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**REPORT //**

**STARTER. Task 1, Scenario 2:  
How can EU trade policy encour-  
age de-risking? Focus on countries  
that have an FTA with the EU**

Report on Scenario 2 July 2025

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The final version of the report will be published as soon as approved.

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## Abbreviations

C2C	Country-to-country
CBAM	Carbon Border Adjustment Mechanism
CGE	Computable General Equilibrium
ECRMA	European Union's Critical Raw Minerals Act
FTA	Free Trade Agreements
FDI	Foreign Direct Investment
ICIO	Inter-Country Input-Output tables
GDP	Gross Domestic Product
GVA	Gross Value Added
JRC	Joint Research Centre
LNG	Liquefied natural gas
MERCOSUR	Mercado Común del Sur (Argentina, Brasilia, Paraguay and Uruguay)
NTB	Non-tariff barriers
OSA	Open Strategic Autonomy
R2R	Region-to-region
ToR	Terms of Reference of the ESPON-STARTER project
TRAINS	Trade Analysis Information System
UNCTAD	United Nations Conference on Trade and Development
USITC	United States International Trade Commission
WIOD	World Input-Output Database
WITS	World Integrated Trade Solution
WTO	World Trade Organization

## Abstract

Recent economic and trade disruptions — from the impact of the pandemic and the war in Ukraine, to intensifying rivalry between the US and China and, more recently, the election of Donald Trump as US President — have prompted the EU to reconsider its approach to globalisation, focusing instead on various aspects of economic security and resilience. These priorities are reflected in various EU strategies and regulations that emphasise themes such as open strategic autonomy (OSA), de-risking, supply chain diversification and access to critical raw materials. The aim is to accelerate the digital and green transitions.

The ESPON STARTER project explores the regional implications of OSA-related scenarios, with a particular focus on strategic raw materials as defined in the EU Critical Raw Materials Act (ECRMA). This report presents the analysis conducted under Scenario 2 of Task 1, which examines the territorial impact of reducing trade barriers with selected partners that already have free trade agreements with the EU. The goal of this trade liberalisation initiative is twofold. Firstly, it aims to facilitate the import of critical raw materials in order to reduce reliance on China and Russia. Secondly, it seeks to send a strong signal in support of rules-based trade amid growing global economic fragmentation. Furthermore, this initiative is one of the European Union's key efforts to diversify its supply sources, thereby strengthening supply chain resilience and enhancing economic security, in line with the European Commission's strategic guidance.

We simulate the impact of reducing virtually all remaining EU tariffs on imports from Japan, Canada and South Korea, as these are the most like-minded countries, as well as being potential suppliers of critical raw materials. Additionally, we simulate a substantial reduction in the existing tariffs charged by the EU on imports from South Africa and Turkey, two key emerging markets with which the EU already has trade and cooperation agreements. These tariff reductions could incentivise these countries to export critical raw materials to the EU market, particularly given the increasing politicisation of trade in these strategic commodities.

The results obtained are modest in absolute terms for all countries, including those favoured by the concessions. Eliminating all tariffs with Canada, Japan and South Korea increases their exports and GDP, albeit at a moderate pace. Japan exhibits the most significant gains. A similar trend is seen for Turkey and South Africa. While these concessions benefit the five countries involved to a small extent, they also generate diversion trade effects, reducing the exports of third countries to Europe. In some cases, the diversion effects can be larger than the creation effects for a single country. This is the case for South Korea.

Given the relatively limited trade impact of these concessions, the policy recommendations emphasise that the EU should complement them with additional instruments of economic diplomacy. This would increase the likelihood of suppliers of critical raw materials choosing to export more to the EU, particularly in an environment of intensifying global competition for access to these minerals and growing “managed trade” practices in this sector. The EU could, for example, offer these countries privileged access to public procurement projects, foreign direct investment or foreign development assistance.

In summary, the EU must adopt a comprehensive strategy that integrates trade policy with other economic instruments to effectively enhance its access to critical raw materials. Without such a multidimensional approach, the goals of OSA and economic security are likely to remain aspirational.

## Keywords

Trade Policy; Free Trade Agreements; Tariffs, Trade preferences, Strategic inputs; Input-Output Analysis; Europe; Regions;

## Highlights

- The ESPON STARTER project examines the regional implications of scenarios relating to the European Union's pursuit of Open Strategic Autonomy (OSA), focusing particularly on strategic raw materials as defined in the EU Critical Raw Materials Act (ECRMA).
- The ECRMA sets ambitious targets to secure the supply of 16 strategic raw materials (SRMs), which are essential for achieving strategic autonomy in Europe. The report corresponding to Task 1-Scenario 1 identified potential alternative country sources for each of the 16 SRMs for which more than 65% of imports were concentrated with a single provider.
- In the context of OSA and the ECRMA, alongside enhancing domestic production and recycling, trade policy could play a significant role in mitigating these dependencies. This report presents the analysis conducted under Scenario 2 of Task 1, which examines the territorial impact of reducing trade barriers with selected partners that already have free trade agreements with the EU.
- Specifically, we simulate the impact of reducing virtually all remaining EU tariffs on imports from Japan, Canada and South Korea, as these are the most like-minded countries, as well as potential suppliers of SRMs. Additionally, we simulate substantially reducing the existing tariffs that the EU still charges on imports from South Africa and Turkey — two key emerging markets with which the EU already has free trade and cooperation agreements. These tariff reductions could incentivise these countries to export SRMs to the EU.
- Overall, the results obtained in these two scenarios are modest in terms of impact, for both the favoured countries and the EU and the rest of the world. Eliminating all tariffs for Canada, Japan and South Korea increases their exports and GDP, albeit at a moderate pace. Japan exhibits the most significant gains. A similar trend is seen for Turkey and South Africa.
- Although these concessions benefit the five countries considered to a small extent, they also generate diversion trade effects, reducing the exports of third countries to Europe. In some cases, the diversion effects can be larger than the creation effects for a single country. This is the case for South Korea, where the positive effect of reducing tariffs is offset by reduced trade with other countries experiencing diversion effects.
- From a territorial perspective, the regional impacts in Europe are also very limited. In general, most NUTS 2 regions experience almost no impact, with a slight bias towards negative effects. This is explained by the substitution of domestic production with increasing imports and the reduction in exports due to the reduction in the GDP of third countries experiencing the deviation effect. In some cases, these negative effects are partially or wholly offset by an increase in exports to markets that have experienced the positive effects of liberalisation.
- Given the relatively limited trade impact of these concessions, the EU should complement them with additional instruments of economic diplomacy. Such a combined approach would increase the likelihood of critical raw material suppliers choosing to export more to the EU. In particular, the EU could offer these countries privileged access to public procurement projects, foreign direct investment, foreign development assistance, and well-defined programmes of migration and labour mobility.

# 1 Introduction

In recent years, the global economic landscape has become increasingly challenging for the EU. The first major shock came in 2020 with the outbreak of the pandemic, which exposed critical vulnerabilities in global supply chains and highlighted Europe's overreliance on Chinese products.

Then, in 2022, the outbreak of the ongoing war in Ukraine delivered a severe energy shock to the continent and shattered the EU's long-standing 'liberal dream': the belief that trade would transform Russia and China's autocratic regimes into liberal democracies aligned with the West.

Complicating matters further, Donald Trump's return to the White House in 2025 and his confrontational stance towards traditional transatlantic allies has prompted the EU to consider the unthinkable: the need to de-risk not only from China, but also from the United States.

Consequently, the multilateral, rules-based liberal order in which Europe once thrived is becoming increasingly remote. The World Trade Organization (WTO) is paralysed, and the erosion of multilateral norms is evident across nearly every area of global economic governance. Geopolitics has launched what might be termed a hostile takeover of the economy. Today, it is no longer possible to understand the global political economy without recognising that economic rationality and dispassionate cost-benefit analyses have taken a back seat. These used to guide policymaking during the era of hyper-globalisation that followed the end of the Cold War and lasted until the 2008 financial crisis.

'Goeconomics' is the buzzword in capitals around the world. Protectionism, nationalism and imperialist tendencies are on the rise again. Industrial policy, national security considerations and efforts to bolster domestic economic resilience have moved to the forefront. Globalisation is no longer widely regarded as a positive-sum game. It can be, and increasingly is, weaponised.

In this shifting environment, the EU has taken decisive steps to upgrade its goeconomic policy toolkit (Bauerle & Meunier, 2024), abandoning its formerly naïve belief in the unqualified benefits of economic integration. As part of its strategy for OSA and economic security, the EU has emphasised the urgent need to ensure access to critical minerals, which are essential for advancing both the green and digital transitions.

The green transition is indispensable: Europe can only strengthen its energy security by fully decarbonising its economy. The digital transition is equally vital. As the Draghi report (Draghi, 2025) makes clear, the EU is falling behind, particularly in areas such as technological innovation and artificial intelligence.

In this context, the ESPON STARTER project examines the regional impact of various trade policies designed to boost European OSA and economic security. It models the implications of using trade policies to gain access to critical raw materials. The project involves the following research areas:

Examining the impact of diversification benchmarks for strategic raw materials outlined in the European Union's Critical Raw Materials Act (EC-RMA).

Assessing the regional effects resulting from concessions in trade negotiations, specifically those contributing to diversification targets for strategic raw materials.

Translating exogenous shocks into policy recommendations and conducting regional-sectoral case studies to provide an in-depth analysis of the effects of these scenarios, taking into account endogenous characteristics, policies and industrial conditions.

This report corresponds to the second scenario of Task 1. It studies the territorial impact of the substitution scheme for key critical raw materials to reduce dependence on potentially unfriendly countries, in line with the European Commission's recommendations. The report analyses how granting additional trade concessions to countries with which the EU already has free trade and cooperation agreements and which have large supplies of critical raw materials would affect trade and production patterns. It also details the regional distribution of these impacts.

The report is structured as follows: Section 1 provides an overview of the background and policy context, explaining the rationale behind selecting the countries for which simulations were conducted. Section 2 outlines the research design, detailing the methodology and data employed. Section 3 presents the results at national and regional levels. Section 4 discusses the key policy implications derived from the findings. Finally, Section 5 summarises the main conclusions and offers final reflections. The document is supplemented by an appendix.

## 1.1 Background and policy context

As outlined in the introduction, the ESPON STARTER project aims to analyse the regional effects of OSA- and economic security-related scenarios derived from trade and economic policies intended to increase the EU's access to critical raw materials. The first report corresponded to the first scenario of task 1 and examined the territorial impact of the substitution scheme for country sources under the 16 SRMs. The results showed that the EU has opportunities to diversify its sources of critical raw materials, particularly by moving away from reliance on China. However, it must be flexible and prioritise countries that share its vision of the global economy, based on rules and open to trade. Advanced liberal economies are particularly important in this regard. The EU should use incentives and subsidies to influence market outcomes, as otherwise excessive dependencies and uneven and harmful impacts between regions and countries in Europe could arise.

Once it becomes clear that there is a compelling need to diversify sources of critical raw materials — not only from 'unfriendly countries' (particularly China), but also from those that supply the EU with excessively high shares of specific minerals, thereby threatening supply security and resilience — we will proceed to estimate the impact of targeted trade and economic policy changes.

The policy context in which these changes are taking place is significantly more challenging for the EU than was envisaged when ECRMA was originally conceived. In 2022, against a backdrop of mounting economic uncertainty, European Commission President Ursula von der Leyen introduced the EU's critical raw materials strategy. This was driven by several converging factors: disruptions to global supply chains caused by the pandemic, which exposed Europe's overdependence on China; the Russian invasion of Ukraine and its far-reaching economic, energy and geopolitical consequences; intensifying strategic rivalry between the United States and China; and the growing threat of global economic fragmentation fuelled by protectionist policies.

At that time, ECRMA proposed various goals, including ensuring that no more than 65% of the EU's annual consumption of one of the 16 critical raw materials came from a single third country. The strategy stated that this could be achieved by 'using trade agreements to secure and diversify trade in critical raw materials'.

However, the situation has grown significantly more complex as of 2025. Alongside the EU's ongoing efforts to reduce its reliance on China, support Ukraine, lessen its dependence on Russian energy, and strengthen supply chain resilience, it now faces its most significant challenge yet: the disruptive economic and foreign policy agenda of the new US administration under President Donald Trump. These policies threaten the foundations of the rules-based liberal international order — a framework within which the EU has long operated comfortably — and mark the most serious rupture in transatlantic relations since the Second World War. As Baldwin (2025: 1) has argued, the Trump Administration "is trying to hack the global trade system. Not reform it. Not rebuild it. Hack it – in the tech-world sense. Bypass the code, short-circuit the rules, and brute-force a quick fix using tariffs that are big, bold, and everywhere at once".

Consequently, the EU has concluded that some of the policy initiatives introduced in recent years to address the fragmentation of the global economy and incorporate geoeconomic considerations more clearly into trade and foreign economic policies require urgent enhancement.

