European Commission

ISSN 2529-332X

Selective Industrial Policy for the EU Open Strategic Autonomy: the Role of Products' Relatedness

SINGLE MARKET ECONOMICS PAPERS

FILIPPO BONTADINI
VALENTINA MELICIANI

Working Paper 30

The opinions expressed in this paper are the authors' alone and cannot be attributed to the European Commission.

EUROPEAN COMMISSION

Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
Directorate A – Strategy & Economic Analysis
Unit A1 – Chief Economist Unit

Contact: GROW-A1@ec.europa.eu

European Commission
B-1049 Brussels

Selective Industrial Policy for the EU Open Strategic Autonomy: the Role of Products' Relatedness

Single Market Economics Papers

Filippo Bontadini

Valentina Meliciani

EN PDF	ISBN 978-92-68-23792-2	ISSN 2529-332X	DOI:10.2873/3267849	ET-01-25-001-EN-N

Manuscript completed in January 2025

1st edition

Luxembourg: Publications Office of the European Union, 2025

Selective industrial policy for the EU open strategic autonomy: the role of products' relatedness[1]

Filippo Bontadini

(Luiss Institute for European Analysis and Policy)

Valentina Meliciani

(Luiss Institute for European Analysis and Policy)

Abstract

The European Union is facing a growing dependence vis-à-vis external suppliers around strategic technologies, components, and raw materials that are crucial to achieve a fair and successful twin transition both in the green and digital areas. In this context it has developed the concept of open strategic autonomy envisaging the necessity to strengthen existing industrial capabilities and developing new ones, while maintaining an open trade policy. In view of these goals, the Draghi Report explicitly calls to set priorities for selective targeted industrial policy. This paper focuses on a selection of products where Europe has a dependence and on a set of products relevant for the twin transition and, based on the economic literature on capabilities, identifies which products are closest to countries' productive capabilities. The results of the empirical analyses point to the importance of considering technological complementarities when designing policy interventions and of better coordinating industrial strategies between the EU and Member States.

1. Introduction

We are living in a world that is very different from what we could expect at the beginning of this century. After almost three decades of increasing globalization, ordered trade relations under the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO) and industrialization of China and other emerging economies, we are now facing an increasing concern towards strategic autonomy and economic security. In May 2000, one year before China's accession into the WTO and after the approval of permanent normal trade with China, President Clinton declared: "Today the House of Representatives has taken an historic step toward continued

[1] This paper has received support from and was developed under the 2024 DG GROW Fellowship Programme of the European Commission. The opinions are those of the authors and should not be considered as representative of the European Commission's official position.

prosperity in America, reform in China, and peace in the world. . . it will open new doors of trade for America and new hope for change in China". The optimism that accompanied China's entry into the WTO turned into a concern for the US to lose technological supremacy and manufacturing capacity due to unfair Chinese competition and to protectionist policies. In 2018 the Trump administration imposed a series of tariffs on China's products that were confirmed by the Biden administration. In addition to the US-China trade war and the consequent geopolitical tensions, the continuous crises starting with the 2008 financial crisis, followed by the COVID-19 pandemic, the war in Ukraine, the ensuing energy crisis, and the conflict in the Middle East have questioned the virtues of globalisation and led to a need for security in all domains including economic security (Evenett et al., 2024). As a consequence, economic security has become a new goal of industrial policy to be reached through strategic autonomy (Fontana and Vannuccini, 2024) and technological sovereignty (Edler et al., 2023). A recent paper by Edler et al. (2023) focuses on the rationale behind technological sovereignty, which is intimately linked to strategic autonomy, conceiving it as state-level agency within the international system which is not an end but a means for sustaining national competitiveness and building capacities for transformative policies to tackle major societal challenges. This goes beyond the traditional arguments for technology and industrial policies such as the infant industry argument, inter-industry linkages or the existence of positive externalities and dynamic increasing returns[2].

New industrial policies in Europe build on the notion of Open Strategic Autonomy (OSA) aiming at achieving European resilience in strategic value chains without abandoning the principles of open trade and ordered trade relationships. However, it is not always clear how "strategic" value chains/ products can be defined and the number of products/materials/value chains that have been targeted by the European Union has been increasing over time (see Section 2).

In this context, the aim of this work is to propose some criteria for prioritizing targeted areas based on industrial policy arguments and empirical tools drawn from the capabilities and economic complexity (EC) literature that help identify products that are closest to countries productive capabilities.

[2] Juhász et al. (2023) interpret national security using the traditional externality argument: reducing dependence on a foreign source of supply – for example, rare earths or semiconductor inputs – makes a country as a whole more secure and this social benefit is not fully internalized in the decisions of individual firms.

Having this framework in mind, we look at four product categories (i) products with a EU-wide dependence as identified by the methodology in Arjona et al (2023); (ii) a subset of these products that the European Commission identifies as belonging to a sensitive ecosystem, i.e. being relevant for health, renewables, aerospace/defence, digital, electronics and energy intensive industries (see European Commission 2021b chapter 1.1); (iii) net zero industry act (NZIA) products; (iv) and semiconductors[3]. Within these fields, the paper aims at identifying areas of opportunity considering both the perspective of the EU as a whole and that of single European countries.

In particular, we use tools developed in the literature on proximity and complexity (Hidalgo et al. 2007; Hidalgo 2021; Balland et al. 2022) to identify strategic products that are closer to the European production capabilities distinguishing between absolute and relative distance with different implications for policies at the European and national level. The paper is organised as follows: Section 2 focuses on the evolution of the concept of Open Strategic Autonomy and reviews the most relevant policies and regulations implemented in Europe under this heading. These policies inform our choice of what the EU considers strategic products. Section 3 introduces the methodology adopted to measure trade dependencies and product proximity/distance in absolute and relative terms. Section 4 discusses the results of the empirical analysis, while the last Section concludes and draws policy implications.

2. Open Strategic Autonomy and industrial policy in Europe

In this section we look at the geopolitical developments that accompanied the evolution of the concept of strategic autonomy and the related European policies. Based on this review, we identify targeted areas for industrial policy and possible arguments in favour of these policies which inform the choice of the products/value chains on which we conduct the empirical analysis. These products are highlighted in bold in Table 1.

The concept of strategic autonomy originated in the context of EU foreign and security policy (European Council, 2013; European Union Global Strategy, 2016) and was explicitly extended to economic policy in the new industrial strategy for Europe launched in March 2020 and updated in May 2021 (European Commission 2020 and 2021a). It aimed at responding to new challenges

[3] Although there is some overlap between this category and NZIA and semiconductors, we look separately at these categories due to their relevance for the green and digital transition.

emerging after the Covid pandemic by reducing European vulnerabilities and increasing the resilience in supply chains.

In February 2021, Executive Vice-President and Commissioner for Trade, Valdis Dombrovskis, referring to the revised EU trade strategy, said: *"The challenges we face require a new strategy for EU trade policy. We need open, rules-based trade to help restore growth and job creation post-COVID-19. Equally, trade policy must fully support the green and digital transformations of our economy and lead global efforts to reform the WTO. It should also give us the tools to defend ourselves when we face unfair trade practices. We are pursuing a course that is open, strategic and assertive, emphasising the EU's ability to make its own choices and shape the world around it through leadership and engagement, reflecting our strategic interests and values."*

The European Commission Communication (European Commission 2021c) explicitly refers to Open Strategic Autonomy (OSA) as a "policy choice, but also a mind-set for decision makers", building on the importance of openness but also supporting domestic policies to strengthen the EU economy and particularly its position in the green and digital value chains. In 2021 the European Commission (2021b), as part of its updated industrial strategy responding to the European Council request of 2 October 2020, presented a methodology to identify EU's strategic dependencies and vulnerabilities particularly in the most sensitive industrial ecosystems. The analysis identified 137 products (representing 6% of the EU's total import value of goods) in sensitive ecosystems for which the EU was highly dependent and showed that about half of imports for these dependent products originate in China. This opened the way to periodic reviews of strategic dependencies and monitoring of risks associated with these dependencies with the objective of reducing them in order to ensure European *economic security*. With this aim Arjona et al (2023) identified 564 products where the EU experiences an important level of foreign dependency and 204 of these products are in sensitive industrial ecosystems. Targeting these products can be justified on the basis of "economic security" arguments. Juhász et al. (2023) relate this argument to the more traditional concept of externalities: reducing dependencies makes a country more secure but this side-effect is not taken into account in the sourcing decisions of private firms leading to too little investment in these areas. Moreover, if these products belong to sectors/value chains related directly to security and safety, health or the green and digital transition too little investment increases the risk of not reaching social goals. Based on these considerations, we include in our analysis all dependent products and dependent products in critical ecosystems, identified by Arjona et al (2023).

The shift in EU perspective towards economic security and strategic autonomy, the challenges linked to the green and digital transitions and the active policies implemented by China and US in these strategic fields led also to the approval of important measures to sustain European competitiveness in the digital and green value chains. In 2023, the EU adopted the Chips Act Regulation (European Commission, 2023c) with the main goal of strengthening the “competitiveness” and “resilience” of the EU by addressing the “strategic dependencies” in the design and production of all types of semiconductors. Like in the United States, that had already approved the Chips and Science Act in summer 2022, explicitly aiming at helping the country restore its leadership in the manufacturing of advanced semiconductors, the initiative was framed in relation to the achievement of “strategic autonomy” (Bulfone et al. 2024). The main goal of the regulation is to increase the global share of semiconductor production of the EU from 10 to 20 per cent by 2030. In the case of semiconductors, industrial policies respond not only to the need of ensuring economic security, but also to a long term view of strategic competitiveness. Juhász et al. (2023) define industrial policies as “those government policies that explicitly target the transformation of the structure of economic activity in pursuit of some public goal. The goal is typically to stimulate innovation, productivity, and economic growth. But it could also be to promote climate transition, good jobs, lagging regions, exports, or import substitution”. Semiconductors have multiple uses and are at the basis of the digital transition. Based on these arguments, we include the semiconductor value chain in our analysis.

Finally, the European Union has played a major role in highlighting the urgence to address climate change challenges by accelerating the green transition. The European green deal sets ambitious goals of reducing net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels and to reach climate neutrality by 2050. In February 2023, following the US Inflation Reduction Act, the European Commission (2023a) approved the Green Deal Industrial Plan for the scaling up of the EU manufacturing capacity for the net-zero technologies and products required to meet Europe's ambitious climate targets, followed by the Net Zero Industry Act (NZIA), presented on 16 March 2023 (European Commission, 2023b), aiming to restore European competitiveness in net zero technologies where Europe is currently a net importer in many products and at different stages of the value chain. For example, for solar photovoltaic technologies and their components, the dependency exceeds 90% in certain upstream segments of the value chain, such as ingots and wafers. In other sectors, such as wind turbines and heat pumps, Europe maintains a trade surplus but this surplus is deteriorating. The main goal of the NZIA is to achieve 40% of the production necessary to fulfil the EU's needs for strategic technology products by 2030. In the case of the green value chain, although framed in concept of economic security, industrial policies also respond to the more traditional logic of positive externalities. Moreover, the green transition can be considered a grand challenge in the context of sustainable development goals (Mazzucato, 2021). With this logic we also focus on green products using the list of Net Zero Industry Act (NZIA) products.

This Section has focused on the European strategy, however it should be taken into account that industrial policies in Europe are carried out mainly by member states, each with its own distinctive capabilities and economic structures. The empirical analysis carried out in Section 4 addresses the question of how to coordinate national policies to effectively address the European priorities.

Table 1: Open Strategic Autonomy and Industrial Policy

Geopolitical Developments	**OSA Concept**	**OSA related policies**	**Targeted inputs/products/value chains and rationale in bold those included in our study**
	2008-2019		
Russian Annexation of Crimea (2014) Brexit (2016-2020) Trump Administration (2017-2021) China-USA trade war (2018-)	Strategic autonomy **linked to common foreign and security policy** (European Council 2013; European Union Global Strategy 2016)	EU raw materials initiative (2008), with list of critical materials in 2010 (14), 2014 (20) and 2017 (27)	Critical raw materials: economic security
	2019-2024		
Covid outbreak Russian invasion of Ukraine	Strategic autonomy **explicitly extended to economic policies**	Identification of European dependencies (2020-)	**EU dependent products**: economic security

Biden Administration US Chips Act US Inflation Reduction Act	2020: a new industrial strategy for Europe "that will support the twin transitions, make EU industry more competitive and enhance Europe strategic autonomy" The Commission revised its trade policy in 2021 to support the EU's open strategic autonomy	Eu assessment of critical raw materials (2020 and 2023). Critical Raw Materials Act (April 2024) Chips Act (September 2023) Green Deal Industrial Plan (February 2023) Net Zero Industry Act (June 2024)	**EU dependent products in sensitive ecosystems:** Economic security, societal goals Critical raw materials: economic security **Semiconductors:** economic security, positive externalities, dynamic increasing returns **Green products/value chain**: economic security, positive externalities, grand challenges.

3. Country-product distance, import dependencies and the evolution of comparative advantage: data and methodology

To carry out our analysis we rely on bilateral trade data at the product level over the period 2012-2021 from the BACI-CEPII dataset (Gaullier and Zignago, 2010). This data source is widely used in the trade literature and offers mirrored trade flows[4] at the product level with 6-digit HS12 codes, which allows us to identify specific goods and to isolate those belonging to four key groups, we discussed in Section 2.

First, relying on lists compiled by the EU Commission, we look at products in which the EU has a dependence, identified as in Arjona et al (2023); second, we also look at the subset of EU-dependence products that belong to a strategic ecosystem: health, renewables, aerospace/defence, digital, electronics and energy intensive industries.

[4] In standard trade statistics imports and exports do not fully match because of how transportation, freight and insurance costs are recorded. BACI-CEPII data provide a harmonised version of trade data where import between two countries is equal to export between the same pair of country.

Third, we include in our analysis products that are relevant for the NZIA, and, fourth, we look at semiconductors, both also identified by the EU Commission. In the rest of the paper, we refer to the products included in the last three categories as “strategic products”.

We include in our analysis all EU countries and the UK over the period 2013-2021.

