                       | Medical technologies                        |
| 901819 | Medical, surgical instruments and appliances: electro-diagnostic apparatus (including apparatus for functional exploratory examination or for checking physiological parameters), n.e.c. in item no. 9018.1 | Medical technologies                        |
| 901920 | Therapeutic respiration apparatus: ozone, oxygen, aerosol therapy apparatus: artificial respiration or other therapeutic respiration apparatus                                                              | Medical technologies                        |
| 902000 | Breathing appliances and gas masks: excluding protective masks having neither mechanical parts nor replaceable filters and excluding apparatus of item no. 9019.20                                          | Medical technologies                        |
| 902212 | Apparatus based on the use of x-rays: including radiography or radiotherapy apparatus, whether or not for medical, surgical, dental or veterinary uses, computed tomography apparatus                       | Medical technologies                        |
| 902214 | Apparatus based on the use of x-rays: including radiography or radiotherapy apparatus, for medical, surgical or veterinary uses, not dental uses, excluding computed tomography apparatus                   | Medical technologies                        |
| 902221 | Apparatus based on the use of alpha, beta, gamma or other ionising radiations, including radiography or radiotherapy apparatus: for medical, surgical, dental or veterinary uses                            | Medical technologies                        |

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| 902230 | X-ray tubes                                                                                                                                                                                                | Medical technologies                        |
| 902290 | Apparatus based on use of x-rays and similar: parts and accessories (x-ray generators, tubes, high tension generators, control panels and desks, screens, examination or treatment tables, chairs and like | Medical technologies                        |
| 902710 | Instruments and apparatus: gas or smoke analysis apparatus, for physical or chemical analysis                                                                                                              | Precision, optical & scientific instruments |
| 902720 | Chromatographs and electrophoresis instruments                                                                                                                                                             | Precision, optical & scientific instruments |
| 902730 | Spectrometers, spectrophotometers and spectrographs: using optical radiations (UV, visible, IR)                                                                                                            | Precision, optical & scientific instruments |
| 902750 | Instruments and apparatus: using optical radiations (UV, visible, IR), (other than spectrometers, spectrophotometers and spectrographs)                                                                    | Precision, optical & scientific instruments |
| 902781 | Instruments and apparatus: for physical or chemical analysis, for measuring or checking viscosity, porosity, expansion, surface tension or quantities of heat, sound or light, mass spectrometers          | Precision, optical & scientific instruments |
| 902789 | Instruments and apparatus: for physical or chemical analysis, for measuring or checking viscosity, porosity, expansion, surface tension or quantities of heat, sound or light, exposure meters             | Precision, optical & scientific instruments |
| 903040 | Instruments and apparatus: specially designed for telecommunications (e.g. cross-talk meters, gain measuring instruments, distortion factor meters, psophometers)                                          | Precision, optical & scientific instruments |
| 903082 | Instruments and apparatus: for measuring or checking semiconductor wafers or devices (including integrated circuits)                                                                                       | Precision, optical & scientific instruments |
| 903120 | Test benches                                                                                                                                                                                               | Precision, optical & scientific instruments |
| 903141 | Optical instruments and appliances: for inspecting semiconductor wafers or devices or for inspecting photomasks or reticles used in manufacturing semiconductor devices, n.e.c. in chapter 90              | Precision, optical & scientific instruments |
| 903149 | Optical instruments and appliances: for measuring or checking, n.e.c. in chapter 90                                                                                                                        | Precision, optical & scientific instruments |
| 903180 | Instruments, appliances and machines: for measuring or checking n.e.c. in chapter 90                                                                                                                       | Precision, optical & scientific instruments |
| 903190 | Instruments, appliances and machines: parts and accessories for those measuring or checking devices of heading no. 9031                                                                                    | Precision, optical & scientific instruments |

# NOTES

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6. IMF, "China's New Chapter: Rebalancing and Unleashing Market Forces", Remarks by IMF First Deputy Managing Director Dan Katz at the China Development Forum, 22 March 2026.
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20. U.S. Census Bureau, "Advanced Technology Product (ATP) Code Descriptions".
21. As previously stated, the MPI is not an absolute measure of product "quality". Rather, it identifies exporter-product pairs whose observed unit value lies above the export-share-weighted global benchmark.
22. Bilateral flows between Germany and Italy have been excluded from the Germany-Italy numerator and the common world denominator. A product counts as Germany-Italy, China or US-led when the country or group of countries has a larger export share than the other two, even if some fourth country has a still larger share.
23. German-Italian bilateral flows have been excluded from the Germany-Italy numerator and the common world denominator.
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