Against this backdrop, the analysis of additional trade concessions to countries with which the EU already has free trade agreements is taking place. As well as diversifying sources of critical raw materials to enhance economic resilience and support the green and digital transitions, this initiative aims to counter protectionism and reinforce the EU's commitment to open, rules-based trade. To this end, we have modelled trade concessions with Canada, Japan, South Korea, South Africa and Turkey. All of these countries have substantial supplies of bismuth, cobalt, copper, germanium, lithium, nickel and platinum group metals, all of which are considered critical raw materials by the EU.

Of the advanced democracies, Canada, Japan and South Korea are the three most strongly committed to a rules-based trading system, and are the most closely aligned with the European Union in terms of shared values and strategic interests. Alongside European countries, these three nations are among the most concerned about rising US protectionism and the isolationist, neo-nationalist policies of the Trump administration.

Turkey, a NATO member and key player in European security and regional stability, remains a strategically important partner for the EU. Finally, South Africa is the only BRICS country with which the EU currently has a free trade agreement.

Taken together, these countries are ideal candidates for simulating trade concessions and analysing their potential economic and regional impacts.

## 1.2 Research design

The 2022 ECRMA strategy identifies securing and diversifying trade in critical raw materials through trade agreements as its main tool. Not only does diversifying suppliers decrease reliance on current partners, it also enhances economic security against unexpected economic, geopolitical or regulatory shocks.

In this scenario, having identified potential source countries as an alternative to the main exporters of the 16 critical raw materials in Scenario 1, we now simulate the potential effects of trade concessions offered by the EU27 to some of these potential new providers.

As explained in the previous section, we focus on a shortlist of countries with existing, ratified free trade agreements: Canada, Japan, South Korea, Turkey and South Africa. The concessions are materialised in the form of a reduction in the current tariffs applied by the EU27 to each of these countries, with different liberalisation schemes considered in terms of intensity and types of products.

In particular, we simulate the following tariff reductions: For Canada, Japan and South Korea, we presume that the EU will reduce all existing tariffs to zero. For Turkey and South Africa, it is assumed that the EU will cut tariffs currently applied to selected products by 50%. More precisely, in the case of Turkey, only agricultural products are subject to the reduction, whereas in the case of South Africa, the reduction covers selected products from both the agricultural and industrial sectors. (A list of the products involved in the simulation can be found in Tables 8 and 9 of the Appendix.)

The analysis is conducted in two stages:

- We start with a country-to-country (C2C) analysis, using the SMART simulation tool, developed by the World Bank (WITS)
- The second stage corresponds to a region-to-region (R2R) analysis, conducted using the EUREGIO-2017 framework.

The EU27 countries have introduced concessions as liberalisation measures to facilitate the supply of critical raw materials. These involve reducing tariffs on a variety of products despite there being trade barriers in place despite the free trade agreement between the EU and those countries. While we expect positive impacts for beneficiary countries and products, there may be negative effects for European countries and regions due to increased competition from imports. Reducing tariffs on industrial and agricultural products would not automatically lead to higher exports of critical raw materials to the EU. However, they provide an important incentive for trade partners to redirect their products towards the EU, given that trade in critical minerals responds to both market forces and 'managed trade'.

## 1.3 Literature review

Several reports from European institutions, including the European Commission and the Joint Research Centre (JRC), have identified critical raw materials, assessed potential shortages and evaluated their impact on the green and digital transitions (see the European Commission's Raw Materials Information System, 2023). Key references include the methodologies used to identify these materials and assess associated dependency risks (European Commission, 2021; Arjona et al., 2023). Brockenhuus-Schack and Nedergaard (2005) even argue that the ECRMA represents a paradigm shift in EU trade and industrial policy, moving from a neo-liberal approach to a more 'dirigiste' stance.

Recent scientific studies have made significant contributions to this field. For example, Borin et al. (2023) use an Italian foreign transaction dataset to map vulnerabilities at firm level and examine how supply reductions due to fragmentation might affect the economy. This methodology is employed by several European Central Banks and is a crucial reference for the ESPON-STARTER fourth case study. Meanwhile, Ioannou et al. (2023) explored the implications of the ECRMA on European monetary policy, and Firgo et al. (2024) proposed a framework to prioritise reshoring activities by identifying import dependencies and risks. They provided an example from an Austrian region to illustrate this framework.

Baldwin et al. (2023) analysed global value chain disruptions, focusing on the links that expose supply chains to shocks, and on the need for policies that target individual products rather than entire sectors. Their research reveals that the US is more exposed to foreign suppliers, particularly those in China, than traditional trade data suggests, although macro-level exposure remains modest, with over 80% of US industrial inputs being sourced domestically. The authors' main conclusion is that concerns about supply chain disruption and the corresponding policies should focus on specific products rather than the manufacturing sector as a whole.

Additionally, a growing body of literature is addressing the economic impacts of geoeconomic fragmentation. For instance, Attinasi et al. (2023) use Baqaee and Farhi's (2023) model to quantify the impact of global trade fragmentation. Similarly, Javorcik et al. (2022) investigate the costs associated with friend-shoring. Other studies utilise multi-country, multi-sector models (Eppinger et al., 2021; Góes and Bekker, 2022; Felbermayr et al., 2023; Campos et al., 2023), alongside large macroeconomic models (OECD, 2020; Chepeliev et al., 2022), input-output models using the hypothetical extraction method (Almazán et al., 2024; Wu et al., 2021; Giammetti et al., 2021) and CGE models (Lim et al., 2021).

From a policy perspective, Baldwin (2025) has analysed the probable future evolution of the global trading system following Donald Trump's election as US president and his introduction of aggressive tariffs. There are also analyses of various free trade agreements (FTAs) being developed by the EU with strategic partners, such as Mercosur (Burrell et al., 2011; Timini & Viani, 2020), as well as with specific countries, such as Korea, India and Chile (Su, 2018; Khorana & Perdakis, 2010; Roy & Mathur, 2016; Dür, 2007; Jean, Mulder & Ramos, 2014). However, the timing, potential impact and focus of these papers suggest a lesser interest than previous literature, which often emphasised political economy and regulatory frameworks rather than the economic impact of these agreements. Many of these agreements are still under negotiation or awaiting ratification and implementation. In any case, it is undeniable that the EU has recently accelerated several trade negotiations, from India to Indonesia, and is deepening its ties with the UK and Canada, in order to confront growing American protectionism. The EU has also made strategic political moves in an attempt to lead the reform of the global trading system, and more broadly, the rules-based order in a post-American world (Politico, 2025).

## 2 Overview of Methodology

The aim of this report is to create plausible scenarios that address key issues related to the OSA, the ECRMA and the EU's ongoing FTAs. These scenarios are based on robust quantitative frameworks that analyse spatial and sectoral interactions within and between European countries, focusing on NUTS 2 regions. This section details the methodologies applied in the two aforementioned stages: country-to-country (C2C) and region-to-region (R2R). The C2C analysis uses the SMART simulation model to provide updated, detailed insights into global trade. In contrast, the regional analysis uses EUREGIO-2017 to offer total input-output effects for Europe's 297 regions (EU27 + UK, Norway, Iceland, Switzerland, and Liechtenstein) across 64 sectors.

### 2.1 SMART simulation model

We use the SMART simulation model, which was developed by the WTO and UNCTAD and is included in the World Integrated Trade Solution (WITS), to estimate the impact of new tariffs. This model uses recent data on international trade flows and an updated version of the TRAINS dataset for applicable tariffs (2017). It enables us to evaluate the range of products subject to tariffs and calculate the total impact on exporting countries. The SMART model has been widely used in trade analyses (e.g. Kabir & Salim, 2011; Pereira Villa et al., 2012; Gómez-Abella et al., 2013; Makochekanwa, 2014) and provides estimates of the effects on trade, revenue and consumers in both importing and exporting countries.

Key effects measured by SMART include:

- Trade creation effect: the increase in imports due to lower tariffs, where more efficient foreign suppliers replace domestic producers.
- Trade diversion effect: The shift in imports from one set of foreign suppliers to another due to changes in relative prices caused by tariffs.

The magnitude of this effect depends on factors such as the current level of imports, the percentage reduction in tariffs and the degree to which consumers can substitute one supplier for another. Appendix 8.1.1 provides a detailed description of the technical notation used in the SMART methodology, outlining the main equations and variables employed in our simulation of the overall trade effects resulting from the reduction of newly implemented tariffs.

We focus on total trade effects, particularly trade creation and diversion, while avoiding detailed discussions of price, revenue or welfare impacts. After calculating the trade effects, we conduct an input-output analysis to evaluate the inter-sectoral and inter-regional impacts.

### 2.2 Multiregional Input Output Modelling

From the SMART model's Exporter View Report, we obtain the changes in exports of each HS product from each country to the European Union (EU). We then aggregate all HS products from HS6 to HS2 and normalise the export changes to obtain the percentage change in exports for each HS2 product for each country to the EU. Percentage changes in HS2 are associated with percentage changes in NACE sectors using a bridge matrix specifically developed for this project. This bridge matrix can be found in Excel format in the appendix of this report.

Once the percentage change in exports to the EU for each sector and country has been obtained, the corresponding level values (in millions of euros) are obtained and assumed to be a shock ( $\Delta y$ ) that provokes a direct and indirect impact on socio-economic variables. These impacts are calculated using the input-output framework.

Input-output analysis models the direct and indirect effects of economic shocks across all sectors. The development of multi-regional input-output (MRIO) databases has transformed IO analysis by providing insights into global trade flows and value chains at a country-to-country level (Lenzen et al., 2013; Merciai & Schmidt, 2018; Remond-Tiendrez & Rueda-Cantuche, 2019; Stadler et al., 2018; Tukker & Dietzenbacher, 2013; Wood et al., 2014).

The ESPON-IRIE project has contributed to this by creating EUREGIO-2017, which builds on the EUROSTAT-supported FIGARO framework (Remond-Tiendrez and Rueda-Cantuche, 2019). This framework provides detailed sector-to-sector and region-to-region data within Europe and other countries at the NUTS-2 level for all EU27 countries, including the UK, Norway, Iceland, Switzerland and Liechtenstein — a total of 297 NUTS-2 regions. Unlike previous EUREGIO approaches (Thissen et al., 2019, 2018, 2013), this study's EUREGIO-2017 framework employs the latest coherent FIGARO figures at the country level as constraints.

Additionally, it is important to note that the EUREGIO-2017 framework captures not only sector-region-to-sector-region flows within Europe, but also sector-region-to-sector-country flows with other countries, including the US, China, Japan and Russia. Considering these flows enables a more detailed analysis of the economic relationships and dependencies between regions and third countries, thereby enhancing the accuracy and completeness of the impact analysis conducted in the study (Miller and Blair, 2009). Consequently, this framework is the most comprehensive and up-to-date multi-sectoral, multi-regional framework currently available for Europe.

Once the database is described, some insights into the multiregional and multisectoral input output framework are needed. First, let's  $\mathbf{Z}$  depict a block matrix with  $\mathbf{Z}^{rs}$  matrices that capture the inter-industry relations between regions  $r$  and  $s$ . So, each submatrix  $\mathbf{Z}^{rs}$  is a  $n$ -by- $n$  matrix where  $n$  is the number of sectors accounted. The matrices on-diagonal ( $\mathbf{Z}^{rr}$ ) capture the domestic intermediate flows (intra-regional intermediate flows). By contrast, all off-diagonal matrices ( $\mathbf{Z}^{rs} \forall r \neq s$ ) contain the inter-industry interregional flows where  $Z_{ij}^{rs}$  is the value of the production generated by sector  $i$  in region  $r$  that is being used as an intermediate input by sector  $j$  in region  $s$  (interregional inter-industry flow). The gross output of each industry is depicted by a column vector  $\mathbf{x}$ . Then, dividing each element of the intermediate inputs matrix ( $Z_{ij}^{rs}$ ) by the gross output of the sector  $j$  of the region  $s$  ( $x_j^s$ ) we obtain the matrix of technical coefficient, in matrixial form:  $\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-1}$ . Each element of this matrix ( $A_{ij}^{rs}$ ) informs us about the requirements that has the industry  $j$  of region  $s$  from the industry  $i$  from region  $r$  to produce an output of 1 monetary unit (one million Euros in our case). Let's call the matrix of value-added generated as  $\mathbf{M}$ , where each component  $M_{cj}^s$  depict the component  $c$  of value-added (gross operating surplus, compensation of employees, taxes, etc.) associated to industry  $j$  from region  $s$ . For the lack of simplicity let's assume there are no other components on the supply side and to aggregate the matrix  $\mathbf{M}$  to obtain a row vector called  $\mathbf{m}$  ( $m_j^s = \sum_c M_{cj}^s$ ). Then, dividing the  $\mathbf{m}$  vector element by element by the gross output, we obtain, for each sector of each region the share of value-added over the total output, let's call this vector as  $\mathbf{v}$ . Note that this vector ( $\mathbf{v}$ ) is a vector of value-added requirement per unit of output. Finally, the final demand matrix, usually called  $\mathbf{Y}$ , is also a block matrix of matrices  $\mathbf{Y}^{rs}$  where each component  $Y_{id}^{rs}$  represent the final demand that makes the agent  $d$  (households, government, NPISHs, etc.) of region  $s$  from industry  $i$  of region  $r$ . Let's also aggregate all columns in the final demand matrix to obtain a column vector ( $\sum_{sd} Y_{id}^{rs} = y_i^r \rightarrow \mathbf{y}$ ), then, the main equations are the following:

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{y} \leftrightarrow \Delta\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\Delta\mathbf{y}$$

$$\Delta\mathbf{m} = \hat{\mathbf{v}}(\mathbf{I} - \mathbf{A})^{-1}\Delta\mathbf{y}$$

Where  $\Delta\mathbf{y}$  is a vector of  $N$ -by- $R$  elements, where  $N$  depict the number of sectors taken into account and  $R$  is the number of regions considered. Each element of this vector ( $\Delta y_i$ ) represents the shock in monetary units, previously mentioned. Note that the Leontief model is a linear model, so, percental changes in the output depict the same percental variation in the value-added (or employment) at the sector-region level ( $\frac{x_i^{r*} - x_i^r}{x_i^r} = \frac{m_i^{r*} - m_i^r}{m_i^r}$ ).