Our analysis focuses on two key outcome variables: first, a trade dependence index, which is built on the follow net balance measure[5]:

$$NetBalance = \frac{m_{ik} - x_{ik}}{m_{ik} + x_{ik}}$$

Where x_{ik} and m_{ik} are exports and imports, respectively, which we then bind to vary between 0 and 1, so that it has the same range as distance:

$$TradeDep = \frac{NetBalance - (-1)}{1 - (-1)}$$

This measure captures each country’s dependence, in trade terms, vis-à-vis the rest of the World, it does not identify extra-EU countries explicitly, but since we use it to study trade patterns in products that have been identified to be critical for the EU it is reasonable to assume that trade dependence could not be assuaged by intra-EU trade.

The second key index we compute is the revealed comparative advantage as a Balassa index:

$$RCA_{ik} = \frac{x_{ik} / \sum_k x_{ik}}{\sum_i x_{ik} / \sum_i \sum_k x_{ik}}$$

This measure captures a country’s specialisation, relative to the rest of the World, in exports of a given good. Considering both these outcome variables is important from a policy perspective. The on-going policy debate around industrial policy and open strategic autonomy is not, in fact, geared towards merely reducing the EU’s trade dependence, but also towards developing productive capabilities in strategic value chains in the long run. It is therefore important to not only identify ways for countries to diversify their supplier base, but also which products offer the best chance of successfully developing new capabilities.

[5] The EC has developed a more refined approach to identify products in which the European Union has a trade dependence (Arjona et al 2023). We resort here to a simpler measure that has been widely used in the literature.

Since building capabilities is a long and costly process, a key contribution of our research is to identify which products, in the four identified categories, are closest to countries' productive capabilities and to relate distance to trade dependencies and to the probability to develop comparative advantages over time. We do so by deploying a well-established array of measures developed within the literature of economic geography, technological capabilities and economic development.

Our starting point is a measure of dissimilarity across products, which we identify in line with Hausmann et al (2007), as the conditional probability that two products have of being exported together, formally:

$$\Phi_{kk'} = \frac{\sum_i y_{ik} y_{ik'}}{\max\left(\sum_i y_k , \sum_i y_{k'}\right)}$$

Where y_{ik} is a vector populated with one for each country exporting product k with RCA, and $y_{ik'}$ is the same for product k'. Therefore, the numerator is the number of countries that export both k and k' with an RCA (i.e. a Balassa index above 1). We then look at the number of countries that export each product with RCA ($\sum_i y_k$ and $\sum_i y_{k'}$, respectively) and take the larger of the two to normalise our measure.

$\Phi_{kk'}$ is a product-by-product matrix populated with the proximity of each product pair. The proximity measure has become standard in the literature of regional studies and economic complexity. To provide the intuition of this measure, it aims at inferring capability requirements from trade patterns. The key idea is that two products (e.g. mobile phones and laptops) that have a high likelihood of being exported by the same country with RCA will share more requirements – and therefore be similar. In contrast two products that are unlikely to be exported with RCA by the same country (e.g. laptops and t-shirts) will share few capability requirements and will therefore have low proximity.

Once we have this measure, we can compute for each country-product pair a measure of relatedness:

$$dist = 1 - Relatedness_{ik} = 1 - \frac{\sum_{k'} \Phi_{kk'} * y_{ik'}}{\sum_{k'} \Phi_{kk'}}$$

We achieve this by computing the sum of the proximity between our product of interest k and those that the country exports with RCA – which we filter in the denominator with our vectors $y_{ik'}$. We then normalise this with a hypothetical country that would export all products with RCA, i.e. the sum of the column of $\Phi_{kk'}$ corresponding to k'. In doing so, we obtain what the literature has referred to as density relatedness, by computing $1 - Relatedness$ we obtain a measure of country-product distance.

To illustrate the logic underlying this measure, let us assume we wish to capture the distance between Germany and cars. This measure will depend on which products Germany exports with RCA and how similar these products are with respect to cars. Therefore, exporting trucks will be more important than exporting t-shirts. So, the numerator of our measure is the weighted sum of products that Germany exports with RCA, using proximity with respect to cars as weights (the numerator). This is compared with what the same weighted sum would be for a country that was exporting all products with RCA (the denominator). If Germany exports with RCA many products that are closely related to cars, it will have a high relatedness to cars (and therefore a low distance). All told, this measure gives us for each product how unrelated it is with respect to each country's economic structure. Naturally, countries that are highly diversified – i.e. that export many products with RCA – and export many products with RCA will have lower distances to almost all products than smaller economies that export fewer products with RCA. As the number of countries increases, the vector $y_{ik'}$ approaches a vector populated only by 1, the numerator and denominator in equation 2 become increasingly closer to each other our measure of distance $= 1 - Relatedness = 0$. Countries' distance is therefore negatively correlated to export diversification, mechanically, while it integrates this with information on proximity of products.

At the same time, this measure also reflects differences in countries' productive structures and, in turn, their underlying technological capabilities and factor endowments. It is in fact reasonable that large, highly diversified economies such as Germany and Italy would be better placed than smaller service oriented economies such as Ireland and Luxembourg to specialise successfully in twin-transition goods. These are relevant aspects that European policy makers would want to take into account when considering how to foster specialisation in the twin transition without undermining EU cohesion.

From a country's domestic perspective, however, it is less important if a country is closer to a given product with respect to another country. What matters in this case is what is the closest product to the country's productive structure among all the products the country could be producing.

To illustrate let's consider a small service oriented economy that has high distance, in absolute terms, from all strategic products. It is still relevant to identify which of all the strategic products lies closest to the country's productive structure; for instance, is the country relatively closer to solar panels or microchips?

Conversely, if we look at a country with a large and highly diversified manufacturing base all products will be close in absolute terms. Nonetheless, it will still be important to identify which of the strategic products are closest and, importantly, which other non-strategic products might be closer. If a country is closer to non-strategic products, should it still pursue specialisation in that direction? What is the opportunity cost of this choice? What other specialisation patterns is the country giving up?

To answer these questions, it is necessary to move from a measure of country-product distance in absolute terms, to a relative one where we normalise the measure of distance for each country, compared to the country's distance with respect to all (not just the strategic ones) products.

$$RelDist_{ik} = \frac{dist_{ik} - mean(dist_{ik})}{sd(dist_{ik})}$$

A useful way of thinking of the difference between these two measures of distance is the notion of absolute and comparative advantage. To the extent that distance is a good proxy of the opportunity cost of a product, a Ricardian theory would recommend that each country only focuses on the product that is closest to them among all other products. This should be regardless of whether a product is strategic or not and if, as a matter of policy, a country should wish to focus on strategic goods, they should still identify the closest products in relative terms.

In contrast, if European policies are to be coordinated at the supranational level this would require identifying the countries closest to each strategic product in absolute terms, i.e. based on absolute advantage, in order to maximise the efficiency of the European support. In this case it should be the absolute, rather than the relative, distance that should guide policy makers. However, the two approaches can be integrated considering that large manufacturing countries may have limited resources to reduce dependencies/develop capabilities in a high number of products. Therefore, also smaller member states with limited relative distance may play a role if Europe wants to develop extensive end-to-end value chains in critical areas. This would require a high level of coordination between the EU and national member states.

In the next section we present descriptive results that look at distance both in absolute and relative terms and also explore how these are related to trade dependencies and evolutions in countries' RCA.

4. Empirical analysis

4.1 Mapping distance, dependence and specialisation

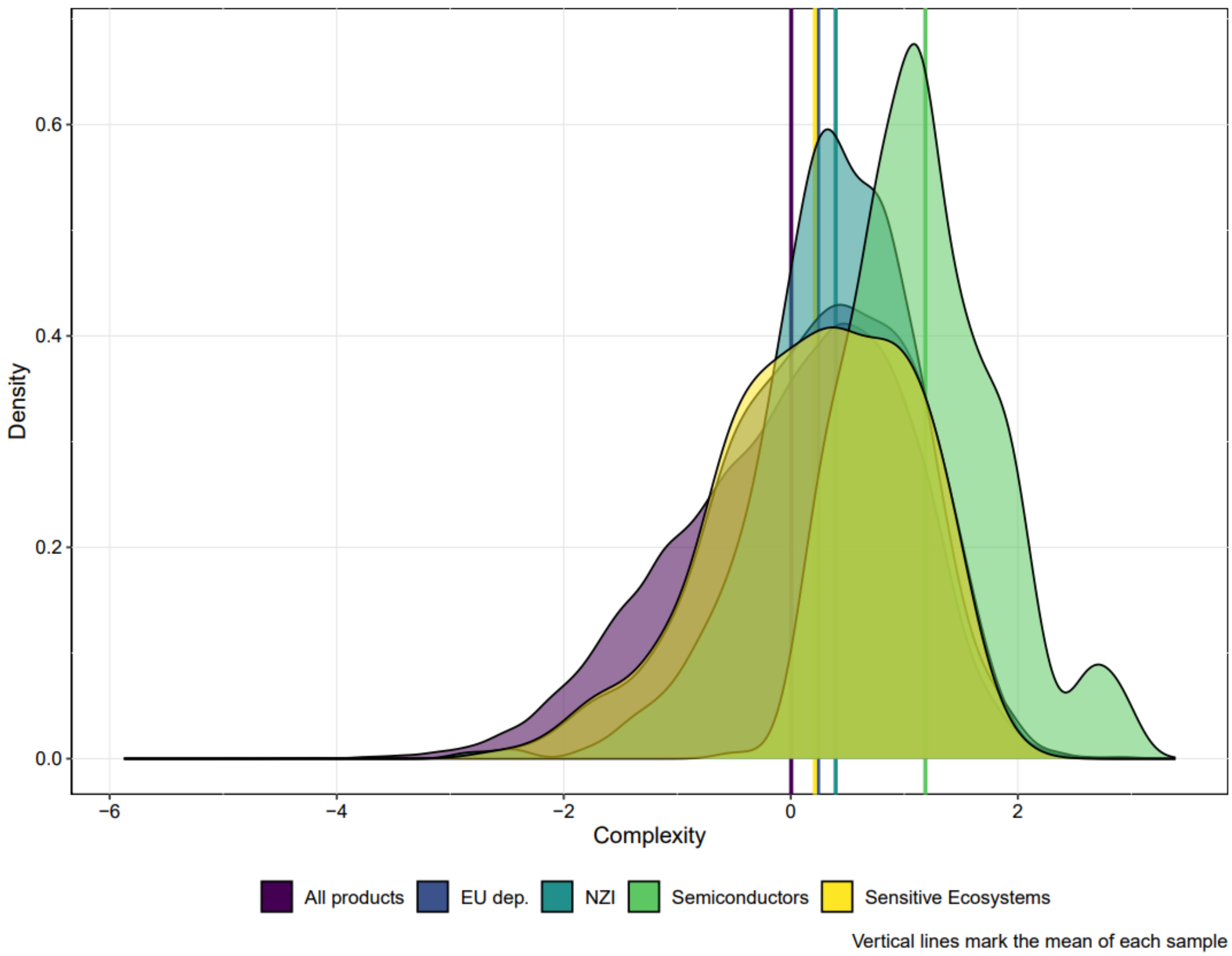
The four product categories considered in this study may require rather diversified capabilities and have, more broadly, technologically features. In order to assess this possible heterogeneity we first look at how complex products in our sample are. To do so we resort to the measure of product economic complexity, computed following the "reflection method" as described in Mariani et al (2015). The intuition underpinning the concept of economic complexity is that complex products require many *and* rare capabilities. The rarity of capabilities required is understood as the inverse of a product's ubiquity in trade flows, – i.e. how many countries trade a given product with a RCA – while the number of capabilities required is captured by the export diversification – i.e. the number of products exported with RCA – of countries exporting a given product. So, empirically speaking a product is complex if it is exported with RCA by very few countries who are highly diversified.

We rely on this measure as a general qualifier of capability requirement and technological features of products because it has been used widely in the literature (Hidalgo and Hausman, 2009, Balland et al. 2022, 2019) and it is methodologically consistent with the measure of distance in its approach to capturing productive capabilities.

In figure 1 we plot the distribution of the complexity of products, averaged over time, for all products in the BACI-CEPII database and for the four groups of products of interest. EU dependent products, along with the subsample of products relevant for sensitive ecosystems, are distributed in a rather similar way with respect to the total population of products. This may depend on the fact that we consider the whole value chain including also many raw materials with low level of complexity. In addition, this result suggests that while sensitive ecosystem value chains certainly encompass complex technologies, Europe exhibits dependence in the less complex portion of these value chains.

This is consistent with the fact that when we look at the other two groups which are identified based purely on technological aspects rather than dependence, we find a rather different picture. NZIA have a slighter higher average and are significantly more concentrated around the mean, suggesting higher prevalence of complexity among them. Semiconductor set themselves apart rather starkly, with a distribution of complexity significantly skewed towards higher values, reflecting the fact that semiconductors are high-tech products that require a vast array of capabilities, many of which are quite rare.

Figure 1 – Products' complexity distribution.



Note: Density plot of products' complexity. Complexity is averaged over time to only vary among products.

Source: Authors' elaboration on BACI-CEPII data.

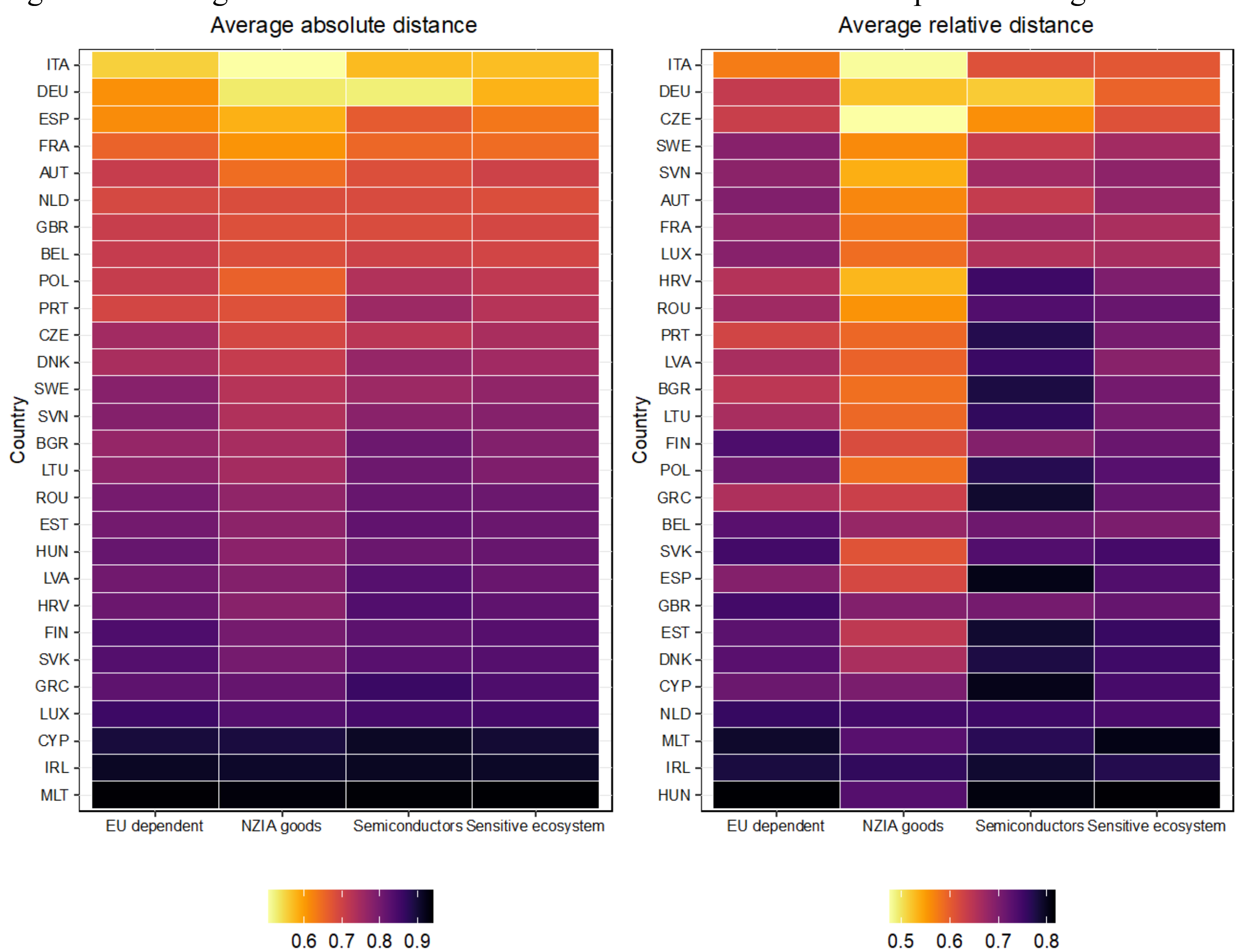
These differences in complexity across product groups are important, because it is reasonable to expect products with higher complexity to be harder to specialise in, given their higher capabilities' requirement. However, it is also worth bearing in mind that economic complexity has been found in the literature to be a predictor of economic growth, and specialisation in complex products has been argued to be a fruitful specialisation pattern (Hidalgo et al. 2007, Hausmann et al. 2007). So, while targeting more complex products may prove a harder task to achieve, it might also bring larger rewards.

While this evidence provides us with preliminary insights on the technological features of strategic products, it is also important to stress that complexity is *not* mechanically linked to how we compute distance. Countries can be distant to highly complex products and lie far away from low-complexity ones, it is however likely that larger more diversified countries will also lie closer to many of the strategic products.

This is illustrated in the lefthand panel of Figure 2, where we can see that it is large and diversified European economies that lie the closest to products across our four groups. Notably, Italy and Germany – Europe's manufacturing leaders – have consistently lower distance than other countries. When looking at the countries farthest from strategic products we find small service-based economies, such as Luxembourg, Cyprus, Malta and Ireland. Interestingly, Eastern European countries despite their key role in manufacturing value chains also appear to be rather distant from strategic products, especially Slovakia, Croatia and Romania.

Comparing product categories, the NZIA goods stand out to be the ones with the lowest distance from EU countries. As we discuss further down these products consist of rather high-tech manufacturing, such as photovoltaic (PV) panels, engines, electric boards and converters.

Figure 2 – Average distance between countries' economic structure and product categories.



Note: Colour refers to unweighted average distance of products in each country-category over the 2012-21 period..
Source: Authors' elaboration on BACI-CEPII data.

Remarkably, things change quite starkly when we look at the relative distance. The distribution also appears to be more concentrated within each country, but much less so across them. The latter is of course the outcome of the normalisation we performed, while the former suggests the fact that countries' productive structure makes them lie significantly closer to few products with respect to others. Ranking of countries, based on the unweighted mean across all groups, also changes significantly: Czechia, for example, moves up from 10th to 3rd, Sweden goes from 12th to 4th, while Spain drops from 3rd to 19th, and France from 4th to 7th when comparing absolute with relative distance. So, despite Italy and Germany retaining their position, it appears that countries that lie in absolute terms rather far from most strategic goods may still find these to be among the closest possible alternatives. The opposite is also true: large, diversified countries such as Spain and France that lie close to most strategic goods in absolute terms may find other non-strategic goods to lie closer to their productive structure. It is also worth noting that NZIA products are closest to European specialization pattern not only in absolute but also in relative terms.

This preliminary evidence suggests that it is larger, more diversified and with a pre-existing specialisation in manufacturing countries that stand the best chance to successfully implement selective industrial policy to reduce dependence and, ultimately, develop a specialisation in strategic products. At the same time, however, the group of countries that lie closest to strategic products in relative terms is rather different. This means that national-level policy makers in countries like Czechia, Sweden or Slovenia for example (all countries that see a significant improvement in their ranking in terms of relative as opposed to absolute distance) may find it rational to still pursue industrial policies aiming to reduce dependencies and develop domestic capacities in strategic products. This evidence shows the complexity of taking optimal decisions on industrial policy at both EU and national levels and the importance of better coordinating industrial strategies between the EU and member states to avoid duplication of efforts and waste of resources. Joint industrial policy actions, aiming at facing the twin transition through collaboration across European countries, such as in the case of industrial alliances and Important Projects of Common European Interest (IPCEI), may be effective tools to reconcile European long run competitiveness with sustainable development. When industrial policies are carried out at the national level, they should be coordinated to avoid countries to target the same products. Ideally countries with the smallest absolute distance are in a better position to reduce dependencies and develop domestic capabilities in strategic products. However, they may have advantages also in other areas and limited resources. Smaller member states with low relative distance will, therefore, be needed to reduce European dependencies. Efforts across member states should be complementary for national policies to be most effective at the European level.

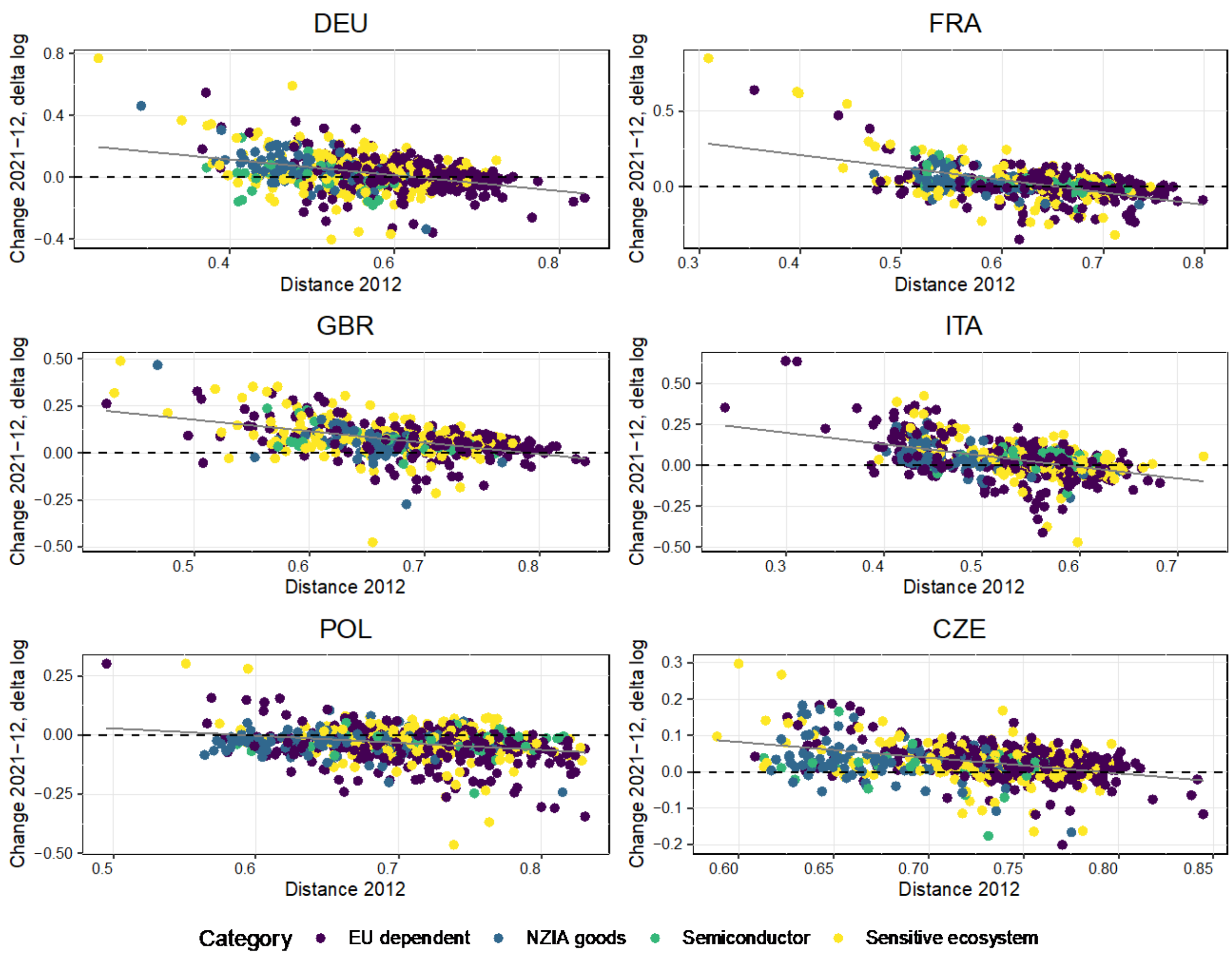
While Figure 2 reports average distances between countries and product categories, additional insight can be gained by looking at over-time variation at a more granular level. Figure 3 looks at initial distance and its percentage change (delta log) for a selection of EU countries; in the Appendix Figure A.1 plots all EU countries.[6]

Overall, we find that there is a high level of persistence in countries' distance vis-à-vis products. While the lines of best fit do have a negative slope, suggesting some mild convergence, this is largely driven by some outliers. These are products that had very low distance in 2012 and have experienced significant increases over the 2012-2021 period.

Most products are concentrated around the dashed horizontal line at 0, suggesting very small changes have occurred, despite some country-wide differences in trends. For example, most products in Poland lie below the 0 line, suggesting that Poland had, overall reduced its distance from strategic products, while the opposite is true for the UK. The high level of persistence is consistent with the Schumpeterian and evolutionary literature focusing on the existence of path dependencies, cumulative trajectories and dynamic increasing returns in the evolution of competencies, technologies and production capabilities (Dosi 1982; Dosi et al. 1988; 1990; Dosi and Nelson 1994).

[6] We have also reproduced Figure 3 for relative distance, results are broadly speaking similar. Interpretation of changes of relative distance is however less straightforward since these are relative changes, i.e. a decrease in in relative distance of one product implies an increase in relative distance of another product. Because relative distance is computed with respect to all products and not just strategic ones, there is no immediate mechanical relationship among relative distances in strategic goods. Still, we omit these results, while they are available upon request.

Figure 3 – Persistence of distance over time, 2012-21.



Note: The figure plots initial levels of distance for each country-product pairs against the delta log change over the period 2012-12. To ensure readability of the figure, axes are not consistent across panels, interpretations should only be made in terms of the strength of the relationship among initial distance and observed changes in distance across countries.
Source: Authors' elaboration on BACI-CEPII data.

4.2 Distance, trade dependence and export specialisation

In this section we further explore the dynamics of country-product distance, by relating it to two key variables: trade dependence and export specialisation. While OSA aims at reducing EU's dependence through diversification of import and building up of productive capacity to serve the EU domestic market, restoring the EU's leadership as exporter of technologically intensive products should also be a goal at least in the long run. If this were not the case the EU would subsidize domestic production below the frontier engaging essentially in import substitution policies whose results have proven unsuccessful in the past.