## 2.3 Simulations

As outlined above, we have simulated trade concessions for two groups of countries with which the EU already has free trade agreements (see Table 1 for a summary of the key features of these agreements), and with which the EU wishes to strengthen its cooperation. This effort serves two purposes: reinforcing open, rules-based trade and improving access to critical raw materials.

To diversify the supply of strategic raw materials (SRMs), Scenario 1 from Task 1 of this ESPON-STARTER project suggested a list of potential alternative countries capable of supplying each of the 16 SRMs. This is intended to reduce excessive dependency on a single provider, which exceeds the official threshold suggested by the European Commission of 65% concentration of imports. Based on the initial analysis in the other report, we have decided to endorse these concessions to these countries because they are the main suppliers or potential substitutes of crucial raw materials, all of which surpass the 65% threshold suggested by the European Commission.

The first group comprises South Korea, Japan and Canada — advanced democracies whose values and approaches to globalisation closely align with those of the EU. South Korea is the main supplier of bismuth, cobalt, germanium and lithium, and a potential supplier of boron and copper. Japan is the main supplier of platinum group metals and a potential substitute for bismuth, cobalt, germanium, lithium, boron, nickel and silicon metal. Finally, Canada is a potential supplier of magnesium metal and rare earth elements for magnets.

The second group includes South Africa and Turkey: two key emerging markets with which the EU has significant trade relations, governed by institutionalised frameworks for trade and cooperation. Turkey is the main supplier of boron and copper, and a potential supplier of magnesium metal, manganese, and rare earth elements for magnets. South Africa is the main supplier of copper, and a potential supplier of manganese and platinum group metals.

**Table 1. Key EU Free Trade Agreements**

Country	Agreement Name	Signing Date	Provisional/ Entry into Force	Tariff Elimination Scope	Sensitive Product Exemptions
<b>Canada</b>	Comprehensive Economic and Trade Agreement (CETA)	Oct. 30, 2016	September 21, 2017	98% initially, target 99%	Poultry, eggs, dairy (quota limits)
<b>Japan</b>	EU-Japan Economic Partnership Agreement (EPA)	July 17, 2018	February 1, 2019	Approx. 97% of duties eliminated	Rice, some dairy, beef (quota limits)
<b>South Korea</b>	EU-South Korea Free Trade Agreement	Oct. 6, 2010	July 1, 2011	Nearly 99% of duties eliminated	Some agricultural products
<b>Turkey</b>	EU-Turkey Customs Union	Dec. 31, 1995	January 1, 1996	Covers industrial goods; agriculture excluded	Agriculture not covered by customs union
<b>South Africa</b>	EU-South Africa Trade, Development and Cooperation Agreement (TDCA)	Oct. 11, 1999	January 1, 2000	86% of EU exports enter duty-free	Some agricultural and processed goods

Source: Own elaboration

Since Donald Trump took office in January 2025, the CETA has reinforced cooperation between the EU and the Canada including enhanced security cooperation. However, no trade concessions have been negotiated.

Table 2 presents the simulations we have conducted using the SMART model.

**Table 2. Simulations considered in this report**

Scenarios	Tariff	Tariff Change	Tariff-Imposing Country	Affected Countries	Affected HS Codes	Elasticities	
<b>Scenario 2</b>	<b>2a</b>	0%	Reduction	EU	Canada, Japan, South Korea	*	By Default
	<b>2b</b>	50%	Reduction	EU	South Africa, Turkey	*	By Default

Source: Own elaboration. \* See Table 8 and 9 in the Appendix for a detail definition of all HS codes considered in each of the country simulations.

### 2.3.1 Simulation 2a: Canada, Japan, South Korea

The EU's trade concessions are modelled using the SMART simulation included in the World Integrated Trade Solution (WITS). Although the EU has Free Trade Agreements (FTAs) with Canada, Japan and South Korea, it is presumed that it will reduce tariffs to zero on all products that are still subject to any positive tariff, even if it is minimal. Although most trade has already been liberalised by these FTAs, several products (listed in Table 8 of the Appendix) remain subject to tariffs. As each partner country's set of dutiable products differs, the simulation is run separately for each of them. However, to ensure clarity and concision, the results are presented in an aggregated form showing the impact of applying a 0% tariff rate to all remaining dutiable products, which differ by country.

### 2.3.2 Simulation 2b: South Africa and Turkey

The SMART simulation implemented in WITS models a partial tariff reduction by the EU targeting Turkey and South Africa. In this scenario, it is assumed that the EU will reduce the tariffs currently applied to selected products that are still subject to positive tariff rates by 50%. Only a few agricultural products are subject to the reduction for Turkey. For South Africa, the tariff reduction covers several products from the agricultural and industrial sectors (see Table 9 in the Appendix for a list of the products involved in the simulation). Although the simulation is conducted separately for each country, the results are shown on an aggregated basis, since the reduction in the applied tariff rate remains the same and only the affected products differ.

## 2.4 Rationale, virtues and limitations

The aim of this section is to summarize the methods described above and to give a straighter message about the virtues and limitations of the simulations conducted here.

As mentioned, the method has two stages: one using SMART and the other using EUREGIO-2017. The rationale behind the trade analysis conducted with SMART is straightforward: the total trade effect is the sum of the trade creation and trade diversion effects. Therefore, if the EU27 were to eliminate tariffs on this product (*HS Code: 010594 — Chickens, Live, Weighing More Than 185 g*) from Canada, SMART would show how much Canada's exports of this product to the EU27 would increase (trade creation), as well as how much exports of this exact product from other countries to the EU27 would decrease (trade diversion). To account for the characteristics of the actual tariffs of each country-product, which are incorporated in SMART based on TRAINS, the simulations are run for each country-HS6 digit code individually. Each simulation generates deviation effects within each HS code. This implies that, when simulating a tariff reduction for Canada in SMART, all other variables, channels and competitors of Canada for each given product will suffer a loss due to relative price changes favouring Canadian chickens, *ceteris paribus*.

Then, all the obtained trade effects are aggregated and transformed into a percentage vector of trade reduction/increase in EUREGIO-2017, taking into account each included sector and country. Please note that HS6 code products must be aggregated into 64 sectors (NACE). Also note that almost all countries in the world are available in SMART, but not in EUREGIO-2017. Therefore, countries not included in EUREGIO-2017 are aggregated in the 'Rest of the World' category. Clearly, this 'Rest of the World' entity will not be plotted on a map.

Based on the impact of variations in world trade on the goods and countries in which positive or negative variations were obtained in the first stage, EUREGIO-2017 will tell us the total effect following the input-output paradigm. In this case, the rationale behind the Leontief multiplier suggests that an increase (reduction) in Canada's (USA's) exports to the EU27 of the "Agriculture and Livestock" sector (including HS 010594: Chickens, etc.) will lead to an additional increase (reduction) in production across all sectors (goods and services) and in all countries worldwide that are connected to the Canadian "Agriculture and Livestock" sector through technological and trade relations (i.e. input requirements). In this regard, if Canada's GDP increases due to an increase in exports of HS 010594 to Europe, the value added by all sectors supplying inputs to Canada, including the USA, China and the EU, will consequently increase. Similarly, if the USA's GDP decreases due to the deviation effects obtained with SMART (i.e. smaller US exports of HS 010594 to the EU), the input-output effects computed in the second stage for this reduction will imply lower value added (VA) within the US economy, as well as in all the sectors and countries supplying inputs to the US "Agriculture and Livestock" sector. The final total effect obtained by the input-output simulation will include the aggregation of the direct and indirect effects (spillovers) generated by the positive and negative effects of the two considered trade effects (creation and deviation),

channelled through all goods and services sectors in the world economy, including those considered in the “Rest of the World” category.

Importantly, the results presented in the following sections deal with the two stages of this methodology separately and focus solely on the aggregate view that can be plotted on a map. However, it is important to remind you that the main strength of this methodology lies in the use of two different frameworks, offering the greatest available level of detail at each stage (country-product; region-sector) for the whole world and Europe (EU27+EFTA). When focusing on the aggregate results, it is possible to misinterpret the rationale of the analysis or reach incorrect conclusions, since in some cases the positive and negative effects and the direct and indirect effects are partially or totally offset. The results obtained using SMART use the most up-to-date trade data included in WITS by the World Bank, in relation to Comtrade and Trains. Such flows are included in current US dollars, in the same way as the simulations based on this model reported in section 3.2.1. The input-output simulation results based on EUREGIO-2017 are referenced to this framework, which is constructed using official 2017 data in Euro.

Clearly, the **methodology has significant limitations**.

Firstly, classic trade analysis conducted using SMART assumes the 'default' parameters of the model (i.e. elasticities of substitution, demand elasticity and export supply elasticity), which are assumed to be representative, although in theory they correspond to the case of a 'small country'. Furthermore, our analysis focuses on just one dimension of the economic impact of partial trade liberalisation: the variation in trade. It does not consider the final welfare variation for each social group in the main countries affected (e.g. Europe versus each targeted country).

It is also worth mentioning the ongoing debate about the short-term versus long-term nature of input-output (IO) analysis, as well as the trade-offs between IO, CGE and other general equilibrium approaches for dealing with national and regional events.

In this regard, the trade effect simulated using a linear IO analysis assumes the stability of current international and inter-regional relations, which is more likely to occur in the short term. It is therefore necessary to consider additional long-term effects, which may require alternative methodological approaches to deal with changes in firm location, foreign direct investment (FDI) and the shortening of global value chains, as well as reactions in terms of migration or capital mobility. Such analyses are beyond the scope of this report.

Recent developments in regional CGE models, unlike partial equilibrium approaches such as IO frameworks, allow the impact of an economic shock to be traced through various sectors, with long-term adjustments to factors, output and prices. However, these appealing approaches also address the major criticism of the first generation of CGE models, which were viewed by many as a 'black box', as well as their reliance on partial equilibrium analysis for calibration. Furthermore, such regional CGE models involve trade-offs in terms of sectoral and spatial disaggregation.

Although our analysis lacks the capacity to consider long-term effects such as competition and substitution between goods, services, trade partners and labour/capital technical relationships, it adds the novelty of considering the trade effect, including the deviation mechanism, and the sub-national granularity of inter-regional relations across Europe as a whole.

Interestingly, the methodology employed in this report has its own strengths and weaknesses when compared with other alternatives, such as the structural gravity and GEMPPPI approaches used in Task 2.

Last but not least, it is also worth mentioning an additional limitation: the use of an EUREGIO framework referring to 2017. Although it is the most up-to-date territorially comprehensive IO table for the ESPON area, some of the intersectoral and interregional relations included in the 2017 framework may have changed due to the various shocks mentioned in this report, such as the impact of the Coronavirus pandemic, the Russian invasion of Ukraine, the economic sanctions imposed by NATO countries on Russia, the de-risking process affecting trade flows between regions, inflation and technological changes observed since 2020, and the election of Trump as US President.

## 3 Results

The aim of this section is to briefly review the potential overall impact of the two scenarios considered in this report. First, we examine the total trade effects estimated by SMART at country level. Then, we analyse the impact at global and European regional levels in terms of value added (VA), computed using the input-output methodology and taking into account direct and indirect effects. Additional results relating to employment and CO<sub>2</sub> emissions are provided in the Appendix. Before that, we describe the current situation of trade relations between the EU and each of these key countries, providing context for simulating the trade concessions previously described.