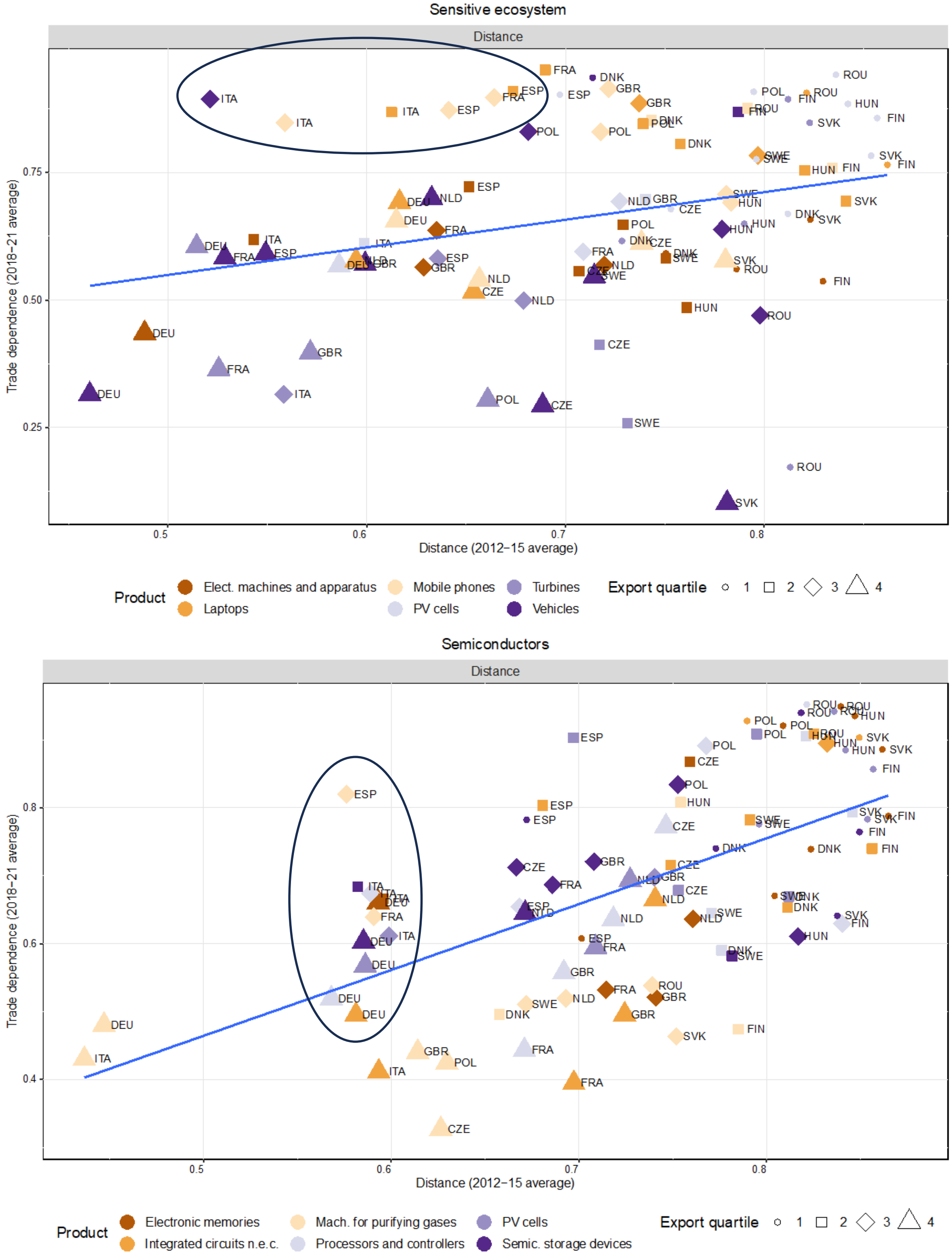
As illustrated in the previous section in Figure 3, our approach allows looking at country-product distance at the most granular level. However, it also allows to aggregate this information to gain insight on what are the broader product categories in which European countries stand the best chance to reduce their trade dependence. Figure 4 plots for a selection of countries[7] the initial distance, averaged between 2012 and 2015 and the trade dependence averaged over the period 2018-21. For each of the four product categories we identify the six 2-digit HS sections that account for the largest shares of export across all countries, so as to focus on those products that have the highest economic significance for the EU.[8]

Overall, among EU dependent products, including those relevant for sensitive ecosystems, which we report in the top panel of Figure 4, we see a positive correlation between initial distance and final trade dependence. This means that if a country´s specialisation pattern is far from the capabilities required for a product, it is more likely to end up importing that product and having a trade dependence. We also detect a cluster of products including mobile phones, laptops and vehicles that exhibit a very high trade dependence but a medium to low distance, for some large EU countries. These are products that would be good candidates for a targeted industrial policy as they are relatively close in terms of capability requirements to some EU countries, especially Italy, France and Spain while also exhibiting a significant margin for reduction of trade dependence.

[7] We focus here on Czechia, Finland, France, Germany, Hungary, Italy, the Netherlands, Poland, Romania, Slovakia, and Sweden. This is done to improve readability of the figure; results with all countries are available upon request.

[8] It is important to note that the averages we compute here are only based on the strategic products within each 2-digit HS section and not all products within that section.

Figure 4 – Initial distance and trade dependence for EU dependent products in sensitive ecosystem and semiconductors.



Note: The figure shows unweighted averages for the initial distance (2012-15) and final trade dependence (2018-21) for selected 2-digit sections of the HS12 product classifications and selected countries. Top panel includes sensitive ecosystems, bottom-panel includes semiconductors

Source: Authors' elaboration on BACI-CEPII data.

When looking at product categories that cover a technologically narrower set of products, such as NZIA goods (reported in the Appendix Figure A.2) and semiconductors in the lower panel of Figure 4, we find a different picture. The positive relationship between distance and dependence is stronger and the upper-left quadrant of the Figure is now almost empty, i.e. among semiconductors products very few have high trade dependence and low distance. The only exception is a cluster of products lying quite close to the line of best fit of product-country pairs with relatively low distance and dependence, including electronic storage devices, PV cells and processors and controllers. As shown in Appendix Figure A.2 lower panel, this is even more pronounced for NZIA goods where we find very few products with low-distance and high-dependence such as vehicles for Italy and electric boards and panels for Spain.

As we have argued, distance is not only relevant for countries' trade dependence, but also to study how their productive structure is likely to evolve. RCAs are captured with Balassa indexes and reflect changes in countries' specialisation, which usually takes place over longer periods of time. To study such long-term changes, we produce transition matrices looking at how country-product pairs evolve considering three possible states: (i) RCA, i.e. Balassa index above 1 (ii) Low RCA, i.e. Balassa index below 1 but above 0.5 (iii) no RCA, i.e. Balassa index below 0.5.

Usually, Balassa index is interpreted binarily, in terms of the economically significant threshold of one: if a country has a Balassa index above one it is considered it does have an RCA in that specific product. We choose here to look at three thresholds to capture significant changes in country-industries' RCA, that are not swayed by small changes around the threshold of one.

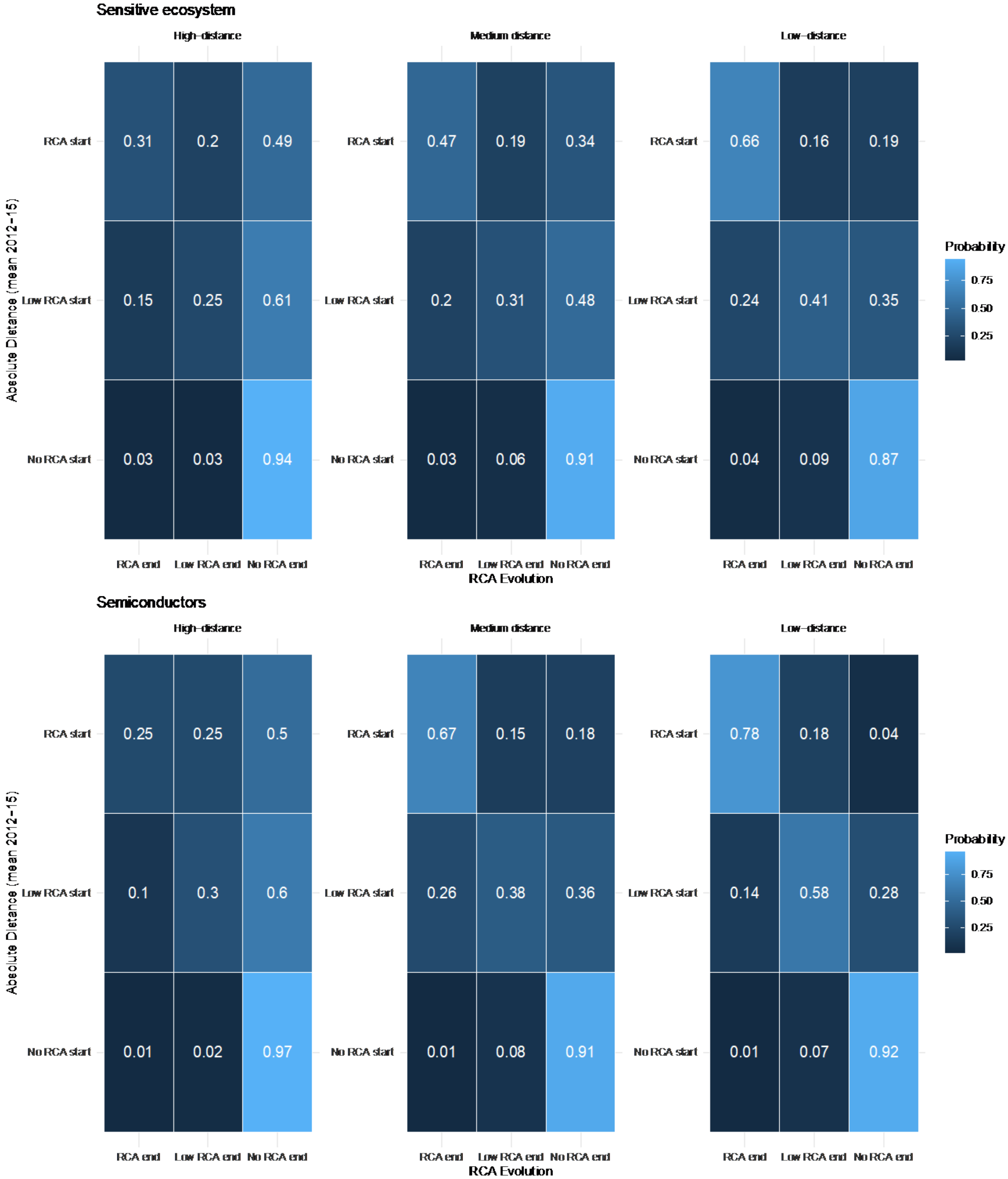
In Figure 5 we report the transition matrices for the products that are relevant for a sensitive ecosystem and for semiconductors, patterns remain however rather stable across product categories as it can be seen in Appendix Figure A.3. The Figures report the same transition matrix for groups of products divided by distance terciles.

The main takeaway from Figure 5 is that distance is more relevant to explain the loss of RCA, rather than the gain thereof. For products in the sensitive ecosystem (semiconductors) category, only 31% (25%) of the high-distance products that start off with an RCA are likely to retain it; when looking at low-distance products, this goes up to 66% (78%). In contrast, looking at the bottom row of the matrices, products that have no RCA at all (i.e. below 0.5) have very little chance to gain an RCA, irrespective of their distance. Looking at products that start of with a low RCA, we see that 15% (10%) of the high-distance products develop an RCA while this increases to 24% (14%) for low distant products. In the case of NZIA products the results are even more marked (Figure A3).

As we will discuss in more detail in the next section, this evidence has implications for industrial policy. While we have seen that countries' distance with respect to products changes slowly over time, industrial policies do have the potential to change countries' economic structure and their position with respect to strategic products, in the long run. We have identified clusters of industries in which countries have lower distance and high dependence for which dependence could be reduced relatively easily. Furthermore, looking at countries' ability to develop new productive capabilities our result suggest that if countries do so, either through industrial policies or otherwise, focussing on individual products disconnected from their broader economic structure, such new capabilities are unlikely to last in the long run.

It follows that industrial policies should aim to shift countries' productive structure in a coherent way, rather than focus on narrow short term large interventions that would yield short-lived surges in productive capacity that are incoherent with respect to the country's broader productive structure. In the next section, we build on this descriptive evidence, developing an econometric setting in which we test distance's relationship with trade dependence, as well as export specialisation.

Figure 5 - Transition matrices for RCA and distance for sensitive ecosystem goods and semiconductors.



Note: The transition matrix looks at three possible states: RCA above 1, between 0.5 and 1, and below 0.5, corresponding to RCA, low RCA and no RCA, respectively. Each matrix refers to terciles of distance. Top panel includes sensitive ecosystem products, bottom-panel includes NZIA products.
Source: Authors' elaboration on BACI-CEPII data.

4.3 Econometric evidence

Countries' economic structure changes gradually over time and, as we have discussed, the distance of a product with respect to a given country exhibits high persistence over time. The descriptive evidence presented in the previous section suggests however that distance is relevant for countries' evolution both in terms of trade dependence and specialisation. Naturally this relationship is likely to be affected by other intervening drivers, such as a product's technological feature and a countries' size, productivity and labour cost. We try to account for these possible confounding factors and test our relationship of interest in the following econometric setting:

$$dln(y)_{ck} = \alpha + \beta_1 dist_{ck} + \beta_2 y_{ck} + \beta_3 X_c + \beta_4 pci_k + rta_{ck} + \varepsilon_{ck} \quad (1)$$

We test a log-difference model, where $dln(y)_{ck}$ is the delta log change of trade dependence between the 2012-15 and the 2018-21 average; $dist_{ck}$ is the country-product distance in the first period, y_{ck} is the initial level of trade dependence.

rta_{ck} is a dummy taking value one if the country had a revealed technological advantage in the product in the first period capturing pre-existing technological capabilities. We compute RTA as a Balassa index based on patent counts which we source from the OECD's REGPAT database and allocate to HS product codes using the crosswalk provided by Lybbert and Zolas (2014). This index captures, rather than productive capabilities, countries' capabilities in terms of innovation output. The relationship between innovation and production is far from straightforward and disentangling this is beyond our scope, but it is reasonable to think that countries with innovative capabilities in specific products would be best placed to gain comparative advantage, especially since a significant proportion of the strategic products are relatively high-tech and close to the frontier.

pci_k is the average complexity of each product, capturing its technological features, accounting for the fact that the relationship between distance and changes in trade dependence may vary across product complexity levels.

We then control for a set of country-level variables X_c, including labour productivity, labour cost[9] and two measures of export diversification. While the first two measures are in line with the

[9] We source data from the OECD on value added and labour compensation which we deflated with GDP PPPs and divide by persons employed for each country.

technology-gap theory and are rather standard controls, the relationship between export diversification and distance requires some further discussion.

As it is apparent from the evidence (see Figure 2) and methodological discussion in section 3 distance and export diversification are tightly related. Larger and more diversified countries will have lower distance vis-à-vis all products; similarly, increases in a country's export diversification are likely to be correlated to a decrease in distance. However, it is also reasonable to expect that they will be negatively correlated to initial levels of export diversification[10].

We therefore include both log levels and delta log changes of number of products a country exports with RCA in our specification. In doing so, we can capture a country's export diversification performance, while accounting for its initial level of diversification. In this context distance captures the structural features at the beginning of the period: we expect that keeping export diversification equal countries should see trade dependence increase more in products distant from their initial productive structure.