### 3.1 Setting the scene: how open is the EU to the chosen partners?

In a world becoming increasingly multipolar, characterised by persistent geopolitical tensions and the weakening of multilateral cooperation, protectionist policies are resurfacing and altering global trade patterns. The EU is not driving these neo-protectionist forces. In fact, it has signed seventy free trade agreements and is the most active defender of the WTO system and the rules-based economic order. However, most of the EU's free trade agreements maintain some tariff and non-tariff barriers that protect specific sectors in both the EU and its trading partners. This is also true of the FTAs with Canada, Japan, South Korea, South Africa and Turkey. In this section, we review the tariff levels between the EU and the countries in question that will be eliminated in the simulations below. The Most Favoured Nation (MFN) tariff is the standard rate that a country applies to imports from all WTO member states with which it has no preferential trade agreements. The applied tariff, on the other hand, is the actual rate, which includes a preferential tariff if one exists, and is usually lower than the MFN tariff. The TRAINS database publishes both types of tariff to highlight the difference between them.

The EU-Canada Comprehensive Economic and Trade Agreement (CETA) entered into provisional force on 21 September 2017. Consequently, Canada and the EU have already abolished 98% of their tariff lines and have agreed to gradually eliminate the remaining 2%.

Following the introduction of CETA, both parties have agreed to eliminate 100% of tariff lines for industrial products, according to the TRAINS dataset (2022). They are currently at around 99%. The few products not liberalised by the EU for imports from Canada include a limited number of products under HS heading 87 (i.e. motor vehicles) and products classified under HS heading 29 (halogenated derivatives of cyclanic, cyclenic or cycloterpenic hydrocarbons), which have MFN tariffs of 5.5%. Table 8 in the Appendix provides a list of products at the HS6 level that remain subject to a tariff. Similarly, Canada has also significantly lowered its tariffs on industrial and agricultural products to around 99% and 90%, respectively. For sensitive agricultural products, both sides apply tariff rate quotas to certain products, including Canadian beef, pork, sweetcorn, and European cheese. These are specific volumes of goods which will be entitled to preferential tariff treatment within each timeframe. Canada will liberalise its remaining tariffs over seven years.

Table 3 provides average data from TRAINS on the Most Favoured Nation (MFN) tariff and the EU's applied tariff on imports from Canada for products that still have a positive applied tariff. The average applied MFN tariff for non-liberalised agricultural products is 20%, while the actual applied tariff is 11%. It should be noted that the tariff on meat from bovine animals is the highest of any product, at around 50%. For industrial products, the tariff rates are lower.

The liberalisation reciprocity under CETA comprises the ambitious market access obligations made by both parties, as well as creative and robust regulatory cooperation that strengthens and supplements these commitments.

**Table 3. European Union tariffs on Canada**

Reporter	Partner	Product	MFN Rate Average	Applied Tariff Average
EU	Canada	Agricultural Products	20.2%	10.8%
EU	Canada	Industrial Products	9.6%	2.8%

Source: Own elaboration based on UNCTAD TRAINS database 2022.

The EU-Japan Economic Partnership Agreement came into effect on 1 February 2019. Upon coming into effect, it eliminated 97% of Japan's tariff lines and 99% of EU tariff lines. Tariff rate reductions or quotas were agreed for those that remained.

Japan is already the EU's fourth biggest market for agricultural exports. Market access has improved for many European products, with tariffs on wine exports disappearing upon entry into force, and a duty-free quota being established for fresh cheeses such as mozzarella and feta. EU exporters of beef benefit from a reduced tariff, and only low duties remain on fresh pork exports to Japan as the agreement has fully eliminated duties on processed meat. Finally, duties on products such as Gouda and Cheddar cheeses will be eliminated over time.

Regarding EU tariffs on Japan, the vast majority of products were duty-free upon entry into force of the agreement, with the remainder to be gradually eliminated in line with a tariff dismantling schedule. Few products are still subject to tariffs. According to the TRAINS database, Most Favoured Nation (MFN) rates are set at an average of 17.5% for agricultural products, while applied tariffs are 9.9%. By contrast, the average MFN rate for industrial products is 6%, while the average applied tariff is 3%.

**Table 4. European Union tariffs on Japan**

Reporter	Partner	Product	MFN Rate Average	Applied Tariff Average
EU	Japan	Agricultural Products	17.5%	9.9%
EU	Japan	Industrial products	6%	3%

Source: Own elaboration based on UNCTAD TRAINS database 2022.

Since 2011, nearly all products (99%), including agricultural produce, have been duty-free thanks to the EU-South Korea trade agreement. Furthermore, non-tariff barriers (NTBs) on key EU exports to South Korea have been eliminated, particularly for industrial products such as automobiles, pharmaceuticals, electronics and chemicals.

According to the TRAINS database, almost all South Korean agricultural exports enjoy duty-free access to the EU market (only 14 products are subject to tariffs, primarily cereals; see Table 8 in the Appendix). The MFN rates for these agricultural products are set at an average of 17.6%, while the applied tariff is around 10.6%. Meanwhile, tariffs have been eliminated for all industrial products.

**Table 5. European Union tariffs on South Korea**

Reporter	Partner	Product	MFN Rate Average	Applied Tariff Average
EU	South Korea	Agricultural Products	17.6%	10.6%
EU	South Korea	Industrial products	0%	0%

Source: Own elaboration based on UNCTAD TRAINS database 2022.

The EU-South Africa Trade, Development and Cooperation Agreement (TDCA) gradually implements a free trade agreement (FTA), creating preferential trade agreements between the EU and South Africa. The EU is South Africa's main trading partner. The FTA seeks to guarantee better access to both the EU and South African markets. It therefore contributes significantly to South Africa's economic integration with the rest of the world. Approximately 90% of the two parties' current bilateral trade is covered by the agreement.

Within ten years, 95% of South Africa's imports to the EU will be liberalised and, within twelve years, 86% will be liberalised. To safeguard the countries' most vulnerable sectors, the FTA excludes some products and liberalises others only partially. In the EU, these are agricultural products, while in South Africa they are industrial products, including specific automobiles and textiles. Nevertheless, provisions for more robust trade liberalisation in the automotive industry have been in place since 2006.

As shown in Table 6 and according to the TRAINS database, MFN rates are set at an average of 21.7% for agricultural products, while applied tariffs are set at 15.1%. By contrast, the average MFN rate for industrial products is 17.7%, with an average applied tariff of 16.8%.

**Table 6. European Union tariffs on South Africa**

Reporter	Partner	Product	MFN Rate Average	Applied Tariff Average
EU	South Africa	Agricultural Products	21.7%	15.1%
EU	South Africa	Industrial products	17.7%	16.8%

Source: Own elaboration based on UNCTAD TRAINS database 2022.

The 1963 Ankara Agreement and its 1970 Additional Protocol form the basis of the Customs Union with Turkey, which has been in place since 1995. Industrial products are exempt from quotas or customs duties. Steel and coal products, for example, are among the industrial products covered by the European Coal and Steel Treaty. However, the Customs Union does not cover agricultural products.

As indicated in Table 7, a 21% applied tariff and a 26% MFN rate are applied to agricultural products that are still subject to duty. Almost all industrial products, however, are duty-free.

**Table 7. European Union tariffs on Turkey**

Reporter	Partner	Product	MFN Rate Average	Applied Tariff Average
EU	Turkey	Agricultural Products	25.9%	21.2%
EU	Turkey	Industrial products	-	-

Source: Own elaboration based on UNCTAD TRAINS database 2022.

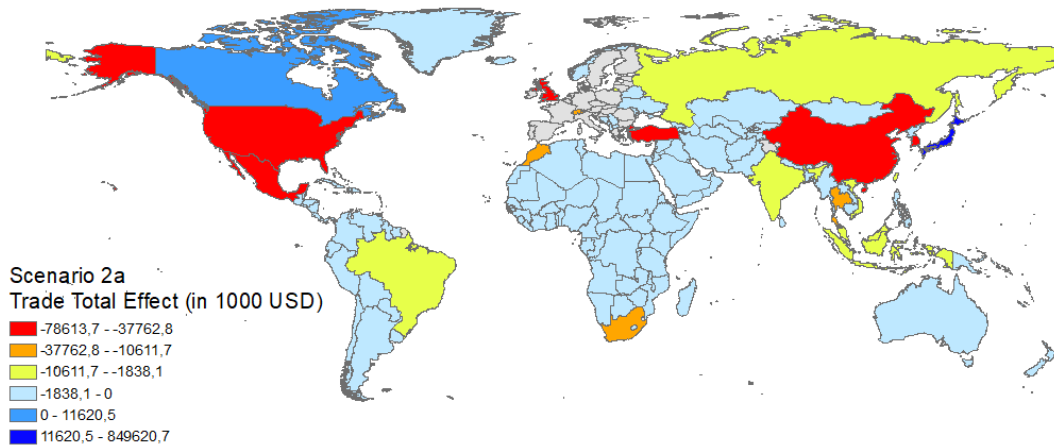
## 3.2 Simulations: the national perspective

### 3.2.1 Trade Total Effects (using SMART)

According to standard trade theory, reducing EU tariffs with selected trading partners is expected to generate trade creation and diversion effects. Once protectionist barriers are reduced or removed, an increase in exports to the EU from countries such as Japan, Canada, South Korea, Turkey and South Africa should be observed. These direct effects reflect the enhanced competitiveness of these partners' goods in the European market. Additionally, indirect effects may emerge as exports from other countries decline due to a shift in European demand towards partners that benefit from reduced or eliminated trade barriers. This reallocation of trade flows highlights the wider systemic impact of preferential trade liberalisation measures. In this section, we test this hypothesis and quantify the effects.

Figure 1 shows the results of the SMART simulation, presenting the total trade effect (composed of trade creation and diversion) after the EU eliminated tariffs on products that were still subject to tariffs for Canada, Japan, and South Korea. Japan is the main beneficiary, reflecting the strong competitiveness of its exports and the significant impact of removing remaining tariffs. Canada shows a modest effect, while South Korea experiences a negative impact when the results are aggregated across all countries. However, the country-level simulation shows that South Korea also experiences a positive trade effect. However, the magnitude is very small, as the tariff reduction was applied to only a few South Korean products that were still subject to tariffs (see Table 8 in the Appendix). Consequently, South Korea now faces increased competition from Japan for similar products. More broadly, the rest of the world records negative total effects on trade, with the countries most affected including the United States, China, the United Kingdom and Mexico. This highlights the trade-offs associated with preferential liberalisation, where the benefits to some partners may come at the expense of market access for others.

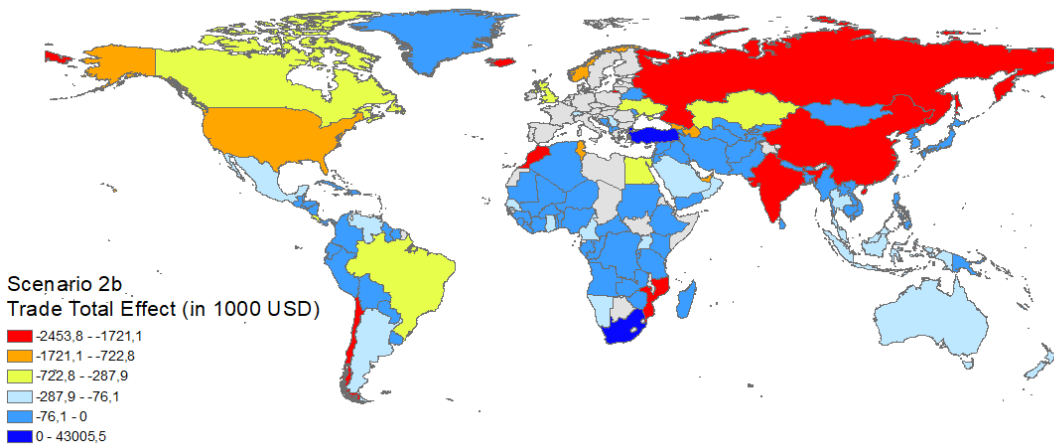
**Figure 1. World effects of Scenario 2a: Canada, Japan, South Korea. Trade Total Effect.**



Source: Own elaboration, based on the results obtained using SMART simulations. Note: the total trade effect includes the “trade creation” and the “trade diversion” effects.

Figure 2 illustrates the impact of the EU reducing existing tariffs on imports from Turkey and South Africa by 50%. As expected, only these two countries experience a positive trade effect, as they receive preferential access, enabling them to replace other suppliers in the EU market. In contrast, all other countries face negative trade effects; the countries most severely affected are China, Russia, India and Chile, among others. These findings highlight the redistributive effects of this trade liberalisation, whereby the chosen partners receive preferential treatment, thereby changing trade patterns at the expense of non-beneficiaries.