Table 1 reports our results, adding controls gradually, for each product group. We find that initial levels of distance are positively correlated with long-term changes in trade dependence, although this relationship changes across products and as we add controls.

In particular, and as expected, countries' export diversification affects the statistical significance of distance. For EU-dependent and sensitive ecosystem products it seems that once we account for countries' export diversification level and change, distance ceases to be relevant to explain countries' change in trade dependence. This however is not the case for NZIA goods and semiconductors, suggesting for these narrower product categories export diversification alone is not enough and that countries' initial structure in terms of distance is important. Interestingly, change in export diversification for NZIA goods also has a positive coefficient suggesting that for this product category both initial distance and countries' export diversification effort matter.

Labour cost and productivity are statistically significant only for EU dependent products and the subsample of products that are relevant for sensitive ecosystems. It is remarkable that labour cost is negatively associated to changes in trade dependence while labour productivity has a positive

[10] This is a standard convergence effect, where countries that are already highly diversified will see their diversification level increase less than the less diversified ones, who have in contrast a higher potential for diversification. We refer to export and not to import diversification since countries' distance from strategic products is likely to depend on the bundle of products that the country exports.

sign. This suggests that countries with high labour productivity and low labour cost have increased imports and decreased exports of products in these two categories.

To make sense of this evidence it is worth bearing in mind that these two product categories are less complex than most products (see Figure 1). Therefore, in line with capability-based theory of countries' specialisation (Hidalgo et al. 2007, Hausmann et al. 2007), high-productive countries tend to specialise in high-complexity products and are, therefore, likely to move away from less complex products in the EU-dependent and sensitive ecosystem categories. Finally, product level complexity in and of itself doesn't seem to matter, except for NZIA goods in which case we see that more complex products are consistently less likely to see their trade dependence increase.

In the Appendix Table A.2 we also replicate Table 1, using relative distance as explanatory variable. We find however results to be quite different: coefficients remain statistically significant only for NZIA and semiconductor goods, i.e. the two technologically narrower product categories. This therefore suggests that generally speaking it is absolute distance, rather than the relative one, that is relevant for a countries' ability to reduce its trade dependence. However, when looking at specific product groups, the relative position of these products within a country's productive structure also matters. This means that policy makers should focus on both absolute and relative distance when targeting areas for industrial policies.

Table 1- Distance and long-term growth in trade dependence

	EU dependent products				Sensitive ecosystems			
Distance	0.471***	0.296**	0.278**	0.227	0.541***	0.261*	0.277*	0.114
	(0.133)	(0.110)	(0.111)	(0.164)	(0.176)	(0.151)	(0.154)	(0.299)
Trade dep.	-0.863***	-0.816***	-0.816***	-0.814***	-1.091***	-1.044***	-1.045***	-1.035***
	(0.0618)	(0.0606)	(0.0604)	(0.0625)	(0.0914)	(0.0822)	(0.0826)	(0.0838)
Labour cost (ln)		-0.148*	-0.148*	-0.138		-0.248**	-0.250**	-0.214
		(0.0792)	(0.0782)	(0.0923)		(0.114)	(0.115)	(0.147)
Labour prod. (ln)		0.161*	0.161*	0.151		0.255**	0.258**	0.220
		(0.0798)	(0.0788)	(0.0939)		(0.115)	(0.116)	(0.150)
Complexity		-0.000206	-0.000797	-0.000834		0.0144	0.0145	0.0144
		(0.00508)	(0.00514)	(0.00519)		(0.0122)	(0.0122)	(0.0124)
RTA			-0.0210*	-0.0209*			0.0254	0.0254
			(0.0114)	(0.0113)			(0.0248)	(0.0248)
Diversif. Change				0.00385				-0.0203
				(0.0680)				(0.123)
Diversif. Level				-0.0210				-0.0654
				(0.0436)				(0.0942)
Constant	0.274***	0.187**	0.207**	0.349	0.380***	0.305**	0.283*	0.734
	(0.0819)	(0.0865)	(0.0868)	(0.320)	(0.121)	(0.136)	(0.138)	(0.673)
Observations	15,039	12,430	12,430	12,430	5,265	4,369	4,369	4,369
R-squared	0.104	0.105	0.105	0.105	0.136	0.136	0.136	0.136
	NZIA goods				**Semiconductors**			
Distance	0.525***	0.380***	0.369***	0.370*	0.404**	0.321	0.310	0.626**
	(0.145)	(0.131)	(0.128)	(0.205)	(0.153)	(0.212)	(0.211)	(0.256)
Trade dep.	-0.782***	-0.758***	-0.758***	-0.752***	-0.647***	-0.652***	-0.652***	-0.677***
	(0.0709)	(0.0729)	(0.0732)	(0.0751)	(0.0784)	(0.0889)	(0.0889)	(0.0890)
Labour cost (log)		0.0501	0.0515	0.151**		0.0321	0.0345	-0.0578
		(0.115)	(0.117)	(0.0658)		(0.106)	(0.106)	(0.0734)
Labour prod. (ln)		-0.0363	-0.0374	-0.143**		-0.0254	-0.0275	0.0704
		(0.117)	(0.118)	(0.0657)		(0.107)	(0.107)	(0.0736)
Complexity		-0.0666***	-0.0670***	-0.0673***		-0.0380	-0.0371	-0.0456
		(0.0176)	(0.0176)	(0.0172)		(0.0275)	(0.0279)	(0.0275)
RTA			-0.0134	-0.0209			-0.0222	-0.0201
			(0.0208)	(0.0215)			(0.0291)	(0.0278)
Diversif. Change				-0.258***				0.0889
				(0.0858)				(0.133)
Diversif. Level				0.00768				0.134
				(0.0547)				(0.0862)
Constant	0.129	0.228*	0.241**	0.304	0.113	0.219	0.234*	-0.689
	(0.0805)	(0.110)	(0.113)	(0.363)	(0.0963)	(0.133)	(0.132)	(0.556)
Observations	2,888	2,378	2,378	2,378	1,176	966	966	966
R-squared	0.123	0.123	0.123	0.126	0.120	0.117	0.118	0.122

Long difference model, with delta log change in trade dependence between the 2012-15 and 2018-21 averages. All explanatory variables are averaged over the period 2012-15, except for Complexity which is a product invariant measure obtained as the average over all available years. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Distance is not only relevant for industrial policies aiming at reducing EU's trade dependence in strategic products, but also for countries' ability to retain specialisation in key products. This is important because while industrial policy can likely achieve specialisation in targeted products in the short term, the key question is how sustainable this is in the long run. In this context distance captures the coherence of the product with respect to the country's overall productive structure.

In table 2, we test a linear probability model where we look at country-product pairs with a 2012-15 average Balassa index, above 1.2, and their likelihood of this dropping below 1 as averaged over the period 2018-21. We identify this event as an RCA drop, allowing us to exclude from our analysis small changes in the Balassa index around the economically significant threshold of one and to focus on considerable shifts in countries specialisation patterns. Our specification remains quite similar to equation 1, with the addition of initial trade dependence as a control.

We find distance to be consistently positively and statistically significantly correlated with likelihood of an RCA drop. This is in line with expectations: countries are likely to lose specialisation in products that, at the beginning of our observed period, are distant from their productive structure.

Trade dependence is also consistently and positively correlated with the likelihood of an RCA drop. The two measures are not mechanically correlated, since trade dependence takes into account both import and export, while the Balassa index is a relative index of specialisation that includes other countries' specialisation pattern. In principle it would be possible for a country to have a high RCA and also to import large amounts of the same product, engaging in intra-industry trade. Our results however suggest that this is not the case and that countries with both a high trade dependence and a strong specialisation in a product that are distant from the country's productive structure are likely to see the latter disappear.

Per-existing technological capabilities, captured with the RTA, do not seem to matter in terms of RCA drop, except for NZIA products. For this product category country-level export diversification is also important: highly diversified countries are more likely to experience an RCA drop, while in contrast countries that have successfully increased their export diversification level are less likely to see an RCA drop. This again suggests that NZIA category encompasses high-tech products for which technology and capabilities play a significant role in terms of specialisation patterns.

Table 2- Distance and RCA drops.

	EU dependent products				Sensitive ecosystems			
Distance	0.216***	0.290***	0.294***	0.568***	0.213**	0.229**	0.232**	0.478***
	(0.0616)	(0.0898)	(0.0900)	(0.115)	(0.0791)	(0.0977)	(0.0990)	(0.159)
Trade dep.	0.104***	0.105***	0.105***	0.105***	0.114***	0.119***	0.119***	0.117***
	(0.0125)	(0.0140)	(0.0140)	(0.0153)	(0.0155)	(0.0174)	(0.0174)	(0.0189)
Labour cost (ln)		0.0202	0.0204	-0.0111		-0.0596	-0.0599	-0.0887
		(0.0469)	(0.0470)	(0.0412)		(0.0574)	(0.0574)	(0.0554)
Labour prod. (ln)		-0.0180	-0.0183	0.0136		0.0603	0.0605	0.0908
		(0.0478)	(0.0479)	(0.0421)		(0.0581)	(0.0582)	(0.0567)
Complexity		-0.0154***	-0.0153***	-0.0155***		-0.0184***	-0.0184***	-0.0189***
		(0.00310)	(0.00311)	(0.00257)		(0.00446)	(0.00446)	(0.00390)
RTA			0.00426	0.00369			0.00506	0.00531
			(0.00498)	(0.00493)			(0.00605)	(0.00637)
Diversif. Change				-0.0595				-0.0194
				(0.0367)				(0.0413)
Diversif. Level				0.104**				0.0891
				(0.0375)				(0.0533)
Constant	0.695***	0.646***	0.642***	-0.0672	0.688***	0.627***	0.622***	3.59e-05
	(0.0474)	(0.0475)	(0.0472)	(0.259)	(0.0642)	(0.0578)	(0.0589)	(0.363)
Observations	13,784	11,302	11,302	11,302	4,871	4,015	4,015	4,015
R-squared	0.021	0.029	0.030	0.037	0.024	0.031	0.031	0.035

	NZIA goods				Semiconductors			
Distance	0.378***	0.439***	0.420***	0.711***	0.145**	0.117	0.108	0.557***
	(0.0927)	(0.134)	(0.135)	(0.196)	(0.0692)	(0.108)	(0.103)	(0.164)
Trade dep.	0.201***	0.215***	0.213***	0.219***	0.138***	0.163***	0.164***	0.163***
	(0.0371)	(0.0438)	(0.0435)	(0.0395)	(0.0378)	(0.0418)	(0.0423)	(0.0430)
Labour cost (log)		0.0578	0.0549	0.0719		0.0748	0.0767	0.0202
		(0.0920)	(0.0923)	(0.0871)		(0.0567)	(0.0541)	(0.0704)
Labour prod. (ln)		-0.0520	-0.0487	-0.0672		-0.0806	-0.0823	-0.0212
		(0.0930)	(0.0934)	(0.0880)		(0.0572)	(0.0545)	(0.0717)
Complexity		-0.0107	-0.0123	-0.0149		0.0265**	0.0276**	0.0180
		(0.0108)	(0.0108)	(0.0112)		(0.0127)	(0.0128)	(0.0140)
RTA			-0.0286*	-0.0310**			-0.0255	-0.0259
			(0.0152)	(0.0148)			(0.0193)	(0.0180)
Diversif. Change				-0.173***				0.00276
				(0.0552)				(0.0587)
Diversif. Level				0.124**				0.166***
				(0.0569)				(0.0440)
Constant	0.477***	0.454***	0.475***	-0.290	0.748***	0.806***	0.817***	-0.338
	(0.0684)	(0.0807)	(0.0874)	(0.444)	(0.0490)	(0.0487)	(0.0469)	(0.325)
Observations	2,138	1,742	1,742	1,742	1,040	852	852	852
R-squared	0.051	0.049	0.051	0.062	0.030	0.032	0.035	0.055

Long difference model, with RCA drop between the 2021-18 and 2012-average. RCA drops are identified when a country with an RCA above 1.2 at the beginning of the period and an RCA below 1 at the edn of the period. Country-products with an RCA below 1.2 at the beginning of the period are excluded from the analysis. All explanatory variables are averaged over the period 2012-15, except for Complexity which is a product invariant measure obtained as the average over all available years. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

These results confirm the descriptive evidence in Figure 5, in the Appendix Table A.1 we report the same results looking at the likelihood of an RCA jump – i.e. going from below .8 to above 1. Remarkably, we find here no significant relationships with distance.[11] However results are different when we explore the relationship between normalised distance and both RCA drops and jumps (Appendix tables A.3 and A.4). While relative distance also matters for RCA drops, when we look at RCA jumps, we now find a consistently positive and statistically significant relationship. It would appear therefore that rather than absolute initial distance, what matters is the initial relative distance for countries' ability to perform RCA jumps. That is, countries tend to develop specialisation in the products that lie closest to their productive terms, in relative rather than absolute terms. This is to be expected, to some extent, since the changes in RCA can be explained by reallocation of exports among products and it is reasonable to expect that firms – and thus countries – will tend to specialise in the products that lie closest to them in relative, rather than absolute terms. That is, countries' economies are likely to veer towards the easiest specialisation opportunity with respect to their own capabilities, even if other foreign countries might stand a better chance to be successful. As we discuss further in the conclusions, this has implications from a policy perspective: countries will be drawn to specialisation patterns based on their productive structure, which might lead in turn to redundant efforts and inefficiencies at the European level in the lack of coordinated efforts.