**Figure 2. World effects of Scenario 2b: South Africa and Turkey. Trade Total Effect.**

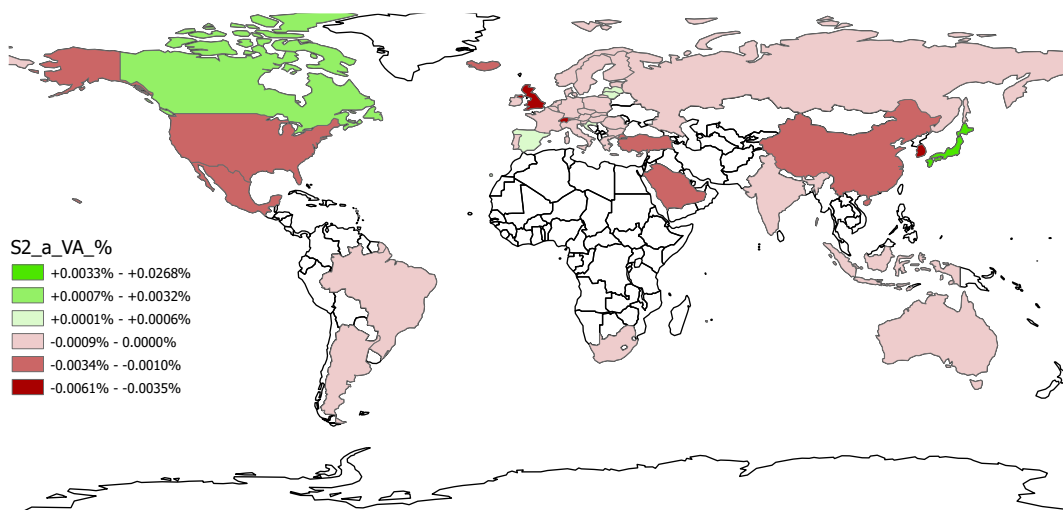


Source: Own elaboration, based on the results obtained using SMART simulations. Note: the total trade effect includes the “trade creation” and the “trade diversion” effects.

### 3.2.2 Value Added Impacts (using EUREGIO-2017)

In this section, we analyse the results obtained at country level once the total trade effects have been plugged into EUREGIO-2017. We then obtain the total (direct and indirect) effects according to the input-output methodology. These results are expressed as a percentage variation in national GDP in the year of reference for these tables (2017), which is considered the 'business as usual' reference point.

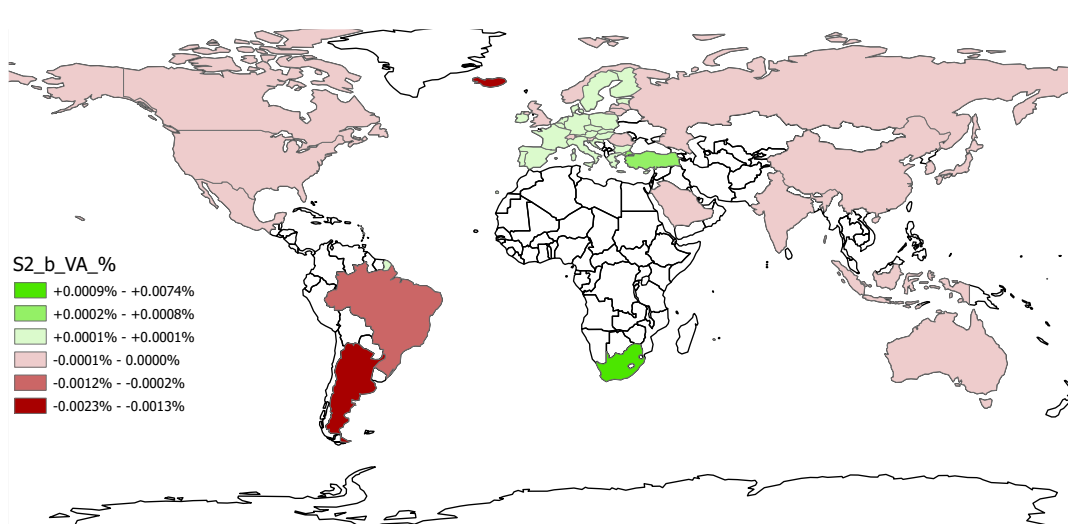
**Figure 3. World effects of Scenario 2a: Canada, Japan, South Korea. GDP (%)**



Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

Figure 3. World effects of Scenario 2a: Canada, Japan, South Korea. GDP (%) Figure 3 shows the spatial distribution of **Scenario S\_2a** impact on GDP at the country level. When considering the trade liberalization scheme described before for this scenario, which concentrates in tariff reductions in favor of Canada, Japan, South Korea, the overall impacts are small. The United Kingdom experiences the largest negative effect, with a GDP loss of 0.006%. Conversely, the largest positive impacts occur, as expected, in Canada and Japan, where tariff reductions are implemented. Despite similar tariff reductions, South Korea shows no positive effect due to offsetting trade diversion.

**Figure 4. World effects of Scenario 2b: South Africa and Turkey. GDP (%)**



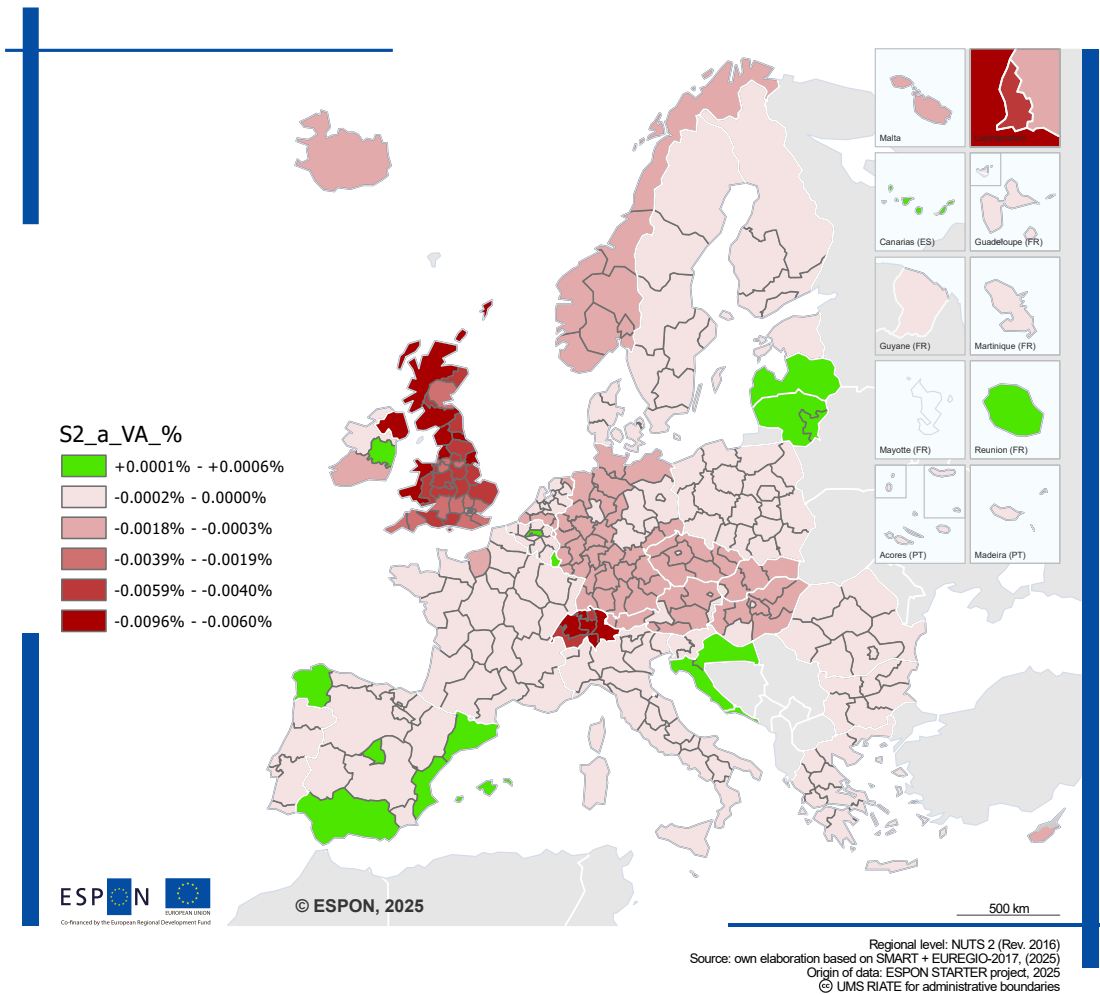
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

Figure 4 presents the total GDP impact (encompassing both direct trade diversion and indirect spillover effects) resulting from **Scenario S\_2b**, which assumes targeted **tariff reductions for South Africa and Turkey**. Consistent with the policy focus, these two economies exhibit the most significant positive deviations: South Africa gains 0.00736% and Turkey gains 0.00080%. Conversely, Iceland experiences the largest negative impact (-0.00227%), followed by Argentina at -0.00131%.

### 3.3 Simulations: the sub-national perspective

This section presents the regional economic impact of scenarios S\_2a and S\_2b on the European continent. As neither scenario targets any of these ESPON regions, all observed effects are exclusively indirect spillovers transmitted through trade and value chain linkages. The figures show the total impact driven by spillovers on GDP at the NUTS-2 level for the 297 ESPON regions (EU-27, UK and EFTA countries). The corresponding spillover effects on socio-economic variables (employment) and environmental indicators (CO<sub>2</sub> emissions) are presented in the Appendix. Figures 5 and 6 show the impact on GDP of scenarios S\_2a and S\_2b respectively.

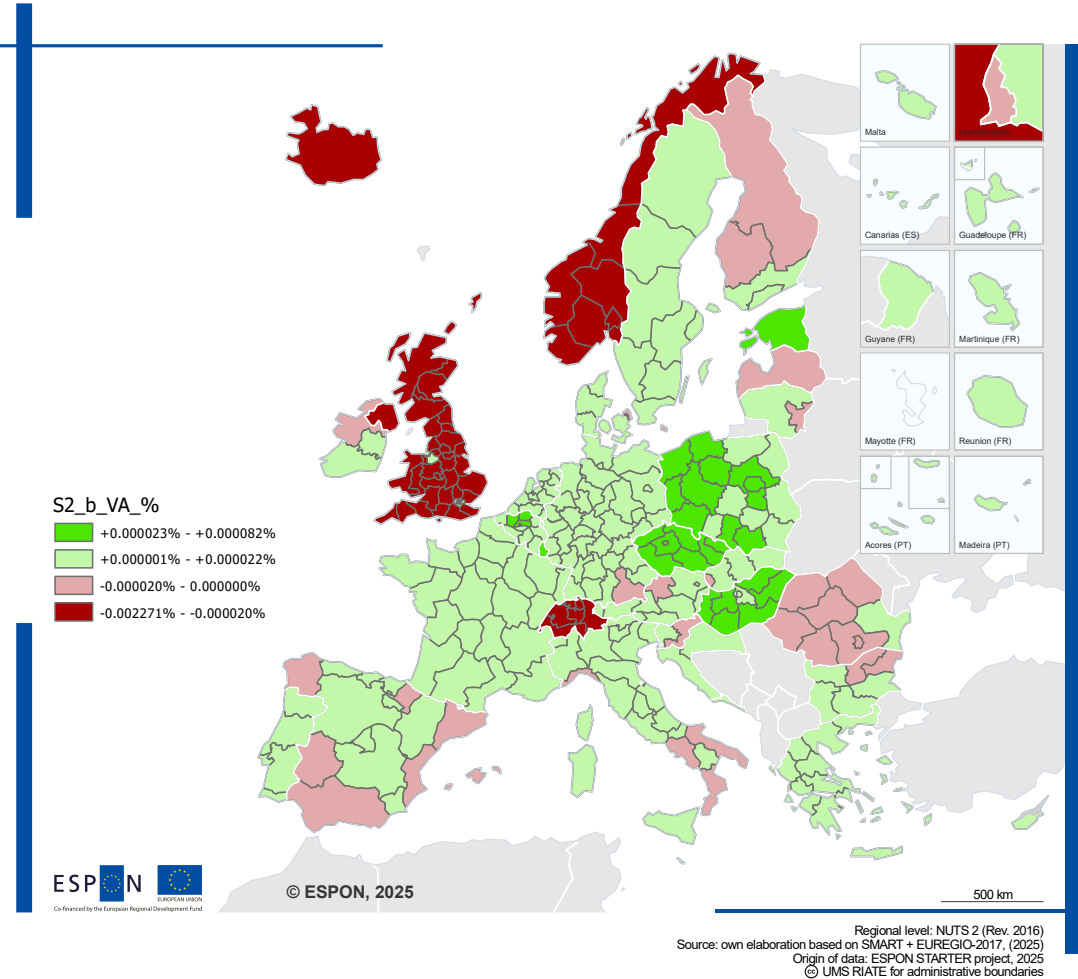
**Figure 5. Regional effects in Europe. Scenario 2a: Canada, Japan, South Korea. GDP (%)**



Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

Figure 5 shows that Scenario S\_2a has modest negative impacts across most European regions. While most effects are marginal, slight variations within countries emerge. For example, in Ireland, the Eastern and Midland region (IE06: +0.00019%) contrasts with the Southern region (IE05: -0.00059%), suggesting differential exposure of sectors to trade adjustments. Similarly, Spain exhibits divergences: Madrid (ES30: +0.00049%) and Catalonia (ES51: +0.00039%) show positive figures, whereas Asturias (ES12: -0.00012%) and Cantabria (ES13: -0.00012%) experience modest losses. The Baltic states also display asymmetry, with the regions of Lithuania (LT01: +0.00048%; LT02: +0.00042%) performing better than Estonia (EE00: -0.00025%). More pronounced effects appear in EFTA regions, particularly in Switzerland's Nordwestschweiz (CH03: -0.00754%) and Zentralschweiz (CH06: -0.00831%) regions, though all impacts remain below 0.01%.