5. Conclusions

In the context of the growing attention to industrial policy, Evenett et al. (2024) have created a New Industrial Policy Observatory (NIPO) documenting cases of public intervention. They find that the recent wave of new industrial policy activity is primarily driven by advanced economies, that subsidies are the most employed instrument and that strategic competitiveness is the more common reason behind the policies. The authors also raise questions around possible negative spillovers and tit-for-tat mechanisms and point to the importance of strengthening multilateral surveillance. With scarce resources, a multiplicity of objectives, increasing international competition and geopolitical challenges, the use of tools and methodologies to inform industrial

[11] We do find some weakly significant results when looking at the probability of the Balassa index going from below to above 1, but these are likely driven by small changes in products that had Balassa indexes around the threshold of one.

policies may prove very useful as recently emphasised also in the Draghi report on the future of European Competitiveness[12]. In this paper, we have referred to the literature on economic complexity (Hidalgo and Hausmann, 2009; Tacchella et al. 2012; Caldarola et al. 2024, Mealy and Teytelboym 2022) for mapping the position of European countries with respect to strategic products and to identify areas of opportunity by looking at those products that are closer to the actual set of countries' capabilities. Our results are three-fold. First, large and diversified manufacturing countries such as Germany and Italy tend to have a productive structure that is closer to most strategic products; this however changes when we look at distance in relative terms, i.e. looking at the product that is closest to a country, rather than the country that is closest to a product. Some small, specialised countries – notably Sweden and Czechia – see their prospects to steer their productive structure towards strategic products improve significantly. Second absolute proximity helps reducing European trade dependencies, while relative proximity helps developing new trade comparative advantages (RCAs). Therefore, both countries with low absolute and low relative distance can contribute to strengthen the European position in strategic products. Third, comparative advantages in products that are distant from countries' capabilities both in relative and absolute terms are unlikely to be maintained.

The first two results point to the importance of coordinating European and member states policies to effectively reduce dependencies and acquire productive advantages in strategic products. While the concentration of resources in large manufacturing countries increases the chances to reduce European dependencies in strategic products, these economies have a diversified industrial structure with possibly absolute and relative strengths also in non-strategic products and may have limited resources (labour, skills, inputs) to reduce dependencies/develop capabilities in a high number of products. Smaller member states with limited relative distance may play a crucial role if Europe wants to develop extensive end-to-end value chains in critical products. However, uncoordinated industrial policies at the national level may not serve this objective effectively. Allowing uncontrolled and uncoordinated state aid, also when limited to strategic products, can interfere with the single market and result in duplication of efforts that should be avoided by strengthening European governance. This may be achieved by extending the logic of strategic alliances and IPCEI, that allow to pool together competencies of different countries, to strategic

[12] https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en

value chains in order to reduce dependencies and develop complementary competencies. Moreover, the logic of IPCEI can be improved allowing the European Commission to select the best projects for a given industrial policy and to provide European co-funding (Di Carlo, Eisl and Zurstrassen, 2024); such an improved structure could increase the effectiveness of European coordination.

Industrial policies should also be better coordinated with cohesion policies in order to increase European competitiveness and resilience without undermining internal cohesion. Over time cohesion policy, through the smart specialisation strategy, has become a "place-centred industrial policy" (Monastiriotis and Gamtkitsulashvili, 2024). It could, therefore, contribute to the strategic priorities of the EU by incorporating the overall objectives of European industrial policy when designing cohesion policies. The empirical analysis carried out in this paper suggests that some small Eastern European economies have low relative distance to strategic products and are well-suited to develop productive advantages in these areas.

European strategies reviewed in Section 2 signal the directions for industrial policy and this paper has shown that European countries' specialisation is not far from some strategic products, particularly NZIA goods that are related to the green transition (see Figure 2). In these products, the evolution of European trade dependencies is negatively related to the complexity of the products. Therefore, Europe has the possibility to reduce dependencies in more complex products that also offer the greater opportunities for long term growth.

Finally, the third set of results of this study show that countries are more likely to lose specialisation in products that fit less with their productive core in both absolute and relative term in line with the structuralist approach pointing to synergic development (Hirschman 1958; Chang and Andreoni 2020). We hence argue that industrial policies should not focus on individual products, but rather aim to foster broader and coherent technological and capability ecosystem. This requires a systemic approach which takes into account the complementarities across different activities at the European level.

References

Arjona, R, W. Connell and C. Herghelegiu, (2023), An enhanced methodology to monitor the EU's strategic dependencies and vulnerabilities, No WP2023/14, Single Market Economics Papers, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (European Commission), Chief Economist Team

Balland, P. A., Broekel, T., Diodato, D., Giuliani, E., Hausmann, R., O'Clery, N., & Rigby, D. (2022). The new paradigm of economic complexity. Research Policy, 51(3), 104450.

Balland, P. A., Boschma, R., Crespo, J., & Rigby, D. L. (2019). Smart specialization policy in the European Union: relatedness, knowledge complexity and regional diversification. Regional studies, 53(9), 1252-1268.

Bulfone, F., Di Carlo, D., Bontadini, F., Meliciani, V. (2024), Adjusting to New Geopolitical Realities. Semiconductors Industrial Policies in the US and EU, IAI Papers, 13 May 2024

Caldarola, B., D Mazzilli, L Napolitano, A Patelli, A Sbardella. Journal of Physics: Complexity, 2024. 1, 2024.

Chang, HJ and Andreoni A. (2020), Industrial policy in the 21st century, Development and change 51 (2), 324-351.

Di Carlo, D., Eisl, A. and Zurstrassen D. (2024), Together we trade, divided we aid: EU industrial policy, state aid and the loosening of EU competition regime, in EU Industrial Policy Report 2024, Luiss Hub for New Industrial Policy and Economic Governance, Chapter 4. https://leap.luiss.it/wp-content/uploads/2024/09/20240919_Luiss_Rapporto-LUHNIP_v6.pdf

Dosi, G. (1982), Technological paradigms and technological trajectories: a suggestive interpretations of the determinants and directions of technical change, Research Policy, vol. 11, 147-162.

Dosi, G., Freeman, C., Nelson, R.R., Soete, L., Silverberg, G. (Eds.) (1988), Technical Change and Economic Theory. Pinter Publishers, London.

Dosi, G., Pavitt, K., Soete, L., 1990. The Economics of Technical Change and International Trade. Harvester Wheatsheaf, London.

Dosi, G. and Nelson, R. (1994), An introduction to evolutionary theories in economics *Journal of Evolutionary Economics,* **4** 153‑72

Edler, J., K. Blind, Kroll, H., Schubert, T. (2023), Technology Sovereignty as an emerging frame for innovation policy. Defining rationales, ends and means, Research Policy 52, 104765.

European commission (2020), COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A New Industrial Strategy for Europe

European Commission (2021a), Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery, COM(2021)350 final, https://eurlex.europa.eu/legal-content/GA/TXT/?uri=CELEX:52021DC0350.

European Commission (2021b), Strategic dependencies and capacities, Brussels, Staff Working Document SWD(2021)352 final, https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=SWD:2021:352:FIN.

European Commission (2021c), COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS EMPTY. Trade Policy Review - An Open, Sustainable and Assertive Trade Policy

EUROPEAN COMMISSION (2022a), EU strategic dependencies and capacities: second stage of in-depth reviews, Brussels, Staff Working Document SWD(2022)41final, https://ec.europa.eu/docsroom/documents/48878.

European Commission (2023a), COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A Green Deal Industrial Plan for the Net-Zero Age

European Commission (2023b) Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on establishing a framework of measures for strengthening Europe's net-zero technology products manufacturing ecosystem (Net Zero Industry Act) COM/2023/161 final. Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:6448c360-c4dd-11ed-a05c-01aa75ed71a1.0001.02/DOC_1&format=PDF.

European Commission. (2023c). *European Chips Act*. Regulation (EU) 2023/1781 of the European Parliament and of the Council of 13 September 2023 establishing a framework of measures for strengthening Europe's semiconductor ecosystem and amending Regulation (EU) 2021/694

Evenett, S., Jakubik, A., Martín, F., Ruta, M. (2024), The Return of Industrial Policy in Data, International Monetary Fund, WP/24/1

FERNÁNDEZ-MIGUEL, A., RICCARDI, M.P., VEGLIO, V., GARCÍA-MUIÑA, F.E., FERNÁNDEZ DEL HOYO, A.P., AND SETTEMBRE-BLUNDO, D. (2022), "Disruption in Resource-Intensive Supply Chains: Reshoring and Nearshoring as Strategies to Enable Them to Become More Resilient and Sustainable", Sustainability, 14, 10909. https://doi.org/10.3390/su141710909

Fontana, O., Vannuccini, S. (2024), How to institutionalise European Industrial Policy (for strategic autonomy and the green transition), Centro Studi sul Federalismo Research Paper, February 2024.

Gaullier, G. and Zignago, S. (2010) BACI: International Trade Database at the Product-Level. The 1994-2007 Version. CEPII Working Paper, N°2010-23.

Hausmann, R., Hwang, J., & Rodrik, D. (2007). What you export matters. Journal of economic growth, 12, 1-25.

Hidalgo, C. A., Klinger, B., Barabási, A. L., & Hausmann, R. (2007). The product space conditions the development of nations. Science, 317(5837), 482-487.

Hidalgo, C.A., 2021. Economic complexity theory and applications. Nat. Rev. Phys. 1–22.

Hidalgo, C. A., & Hausmann, R. (2009). The building blocks of economic complexity. Proceedings of the national academy of sciences, 106(26), 10570-10575.

Hirschman, A O (1958), *The Strategy of Economic Development,* Yale University Press

Juhász, R., Lane, N. J., & Rodrik, D. (2023). *The new economics of industrial policy* (No. w31538). National Bureau of Economic Research.

Lybbert, T. J., & Zolas, N. J. (2014). Getting patents and economic data to speak to each other: An 'algorithmic links with probabilities' approach for joint analyses of patenting and economic activity. Research Policy, 43(3), 530-542.

Mariani M, Vidmer A, Medo M, Zhang Y (2015). "Measuring economic complexity of countries and products: which metric to use?" The European Physical Journal B, 88(11), 293.

Mazzucato M. (2021), *Mission Economy: A Moonshot Guide to Changing Capitalism*. Harper Business.

Mealy P., Teytelboym, A. (2022), Economic complexity and the green economy *Research Policy* **51** 103948.

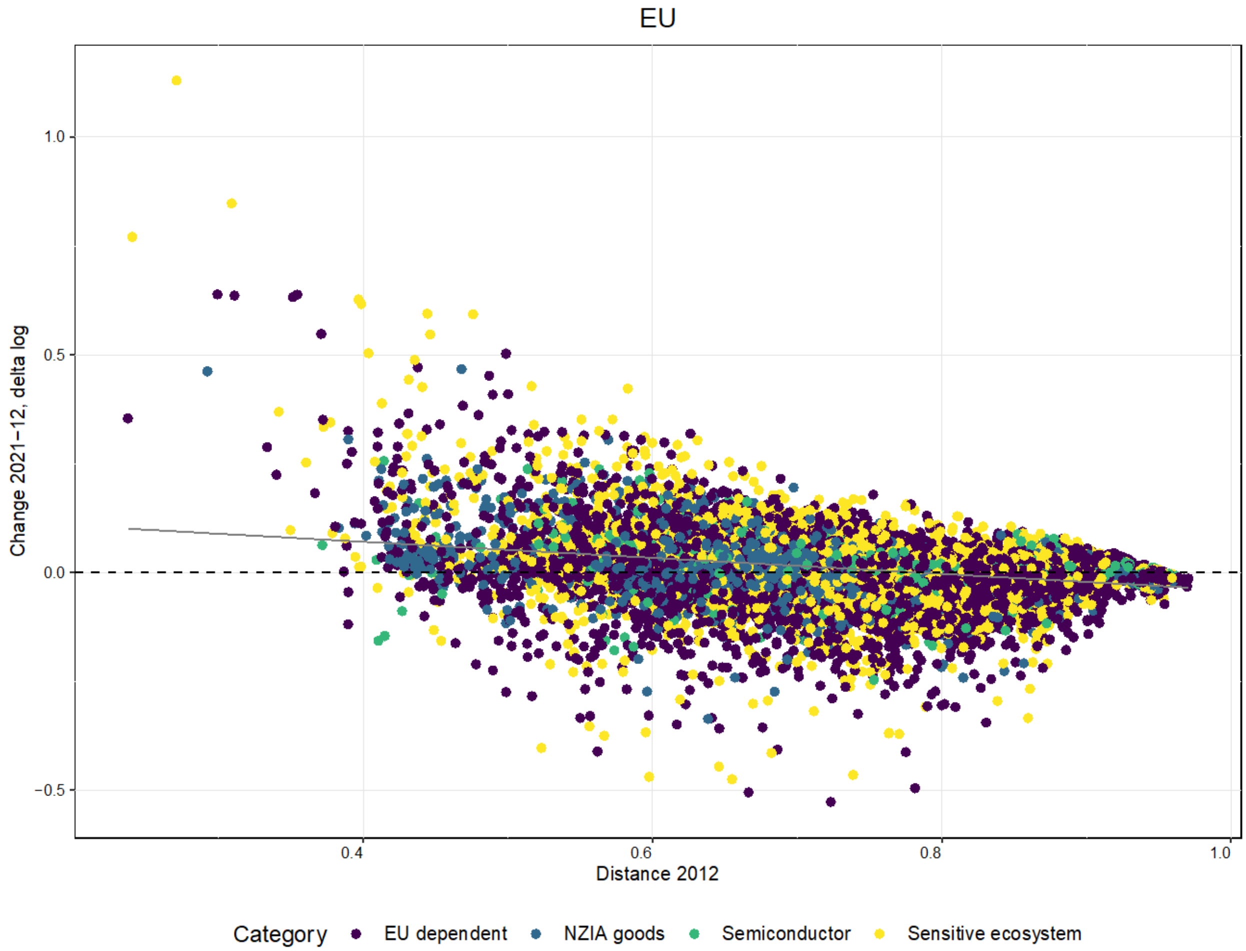
Monastiriotis, V. and Gamtkitsulashvili, T. (2024). Taking the territorial dimension of industrial policy seriously: industrial and cohesion policy in the EU, in EU Industrial Policy Report 2024, Luiss Hub for New Industrial Policy and Economic Governance, Chapter 7. https://leap.luiss.it/wp-content/uploads/2024/09/20240919_Luiss_Rapporto-LUHNIP_v6.pdf

Tacchella A, Cristelli M, Caldarelli G, Gabrielli A and Pietronero L (2012). A new metrics for countries' fitness and products' complexity, *Sci. Rep.* **2** 723.

Appendix

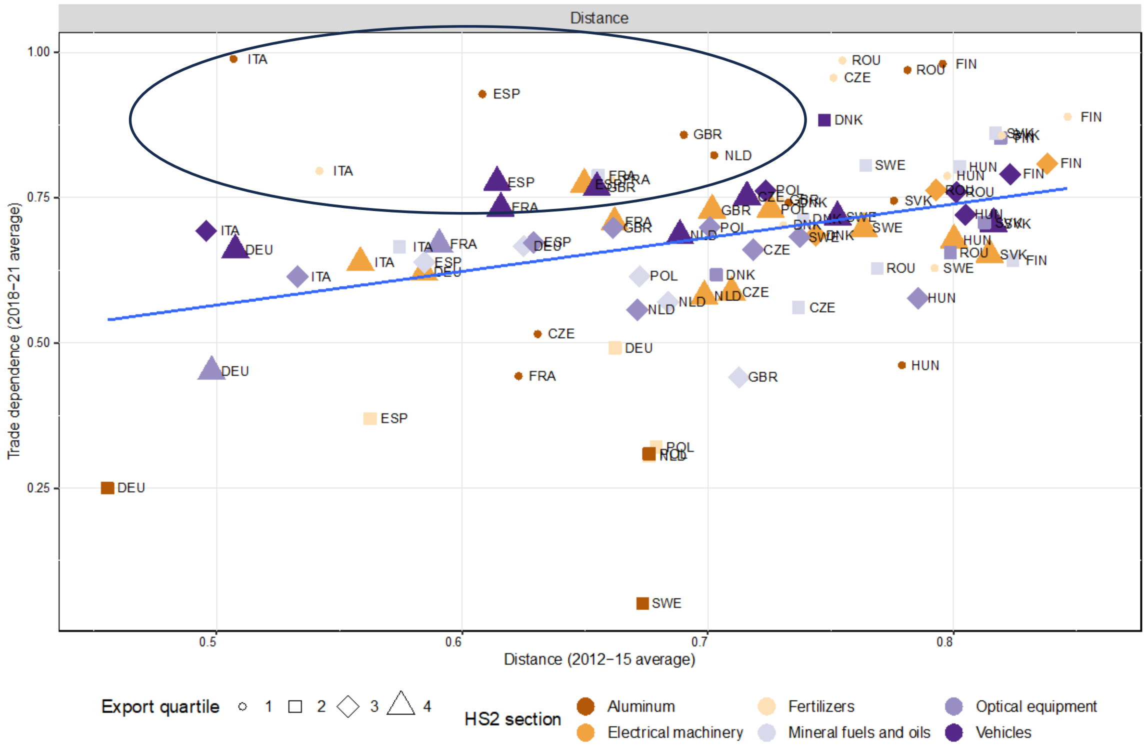
In this appendix we provide additional evidence, which we discuss in the main text. This includes figures on product categories as well as robustness checks of our econometric exercise.

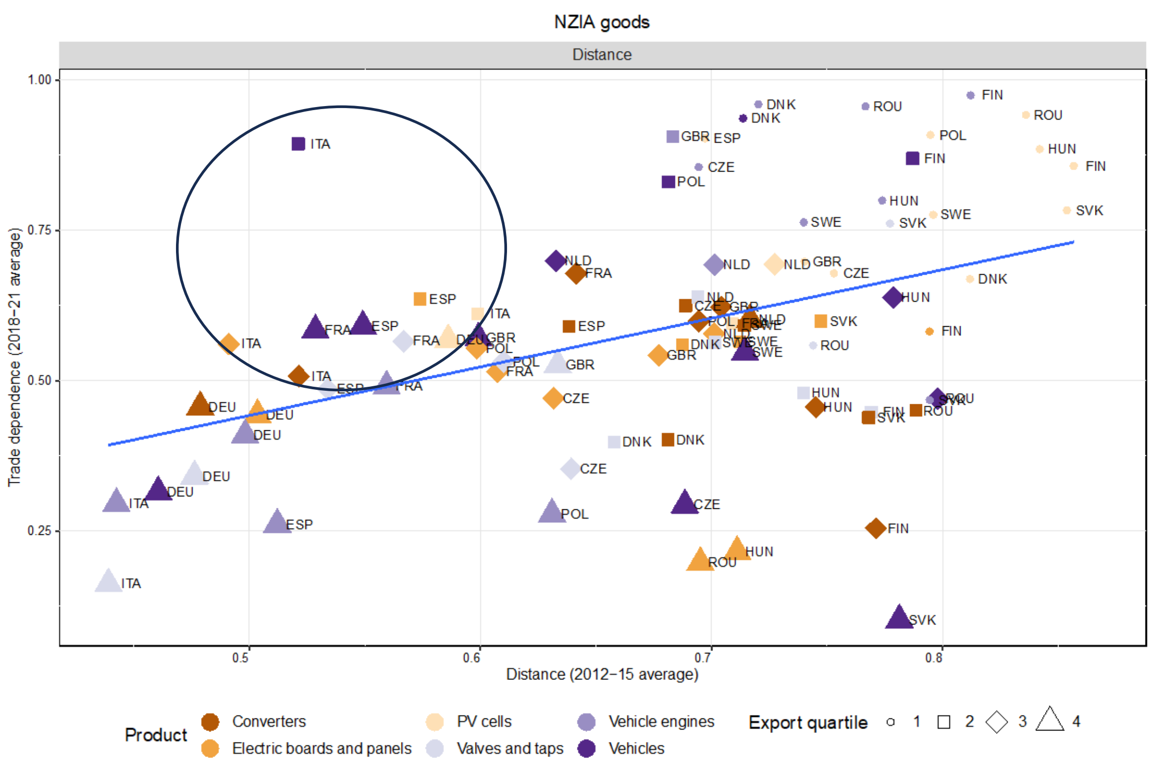
Figure A.1 – Persistence of distance over time, 2012-21, all EU countries.



Note: The figure plots initial levels of distance for each country-product pairs against the delta log change over the period 2012-12. All EU countries are included.
Source: Authors' elaboration on BACI-CEPII data.

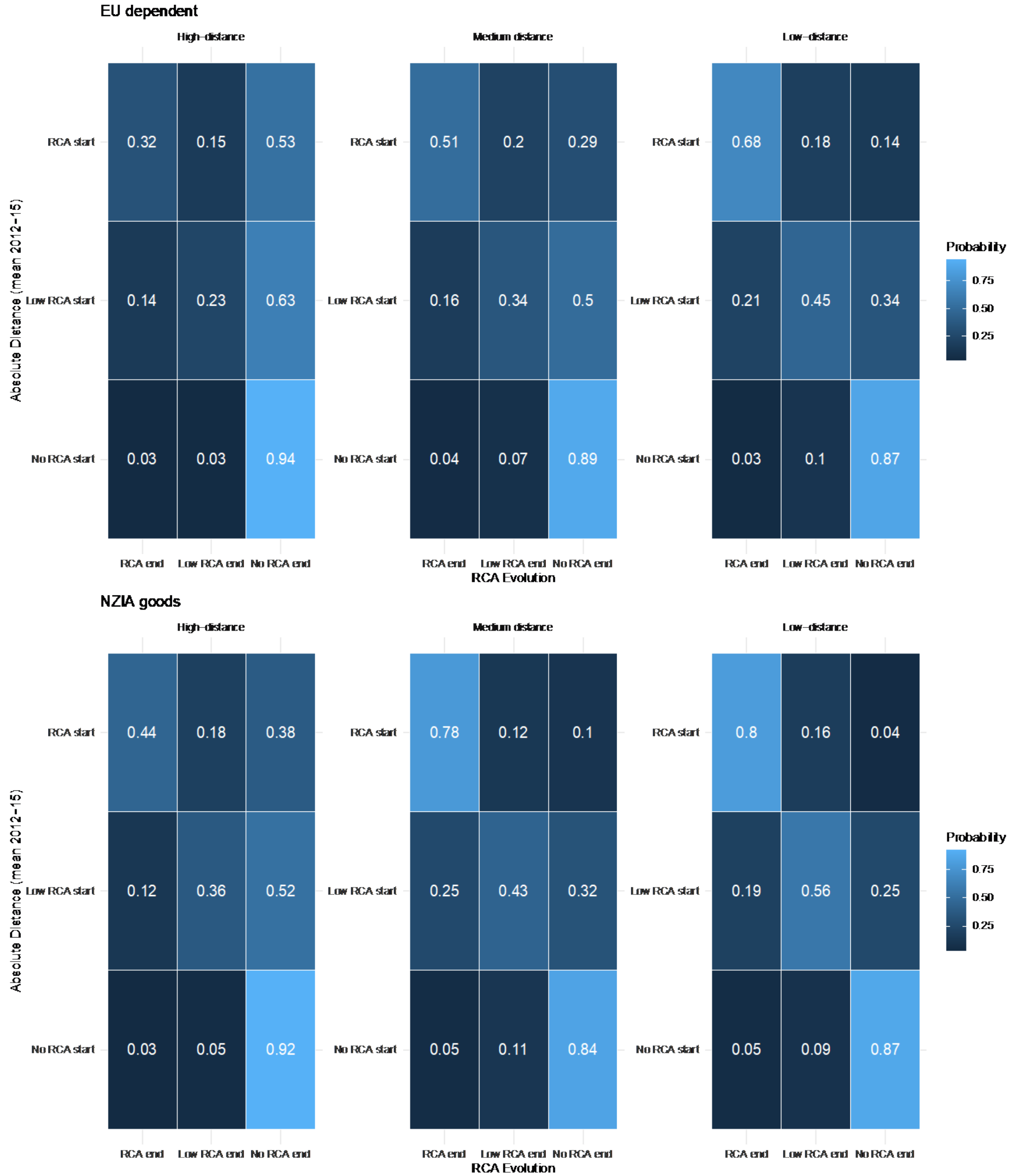
Figure A.2 – Initial distance and trade dependence for EU dependent products in sensitive ecosystem and semiconductors.





Note: The figure reports unweighted averages for the initial distance (2012-15) and final trade dependence (2018-21) for selected 2-digit sections of the HS12 product classifications and selected countries. Top panel includes EU-dependent products, bottom-panel includes NZIA products.
Source: Authors' elaboration on BACI-CEPII data.

Figure A.3 - Transition matrices for RCA and distance for sensitive ecosystem goods and NZIA goods.



Note: The transition matrix looks at three possible states: RCA above 1, between 0.5 and 1, and below 0.5, corresponding to RCA, low RCA and no RCA, respectively. Each matrix refers to terciles of distance. Top panel includes EU-dependent products, bottom-panel includes semiconductors.
Source: Authors' elaboration on BACI-CEPII data.

Table A.1 – Distance and RCA jumps.

	EU dependent products				Sensitive ecosystems			
Distance	-0.0791	-0.120	-0.117	-0.242**	-0.0940	-0.114	-0.111	-0.228*
	(0.0497)	(0.0728)	(0.0734)	(0.0905)	(0.0642)	(0.0780)	(0.0782)	(0.121)
Trade dep.	-0.0650***	-0.0692***	-0.0692***	-0.0714***	-0.0825***	-0.0865***	-0.0865***	-0.0864***
	(0.00984)	(0.0108)	(0.0108)	(0.0111)	(0.0122)	(0.0139)	(0.0139)	(0.0142)
Labour cost (ln)		-0.00744	-0.00736	-0.00959		0.0398	0.0394	0.0489
		(0.0365)	(0.0365)	(0.0285)		(0.0453)	(0.0453)	(0.0464)
Labour prod. (ln)		0.00478	0.00466	0.00761		-0.0401	-0.0397	-0.0496
		(0.0372)	(0.0373)	(0.0290)		(0.0459)	(0.0459)	(0.0474)
Complexity		0.0114***	0.0115***	0.0115***		0.0135***	0.0135***	0.0137***
		(0.00214)	(0.00216)	(0.00192)		(0.00370)	(0.00371)	(0.00354)
RTA			0.00239	0.00252			0.00435	0.00411
			(0.00434)	(0.00426)			(0.00588)	(0.00613)
Diversif. change				0.0657***				0.0179
				(0.0226)				(0.0348)
Diversif. level				-0.0462*				-0.0410
				(0.0227)				(0.0356)
Constant	0.156***	0.195***	0.192***	0.496***	0.183***	0.231***	0.227***	0.512*
	(0.0396)	(0.0419)	(0.0424)	(0.171)	(0.0523)	(0.0542)	(0.0549)	(0.256)
Observations	13,078	10,691	10,691	10,691	4,615	3,797	3,797	3,797
R-squared	0.007	0.012	0.012	0.016	0.011	0.017	0.017	0.018
	NZIA goods				Semiconductors			
Distance	-0.138*	-0.0834	-0.0825	-0.0949	-0.0398	0.0147	0.0185	-0.0921
	(0.0705)	(0.0951)	(0.0947)	(0.124)	(0.0362)	(0.0443)	(0.0464)	(0.0669)
Trade dep.	-0.0951***	-0.0966***	-0.0965***	-0.106***	-0.0595**	-0.0509	-0.0514	-0.0529*
	(0.0276)	(0.0289)	(0.0289)	(0.0276)	(0.0287)	(0.0308)	(0.0308)	(0.0308)
Labour cost (log)		0.0475	0.0477	-0.0194		0.0369	0.0358	0.0478*
		(0.0672)	(0.0671)	(0.0577)		(0.0233)	(0.0245)	(0.0271)
Labour prod. (ln)		-0.0510	-0.0512	0.0194		-0.0346	-0.0336	-0.0466
		(0.0682)	(0.0680)	(0.0581)		(0.0236)	(0.0248)	(0.0277)
Complexity		0.00176	0.00188	0.00171		-0.0160	-0.0165	-0.0144
		(0.00967)	(0.00994)	(0.00996)		(0.0106)	(0.0105)	(0.0104)
RTA			0.00213	0.00599			0.00942	0.00964
			(0.0133)	(0.0131)			(0.0133)	(0.0132)
Diversif. change				0.152***				-0.000214
				(0.0311)				(0.0321)
Diversif. level				-0.0161				-0.0388*
				(0.0381)				(0.0190)
Constant	0.234***	0.250***	0.249***	0.270	0.0948***	0.0880***	0.0829**	0.358**
	(0.0457)	(0.0663)	(0.0678)	(0.286)	(0.0252)	(0.0302)	(0.0348)	(0.140)
Observations	1,868	1,501	1,501	1,501	971	792	792	792
R-squared	0.012	0.010	0.010	0.016	0.009	0.009	0.010	0.012

Long difference model, with RCA drop between the 2021-18 and 2012-average. RCA jumps are identified when a country with an RCA above 0.8 at the beginning of the period and an RCA above 1 at the end of the period. Country-products with an RCA above 0.8 at the beginning of the period are excluded from the analysis. All explanatory variables are averaged over the period 2012-15, except for Complexity which is a product invariant measure obtained as the average over all available years. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A.2 – Relative distance and trade balance.