**Figure 6. Regional effects in Europe. Scenario 2b: South Africa and Turkey. GDP (%)**



Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

Figure 6 shows near-neutral GDP impacts under Scenario S\_2b across European regions, but reveals subtle variations within countries that suggest the effects of spillovers are being filtered by sector. The United Kingdom consistently experiences losses, with Cumbria (UKD1: -0.00009%) and North East Scotland (UKM5: -0.00007%) displaying slightly stronger effects than Cheshire (UKD6: 0.000005%). Hungary presents an unexpected divergence: Közép-Dunántúl (HU21) and Nyugat-Dunántúl (HU22) register marginal gains, while Budapest (HU11) remains neutral, which could indicate localised sectoral advantages. In Italy, Veneto (ITH3: +0.00001%) and Toscana (ITI1: +0.00001%) slightly outperform Lombardia (ITC4: 0.000001%). EFTA regions demonstrate asymmetric responses: Switzerland's Nordwestschweiz (CH03) and Zentralschweiz (CH06) experience mild losses, while Norway's Nord-Norge (NO07) shows marginally stronger effects than Oslo og Akershus (NO01).

Overall, the results obtained in these two scenarios have a modest impact, not only on the countries favoured by the concessions, but also on EU countries and the rest of the world. Eliminating all tariffs with Canada, Japan and South Korea increases their exports and GDP, albeit at a moderate pace. Japan exhibits the most significant gains. A similar trend is seen for Turkey and South Africa. While these concessions benefit the five countries involved to a small extent, they also generate diversion trade effects, reducing the exports of third countries to Europe. In some cases, the diversionary effects can be greater than the creationary effects for a single country. This is the case for South Korea, where the positive effect of reducing tariffs is offset by the reduction in trade with other countries affected by diversion.

From a territorial viewpoint, the regional impacts in Europe are also very limited. Generally, most NUTS 2 regions experience almost zero impact, with a slight bias towards negative effects. This is due to the substitution of domestic production with increasing imports and the reduction in exports due to the reduction in the GDP of third countries experiencing the diversion effects. In some cases, these negative effects are compensated for or offset entirely by an increase in exports to markets that have experienced the positive effects of liberalisation (i.e. the five countries considered plus their main partners).

## 4 Policy implications

The European Union's Single Market, which comprises more than 450 million consumers, is one of the EU's main pillars of economic strength. Given the widespread interest among third countries in accessing this vast market, it is logical and strategic for the EU to leverage the Single Market as a tool to achieve broader policy objectives. One such objective is to secure a stable and diversified supply of critical raw materials from partner countries that are willing to export these resources in exchange for access-related concessions.

Critical raw materials differ fundamentally from conventional commodities. They are becoming increasingly indispensable for advancing both the green transition and technological innovation. In a context where major global powers are competing to secure reliable access to these resources while simultaneously seeking to reduce their dependence on Chinese rare earths and other strategic inputs, the strategic deployment of trade concessions and economic diplomacy emerges as an effective approach, at least in principle. The aim of this strategy is to diversify sources of supply, mitigate the geopolitical risks associated with overreliance on China and Russia, and ultimately enhance the resilience of supply chains and the EU's broader economic security.

However, the results of our simulations indicate that the trade impact of EU concessions to advanced liberal democracies, such as Japan, South Korea and Canada, is relatively limited. This is primarily because the EU already has low or zero tariffs with these countries under existing trade agreements. Notably, Japan is the country that would experience the greatest trade creation following the simulated tariff reductions. This finding provides a compelling rationale for prioritising access to Japanese raw materials, particularly considering Japan's strong alignment with the EU in terms of values and strategic interests. When the EU concessions are applied to emerging countries such as Turkey and South Africa, the latter shows a higher total trade effect and is consequently expected to benefit more from the concessions granted to both countries.

The EU's tariff reduction can be seen as a strategic concession intended to improve trade relations, given that the results demonstrate positive trade effects (trade creation and diversion) and ensure access to strategic raw materials. To strengthen the EU's long-term supply chain resilience and resource security, this strategy could incentivise partner countries to prioritise the EU market for their strategic raw materials, encouraging higher exports to the EU.

Furthermore, reducing tariffs alone does not ensure that partner countries will automatically increase their exports of critical raw materials to the EU. Market dynamics, including transportation costs and other economic factors, may prevent this from happening purely through the forces of supply and demand. Furthermore, given the strategic importance of these materials, export decisions are frequently influenced by geopolitical factors rather than purely economic incentives. In this context, the EU is well positioned in principle, thanks to its extensive network of allies and considerable soft power. Nevertheless, it is crucial that EU member states take additional measures to actively incentivise key suppliers of critical raw materials to prioritise the European market. Such efforts would enhance the likelihood of securing stable and diversified access to these essential resources.

To this end, the EU should consider deploying a broader range of economic diplomacy instruments to ensure better access to critical raw materials from these and other trading partners. In particular, the EU could leverage its foreign aid budget, foreign direct investment policy, and migration frameworks as strategic tools in negotiations aimed at securing privileged access to critical raw materials, especially with developing and emerging countries. The EU could also offer preferential access to public procurement opportunities for companies based in partner countries that serve as key suppliers of these strategic resources. These measures would strengthen the EU's ability to build mutually beneficial partnerships and enhance its position in global supply chains.

In conclusion, it is also important to consider the territorial dimension of the results obtained. As with Scenario 1 in Task 1, it is important to consider the potential heterogeneity of the trade concessions examined in this report. While the results are consistently small and show little variability within countries, European and national institutions should consider the territorial consequences of trade concessions, bearing in mind that social impacts will differ depending on the 'country-product' subject to tariff reduction. In this regard, while the average impact could be positive or negative, depending on the channels covered by our methodology, some specific social groups may experience more challenging outcomes.

## 5 Conclusions

As we have seen, the EU has found itself navigating an increasingly unstable global economic landscape. The 2020 pandemic revealed critical weaknesses in international supply chains, particularly Europe's dependency on Chinese goods. This vulnerability was exacerbated in 2022 by Russia's invasion of Ukraine, which triggered a major energy crisis and shattered the EU's long-held belief that economic integration could liberalise autocratic regimes such as those in Russia and China. More recently, Donald Trump's potential return to the US presidency in 2025 has prompted the EU to reconsider its reliance on both China and its traditional American ally. Protectionism and economic nationalism are on the rise, and globalisation is now being used as a strategic tool rather than as a collaborative enterprise.

In response to these pressures, the EU has begun to recalibrate its approach to global trade and security through its OSA and economic security strategy. This shift prioritises access to critical raw materials that are essential for green and digital transformations. It acknowledges that energy security hinges on full decarbonisation, and that technological innovation is necessary to remain globally competitive. Following a strategy suggested by the EU Critical Raw Materials Act, this report analyses the effects of granting trade concessions to countries with which the EU already has free trade agreements, such as Canada, South Korea, Japan, South Africa and Turkey, in order to diversify its supply of raw materials. Our simulations reveal shifts in trade and production patterns across EU regions and highlight important policy implications.

After conducting a simulation in which the EU reduces its tariffs on imports from various trading partners, the expected trade creation and diversion effects are observed in most of these countries: their exports to the EU increase (trade creation), while some of their exports that were previously destined for other markets are redirected to the EU (trade diversion). Japan's exports to the EU continue to face certain tariff barriers, but its firms are generally highly competitive, resulting in the largest overall effect.

However, trade concessions alone are unlikely to guarantee that these countries prioritise the EU as a destination for their critical raw material exports. Market dynamics and geopolitical considerations will also play a decisive role in shaping such decisions. Therefore, it is essential that the EU complements its efforts to liberalise trade with additional instruments of economic diplomacy, such as providing development assistance to relatively poorer countries, implementing targeted investment policies and granting preferential access to EU public procurement programmes. In summary, the EU's strategic objective of securing a stable and diversified supply of critical raw materials highlights the importance of a well-designed and targeted trade policy. Combined with broader geoeconomic tools, such an approach can enhance resource security and mitigate vulnerabilities across supply chains.

From a territorial perspective, the regional impacts obtained across Europe are also very limited. Generally speaking, most NUTS 2 regions have almost zero impact, with a slight bias towards negative effects. This is due to the substitution of domestic production by increasing imports and the reduction in exports due to the reduction in the GDP of third countries experiencing the deviation effect. In some cases, these negative effects are partially or wholly offset by increased exports to markets that experienced positive effects from liberalisation.

Further research is needed to elucidate the sectoral and social consequences of such trade concessions within each country and region. Beyond the modest average impacts, we must identify the social groups most at risk and define mechanisms to ensure a smooth transition that leaves no one behind.

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## 7 Appendices

### 7.1 Methodological Appendix

#### 7.1.1 Technical aspects for the trade analysis: SMART

Following Laird & Yeats (1986) and related papers that apply SMART (James & Olarreaga, 2005; Khorana et al., 2009; Sadni Jallab et al., 2007), it is convenient to revise the main equations and variables used by SMART in our simulation about the total trade effect of the new tariffs.

$TC_{iSR}$  – Trade creation effect on commodity  $i$  imported from country  $R$  into country  $S$ .

$TD_{iSR}$  – Trade diversion effect on commodity  $i$  imported from  $R$  into country  $S$ .

$M_{iSR}$  – Imports of commodity  $i$  to country  $S$  from exporting country  $R$ .

$M_{iSRW}$  – Imports of commodity  $i$  by  $S$  from the rest of the world.

$P_{iSR}$  – Price of commodity  $i$  in country  $S$  from country  $R$ .

$P_{iSRW}$  – Price of commodity  $i$  in country  $S$  from the rest of the world.

$t_{iSR}$  – tariff ( $t_1$  and  $t_0$  refer to post- and pre-integration tariffs).

$\eta$  – Import elasticity of demand in the importing country.

$\beta$  – Export supply elasticity (ESE).

$\lambda$  – Substitution elasticity (EoS).

The SMART simulation model measures ‘Trade creation’ as follows:

$$TC_{iSR} = M_{iSR}^1 * \eta * \Delta t_{iSR} / ((1 + t_{iSR}) * (1 - (\eta/\beta))) \quad (1)$$

Note that if the elasticity of export supply with respect to the world price is infinite, then the denominator on the right-hand side of Equation [1] becomes unity and can be ignored.

We can rewrite the equation above as:

$$TC_{iSR} = \eta * M_{iSR}^1 \frac{(1+t_{iSR}^1) - (1+t_{iSR}^0)}{(1+t_{iSR}^0)} \quad (1.1)$$

As noted in Laird & Yeats (1986), with extensive expansion, substitution, and rearrangements, it is possible to obtain the following equation to calculate the trade diversion effect:

$$TD_{iSR} = \frac{M_{iSR}}{\sum M_{iSR}} \frac{M_{iSR} * \sum M_{iSRW} * \frac{\Delta(P_{iSR}/P_{iSRW})}{P_{iSR}/P_{iSRW}}{\lambda}}{\sum M_{iSR} + \sum M_{iSRW} + \sum M_{iSR} \frac{\Delta(P_{iSR}/P_{iSRW})}{P_{iSR}/P_{iSRW}}{\lambda}} \quad (2)$$

Equation [2] describes the terms of relative price movements, capturing movement due to changes in tariffs on the imports of countries affected by the new tariffs.

Finally, with Equation [3], we can compute the Product Trade Effect (PTE) just by adding TC and TD effects.

$$PTE_{iSR} = TL_{iSR} + TD_{iSR} \quad (3)$$

By default, SMART considers the same ‘import demand elasticity’ values for all the countries affected by the new tariff, but they may vary by product. Regarding the ‘elasticity of substitution’ (EoS), we assume the value set by default in SMART (1.5). For ‘export supply elasticity’ (ESE), we assume 99 for infinite elasticity by default for all products and partners.