	EU dependent products				Sensitive ecosystems			
Distance	0.133*	0.104	0.0984	0.0814	0.148	0.0482	0.0477	0.0273
	(0.0710)	(0.0673)	(0.0677)	(0.0719)	(0.146)	(0.137)	(0.137)	(0.145)
Trade dep.	-0.813***	-0.797***	-0.799***	-0.810***	-1.042***	-1.023***	-1.022***	-1.030***
	(0.0592)	(0.0616)	(0.0614)	(0.0619)	(0.0903)	(0.0846)	(0.0848)	(0.0822)
Labour cost (ln)		-0.215***	-0.210***	-0.134		-0.314***	-0.319***	-0.213
		(0.0722)	(0.0704)	(0.100)		(0.106)	(0.107)	(0.150)
Labour prod. (ln)		0.227***	0.223***	0.146		0.321***	0.327***	0.218
		(0.0725)	(0.0707)	(0.102)		(0.106)	(0.108)	(0.153)
Complexity		-0.000738	-0.00150	-0.00140		0.0138	0.0138	0.0141
		(0.00515)	(0.00524)	(0.00530)		(0.0123)	(0.0123)	(0.0124)
RTA			-0.0281**	-0.0226*			0.0195	0.0243
			(0.0115)	(0.0113)			(0.0245)	(0.0242)
Diversif. change				0.00387				-0.0222
				(0.0726)				(0.125)
Diversif. level				-0.0721**				-0.0917*
				(0.0306)				(0.0517)
Constant	0.502***	0.268***	0.286***	0.702***	0.652***	0.397**	0.386**	0.921**
	(0.0476)	(0.0779)	(0.0772)	(0.202)	(0.0999)	(0.141)	(0.143)	(0.363)
Observations	15,039	12,430	12,430	12,430	5,265	4,369	4,369	4,369
R-squared	0.099	0.103	0.103	0.105	0.131	0.135	0.135	0.136

	NZIA goods				Semiconductors			
Distance	0.274**	0.228***	0.227***	0.168**	0.256**	0.268**	0.264**	0.264**
	(0.102)	(0.0799)	(0.0800)	(0.0717)	(0.0934)	(0.108)	(0.106)	(0.103)
Trade dep.	-0.738***	-0.745***	-0.749***	-0.751***	-0.633***	-0.661***	-0.663***	-0.671***
	(0.0675)	(0.0669)	(0.0684)	(0.0717)	(0.0681)	(0.0769)	(0.0769)	(0.0874)
Labour cost (log)		-0.0501	-0.0430	0.145**		-0.0219	-0.0161	-0.0474
		(0.116)	(0.117)	(0.0699)		(0.0941)	(0.0949)	(0.0892)
Labour prod. (ln)		0.0630	0.0564	-0.139*		0.0294	0.0239	0.0571
		(0.118)	(0.119)	(0.0701)		(0.0957)	(0.0965)	(0.0898)
Complexity		-0.0696***	-0.0706***	-0.0691***		-0.0495*	-0.0485	-0.0488*
		(0.0177)	(0.0176)	(0.0177)		(0.0282)	(0.0284)	(0.0281)
RTA			-0.0240	-0.0262			-0.0253	-0.0253
			(0.0212)	(0.0217)			(0.0285)	(0.0282)
Diversif. change				-0.241**				0.0841
				(0.0968)				(0.131)
Diversif. level				-0.0832**				-0.00465
				(0.0319)				(0.0634)
Constant	0.320***	0.275**	0.291**	0.887***	0.231***	0.242*	0.255*	0.250
	(0.0507)	(0.111)	(0.112)	(0.173)	(0.0731)	(0.131)	(0.131)	(0.368)
Observations	2,888	2,378	2,378	2,378	1,176	966	966	966
R-squared	0.118	0.122	0.122	0.126	0.116	0.118	0.119	0.120

Long difference model, with RCA drop between the 2021-18 and 2012-average. RCA jumps are identified when a country with an RCA above 0.8 at the beginning of the period and an RCA above 1 at the end of the period. Country-products with an RCA above 0.8 at the beginning of the period are excluded from the analysis. All explanatory variables are averaged over the period 2012-15, except for Complexity which is a product invariant measure obtained as the average over all available years. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A.3 – Relative distance and RCA drops.

	EU dependent products				Sensitive ecosystems			
Distance	0.302***	0.313***	0.313***	0.300***	0.295***	0.292***	0.292***	0.287***
	(0.0318)	(0.0349)	(0.0349)	(0.0364)	(0.0579)	(0.0662)	(0.0662)	(0.0702)
Trade dep.	0.105***	0.107***	0.107***	0.106***	0.111***	0.116***	0.116***	0.115***
	(0.0161)	(0.0165)	(0.0164)	(0.0152)	(0.0186)	(0.0194)	(0.0195)	(0.0180)
Labour cost (ln)		-0.0483	-0.0482	-0.0127		-0.0979*	-0.0978*	-0.0808
		(0.0396)	(0.0395)	(0.0512)		(0.0525)	(0.0527)	(0.0553)
Labour prod. (ln)		0.0490	0.0489	0.0120		0.0983*	0.0982*	0.0807
		(0.0400)	(0.0400)	(0.0523)		(0.0529)	(0.0531)	(0.0562)
Complexity		-0.0175***	-0.0175***	-0.0173***		-0.0210***	-0.0210***	-0.0209***
		(0.00278)	(0.00282)	(0.00281)		(0.00391)	(0.00391)	(0.00391)
RTA			-0.000727	0.000363			-0.000477	0.000242
			(0.00568)	(0.00501)			(0.00629)	(0.00631)
Diversif. change				-0.0462				-0.0144
				(0.0457)				(0.0427)
Diversif. level				-0.0155				-0.0109
				(0.0255)				(0.0332)
Constant	0.644***	0.590***	0.590***	0.704***	0.641***	0.562***	0.562***	0.631***
	(0.0231)	(0.0417)	(0.0414)	(0.149)	(0.0409)	(0.0500)	(0.0506)	(0.193)
Observations	13,784	11,302	11,302	11,302	4,871	4,015	4,015	4,015
R-squared	0.034	0.040	0.040	0.041	0.032	0.040	0.040	0.040

	NZIA goods				Semiconductors			
Distance	0.503***	0.520***	0.519***	0.490***	0.349***	0.353***	0.354***	0.363***
	(0.0497)	(0.0615)	(0.0635)	(0.0681)	(0.0792)	(0.103)	(0.103)	(0.0966)
Trade dep.	0.224***	0.231***	0.225***	0.222***	0.133***	0.149***	0.150***	0.161***
	(0.0372)	(0.0402)	(0.0395)	(0.0396)	(0.0321)	(0.0389)	(0.0387)	(0.0413)
Labour cost (log)		-0.0534	-0.0509	0.0440		0.0916	0.0960*	0.0510
		(0.0575)	(0.0579)	(0.0819)		(0.0565)	(0.0546)	(0.0588)
Labour prod. (ln)		0.0585	0.0565	-0.0418		-0.0957	-0.0998*	-0.0539
		(0.0578)	(0.0582)	(0.0830)		(0.0574)	(0.0554)	(0.0594)
Complexity		-0.0216*	-0.0239**	-0.0227*		0.00566	0.00653	0.00710
		(0.0113)	(0.0115)	(0.0113)		(0.0138)	(0.0142)	(0.0143)
RTA			-0.0358**	-0.0367**			-0.0276	-0.0292
			(0.0142)	(0.0142)			(0.0184)	(0.0181)
Diversif. change				-0.101				-0.00407
				(0.0717)				(0.0446)
Diversif. level				-0.0392				0.0484
				(0.0414)				(0.0319)
Constant	0.417***	0.342***	0.360***	0.650**	0.607***	0.677***	0.684***	0.409*
	(0.0460)	(0.0780)	(0.0782)	(0.249)	(0.0697)	(0.0672)	(0.0658)	(0.205)
Observations	2,138	1,742	1,742	1,742	1,040	852	852	852
R-squared	0.076	0.074	0.077	0.080	0.061	0.061	0.065	0.069

Long difference model, with RCA drop between the 2021-18 and 2012-average. RCA jumps are identified when a country with an RCA above 0.8 at the beginning of the period and an RCA above 1 at the end of the period. Country-products with an RCA above 0.8 at the beginning of the period are excluded from the analysis. All explanatory variables are averaged over the period 2012-15, except for Complexity which is a product invariant measure obtained as the average over all available years. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A.4 – Relative distance and RCA jumps.

	EU dependent products				Sensitive ecosystems			
Distance	-0.171***	-0.175***	-0.174***	-0.163***	-0.170***	-0.166**	-0.167**	-0.164**
	(0.0298)	(0.0353)	(0.0356)	(0.0344)	(0.0509)	(0.0607)	(0.0612)	(0.0626)
Trade dep.	-0.0645***	-0.0696***	-0.0694***	-0.0711***	-0.0807***	-0.0857***	-0.0854***	-0.0852***
	(0.0116)	(0.0122)	(0.0121)	(0.0113)	(0.0138)	(0.0150)	(0.0149)	(0.0141)
Labour cost (ln)		0.0207	0.0201	-0.00498		0.0575	0.0556	0.0447
		(0.0290)	(0.0290)	(0.0334)		(0.0420)	(0.0422)	(0.0450)
Labour prod. (ln)		-0.0225	-0.0219	0.00436		-0.0576	-0.0559	-0.0445
		(0.0294)	(0.0294)	(0.0341)		(0.0424)	(0.0427)	(0.0457)
Complexity		0.0126***	0.0127***	0.0126***		0.0151***	0.0150***	0.0150***
		(0.00195)	(0.00197)	(0.00195)		(0.00350)	(0.00349)	(0.00352)
RTA			0.00378	0.00369			0.00709	0.00670
			(0.00449)	(0.00422)			(0.00625)	(0.00648)
Diversif. change				0.0544*				0.0136
				(0.0275)				(0.0324)
Diversif. level				0.00259				0.00541
				(0.0178)				(0.0236)
Constant	0.217***	0.251***	0.249***	0.205**	0.233***	0.278***	0.274***	0.237
	(0.0243)	(0.0338)	(0.0338)	(0.0974)	(0.0398)	(0.0505)	(0.0501)	(0.139)
Observations	13,078	10,691	10,691	10,691	4,615	3,797	3,797	3,797
R-squared	0.013	0.018	0.018	0.019	0.016	0.021	0.021	0.021
	NZIA goods				Semiconductors			
Distance	-0.241***	-0.244***	-0.244***	-0.210***	-0.147***	-0.108**	-0.109**	-0.113***
	(0.0525)	(0.0585)	(0.0587)	(0.0625)	(0.0406)	(0.0400)	(0.0403)	(0.0392)
Trade dep.	-0.108***	-0.102***	-0.101***	-0.104***	-0.0597**	-0.0464	-0.0466	-0.0520
	(0.0240)	(0.0244)	(0.0244)	(0.0271)	(0.0266)	(0.0294)	(0.0295)	(0.0310)
Labour cost (log)		0.0641	0.0640	-0.000321		0.0205	0.0183	0.0361
		(0.0451)	(0.0453)	(0.0555)		(0.0222)	(0.0227)	(0.0230)
Labour prod. (ln)		-0.0673	-0.0674	-0.000204		-0.0189	-0.0169	-0.0350
		(0.0453)	(0.0455)	(0.0557)		(0.0224)	(0.0229)	(0.0233)
Complexity		0.00879	0.00908	0.00772		-0.00856	-0.00888	-0.00921
		(0.00942)	(0.00970)	(0.00977)		(0.00996)	(0.00985)	(0.0101)
RTA			0.00444	0.00646			0.00971	0.0107
			(0.0131)	(0.0129)			(0.0128)	(0.0128)
Diversif. change				0.102**				0.00191
				(0.0391)				(0.0266)
Diversif. level				0.00836				-0.0207*
				(0.0292)				(0.0102)
Constant	0.299***	0.364***	0.362***	0.241	0.174***	0.157***	0.154***	0.272***
	(0.0383)	(0.0544)	(0.0554)	(0.182)	(0.0340)	(0.0275)	(0.0289)	(0.0660)
Observations	1,868	1,501	1,501	1,501	971	792	792	792
R-squared	0.023	0.022	0.022	0.024	0.019	0.015	0.016	0.018

Long difference model, with RCA drop between the 2021-18 and 2012-average. RCA jumps are identified when a country with an RCA above 0.8 at the beginning of the period and an RCA above 1 at the end of the period. Country-products with an RCA above 0.8 at the beginning of the period are excluded from the analysis. All explanatory variables are averaged over the period 2012-15, except for Complexity which is a product invariant measure obtained as the average over all available years. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct centres. You can find the address of the centre nearest you online (european-union.europa.eu/contact-eu/meet-us_en)

On the phone or in writing

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

— by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

— at the following standard number: +32 22999696,

— via the following form: european-union.europa.eu/contact-eu/write-us_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website (european-union.europa.eu)

EU publications

You can view or order EU publications at op.europa.eu/en/publications. Multiple copies of free publications can be obtained by contacting Europe Direct or your local documentation centre (european-union.europa.eu/contact-eu/meet-us_en).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu)

EU open data

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

ET-01-25-001-EN-N

Publications Office
of the European Union

DOI: 10.2873/3267849
ISBN 978-92-68-23792-2