## 7.2 Products HS6 included in the analysis

The tables presented show the HS6 product codes that continue to have positive tariffs in each country. Tariff reductions will be applied to these specific product sets by country to conduct a more rigorous analysis of which products remain subject to tariffs.

**Table 8. Products HS6 included in the analysis by country: Scenario 2a**

Canada
010594, 020110, 020120, 020130, 020329, 020610, 020711, 020712, 020713, 020714, 020724, 020725, 020726, 020727, 021020, 021099, 030471, 030479, 030543, 030572, 030579, 030693, 030695, 030739, 040721, 040729, 040811, 040819, 040891, 040899, 071040, 080810, 080830, 100191, 100199, 100390, 100410, 100490, 110811, 110812, 110813, 110814, 110819, 160414, 160420, 160510, 160521, 160529, 160553, 170112, 170113, 170114, 170191, 170199, 220410, 220421, 220422, 220429, 290359, 870322, 870323, 870324, 870331, 870332, 870333, 870340, 870350, 870360, 870370

Japan
020840, 021092, 030119, 030194, 030195, 030231, 030233, 030236, 030239, 030242, 030245, 030247, 030254, 030259, 030283, 030345, 030349, 030366, 030381, 030384, 030445, 030453, 030454, 030485, 030486, 030496, 030497, 030499, 030539, 030569, 030617, 030635, 030636, 030691, 030692, 030694, 030695, 030721, 030722, 030729, 070952, 080610, 080810, 080830, 100610, 100620, 100630, 100640, 110290, 110319, 110320, 110419, 160420, 160521, 160529, 160556, 160569, 180610, 190410, 190420, 190430, 190490, 210112, 230990, 290359, 293392, 293399, 293499, 321519, 321590, 392310, 392321, 392690, 401130, 401140, 401180, 401190, 640299, 640419, 640420, 640590, 690390, 700220, 701919, 760429, 760711, 760719, 761410, 761699, 810820, 810890, 820730, 821192, 821193, 840790, 840820, 840890, 841112, 841182, 841191, 841199, 841229, 841231, 841510, 841581, 842720, 843120, 845630, 845811, 848210, 848220, 848230, 848240, 848250, 848280, 848291, 848299, 848310, 848320, 850132, 850432, 850433, 850610, 850640, 850650, 850680, 850690, 850720, 851310, 851390, 851920, 852721, 852859, 852869, 852872, 853710, 854011, 860110, 860120, 860210, 860290, 860310, 860390, 860400, 860500, 860610, 860630, 860691, 860692, 860699, 860711, 860712, 860719, 860721, 860729, 860730, 860791, 860799, 860800, 870191, 870192, 870193, 870194, 870195, 870210, 870220, 870230, 870240, 870290, 870310, 870321, 870322, 870323, 870324, 870331, 870332, 870333, 870340, 870350, 870360, 870370, 870380, 870390, 870421, 870422, 870423, 870431, 870432, 870490, 870600, 870710, 870790, 870810, 870821, 870870, 870880, 870891, 870892, 870893, 870895, 870899, 871110, 871120, 871130, 871140, 871150, 871160, 871190, 871410, 900211, 901120, 902910, 902920, 902990, 960720, 962000

South Korea
030292, 030392, 080810, 080830, 081030, 081070, 100610, 100620, 100630, 100640, 110290, 110319, 110320, 110419

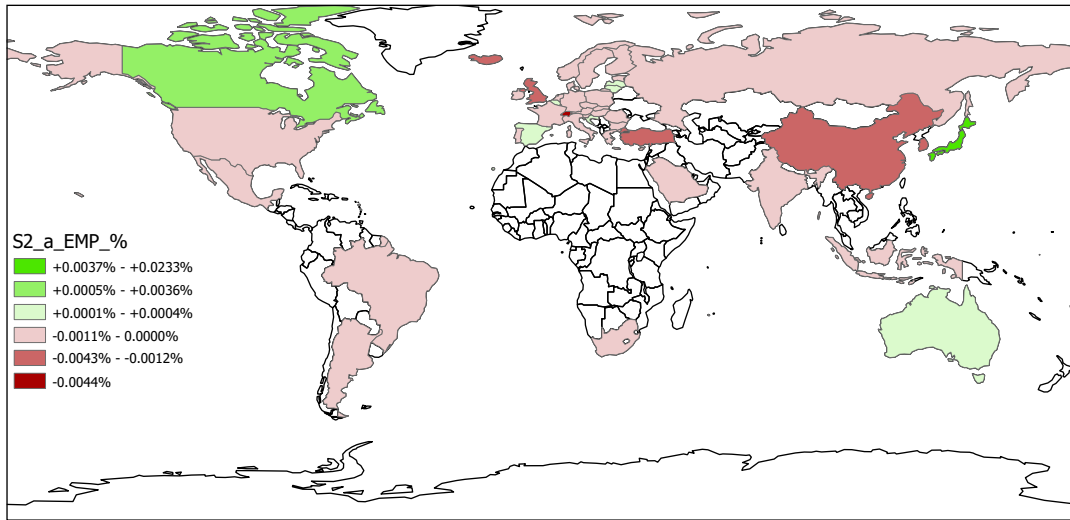
**Table 9. Products HS6 included in the analysis by country: Scenario 2b**

South Africa
010229, 010239, 010290, 020110, 020120, 020130, 020210, 020220, 020230, 020610, 020629, 021020, 021099, 030254, 030289, 030366, 030431, 030432, 030433, 030439, 030449, 030461, 030462, 030463, 030469, 030479, 030483, 030488, 030489, 030752, 040210, 040390, 060312, 070999, 071040, 071190, 080390, 080810, 080830, 081110, 100610, 100620, 100630, 100640, 100710, 110220, 110290, 110313, 110319, 110320, 110419, 110423, 110430, 110811, 110812, 110813, 110814, 110819, 110820, 110900, 130220, 151790, 160250, 160290, 160413, 160414, 160416, 160420, 170112, 170113, 170114, 170191, 170199, 170220, 170230, 170240, 170250, 170260, 170290, 170410, 170490, 180610, 190190, 190211, 190219, 190220, 190230, 190240, 190300, 190410, 190420, 190430, 190490, 190510, 190520, 190590, 200190, 200210, 200290, 200490, 200560, 200580, 200710, 200791, 200799, 200830, 200840, 200850, 200870, 200897, 200899, 200912, 200949, 200961, 200969, 200971, 200979, 200989, 200990, 210111, 210112, 210130, 210210, 210220, 210320, 210610, 210690, 220299, 220410, 220421, 220422, 220429, 220510, 220590, 220710, 220720, 220840, 220890, 220900, 230210, 230240, 230310, 290543, 290544, 350510, 350520, 380910, 382460, 760110, 760120, 760310, 760320

<b>Turkey</b>
010290, 010391, 010392, 010410, 010594, 010599, 020110, 020120, 020130, 020210, 020220, 020230, 020311, 020312, 020319, 020321, 020322, 020329, 020410, 020421, 020422, 020423, 020430, 020441, 020442, 020443, 020450, 020610, 020629, 020711, 020712, 020713, 020714, 020724, 020725, 020726, 020741, 020742, 020751, 020752, 020910, 020990, 021011, 021020, 021099, 030249, 030292, 040110, 040120, 040140, 040150, 040210, 040221, 040229, 040291, 040299, 040390, 040410, 040490, 040510, 040520, 040590, 040610, 040620, 040630, 040640, 040690, 040721, 040790, 040811, 040819, 040891, 040899, 070190, 070310, 070930, 070992, 070999, 071040, 071120, 071151, 071190, 071290, 071410, 071420, 071430, 071440, 071450, 071490, 080221, 080222, 080390, 080711, 080810, 080830, 080940, 081110, 081120, 081190, 100191, 100199, 100310, 100390, 100410, 100490, 100610, 100620, 100630, 100640, 100810, 100821, 100829, 100840, 100850, 100860, 100890, 110100, 110220, 110290, 110311, 110313, 110319, 110320, 110412, 110419, 110422, 110423, 110429, 110430, 110620, 110710, 110720, 110811, 110812, 110813, 110814, 110819, 110900, 121291, 121293, 150110, 150120, 150990, 151710, 151790, 152200, 160100, 160232, 160249, 160250, 160290, 170112, 170113, 170114, 170191, 170199, 170211, 170219, 170220, 170230, 170240, 170260, 170290, 170410, 180610, 190190, 190211, 190219, 190220, 190230, 190240, 190300, 190410, 190420, 190430, 190490, 190510, 190520, 190590, 200190, 200210, 200290, 200310, 200490, 200580, 200600, 200710, 200791, 200799, 200820, 200830, 200840, 200850, 200860, 200870, 200880, 200893, 200897, 200899, 200911, 200919, 200929, 200939, 200949, 200961, 200969, 200979, 200981, 200989, 200990, 210130, 210690, 220299, 220410, 220421, 220422, 220429, 230210, 230230, 230240, 230310, 230690, 230910, 230990

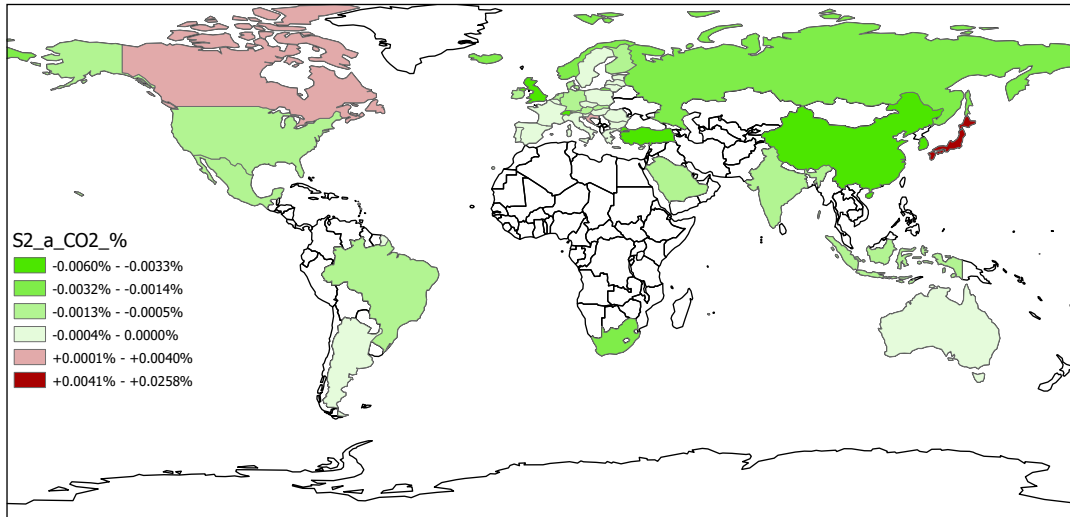
### 7.3 Further results

Figure 7. World impacts of Scenario 2a: Canada, Japan, South Korea. Employment (%)



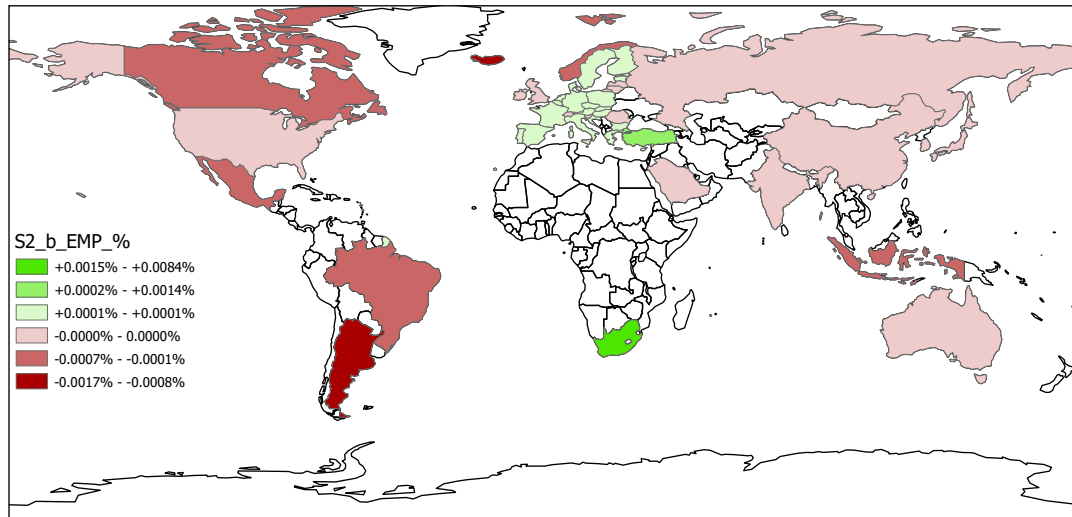
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

Figure 8. World impacts of Scenario 2a: Canada, Japan, South Korea. CO2 (%)



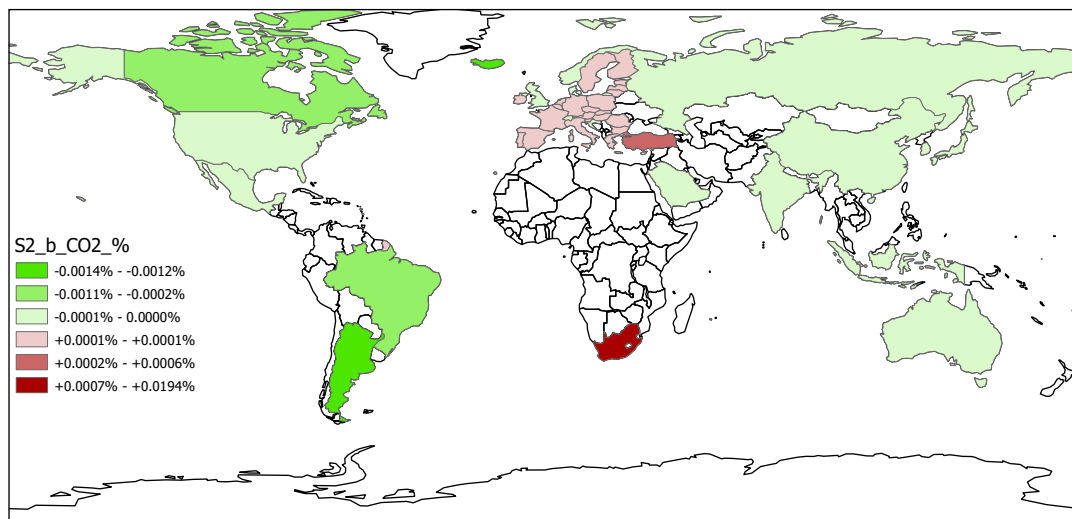
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

**Figure 9. World impacts of Scenario 2b: South Africa and Turkey. Employment (%)**



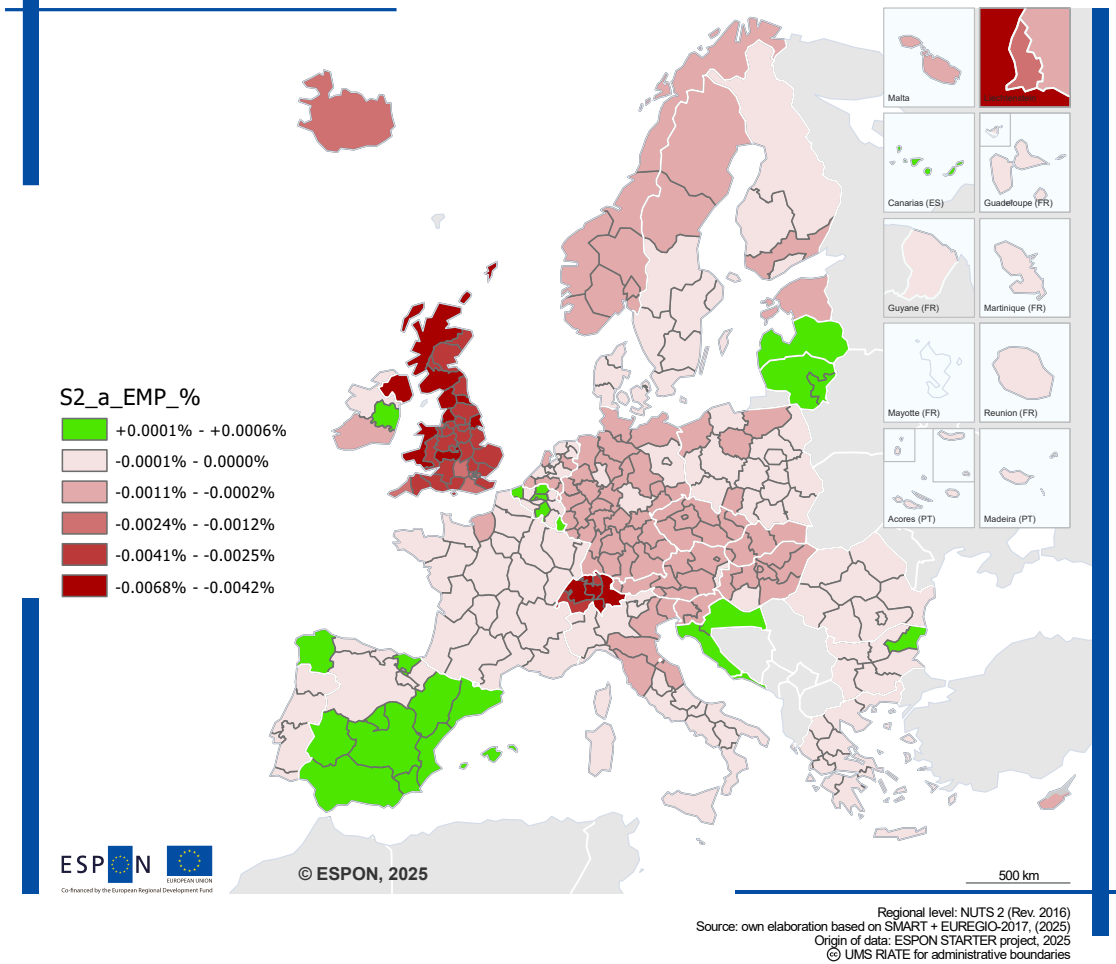
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

**Figure 10. World impacts of Scenario 2b: South Africa and Turkey. CO2 (%)**



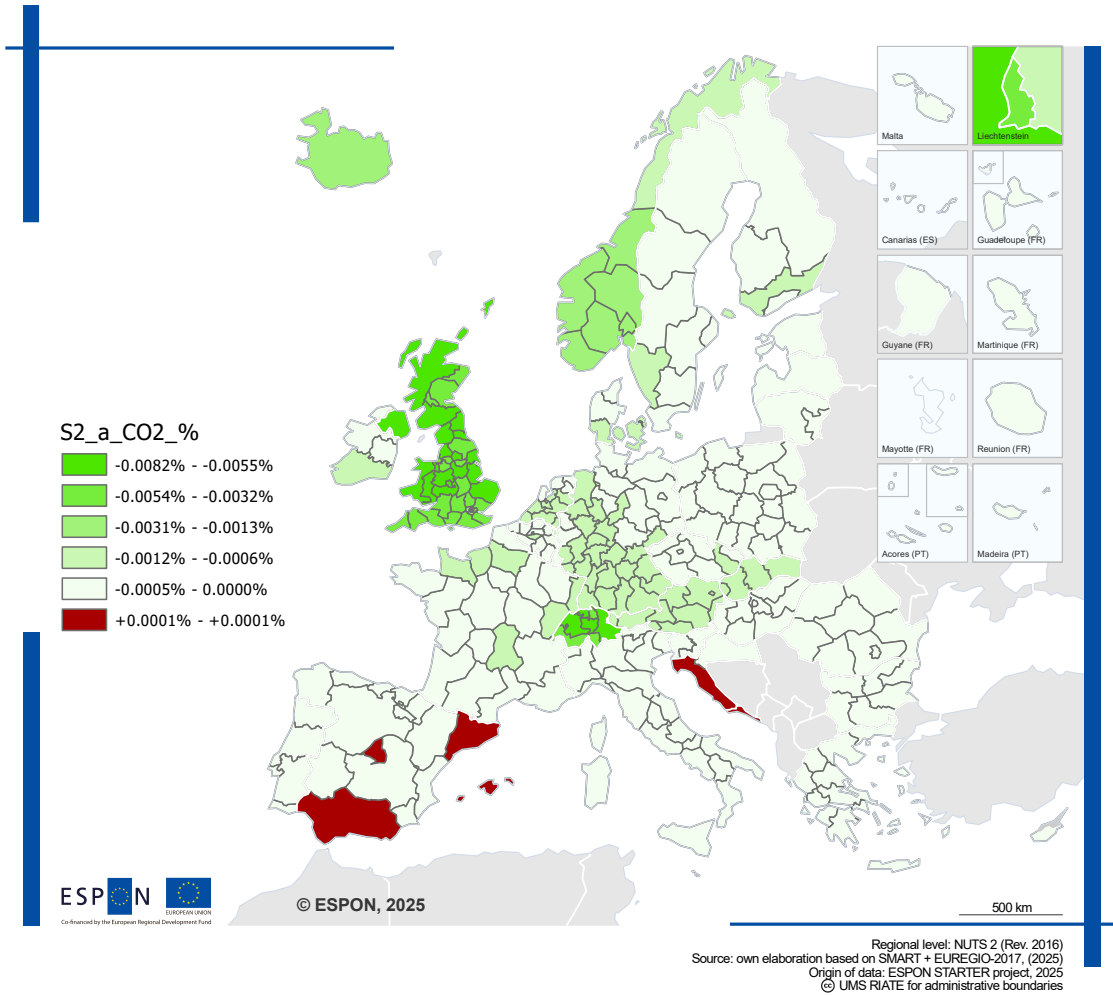
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

**Figure 11. Regional effects in Europe. Scenario 2a: Canada, Japan, South Korea. Employment (%)**



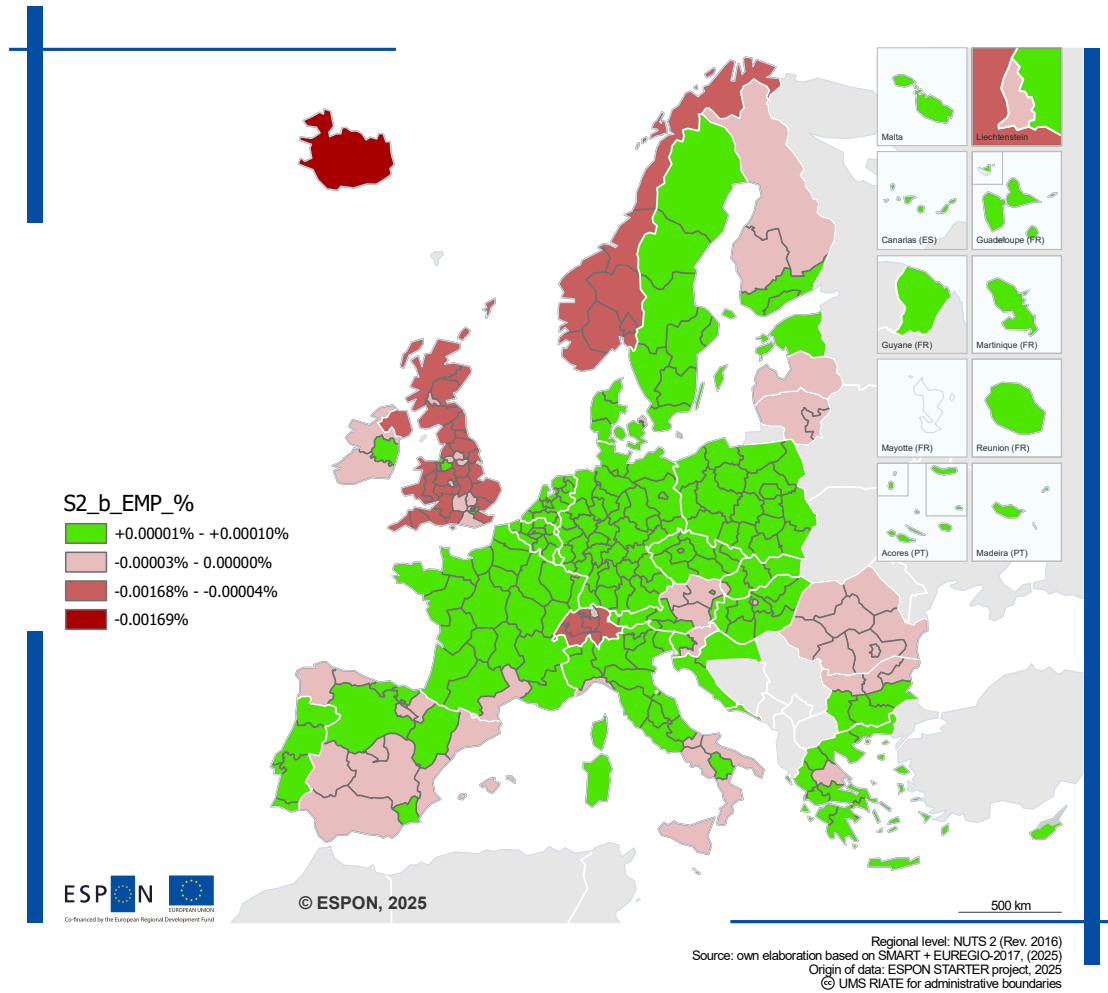
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

**Figure 12. Regional effects in Europe. Scenario 2a: Canada, Japan, South Korea. CO<sub>2</sub> (%)**



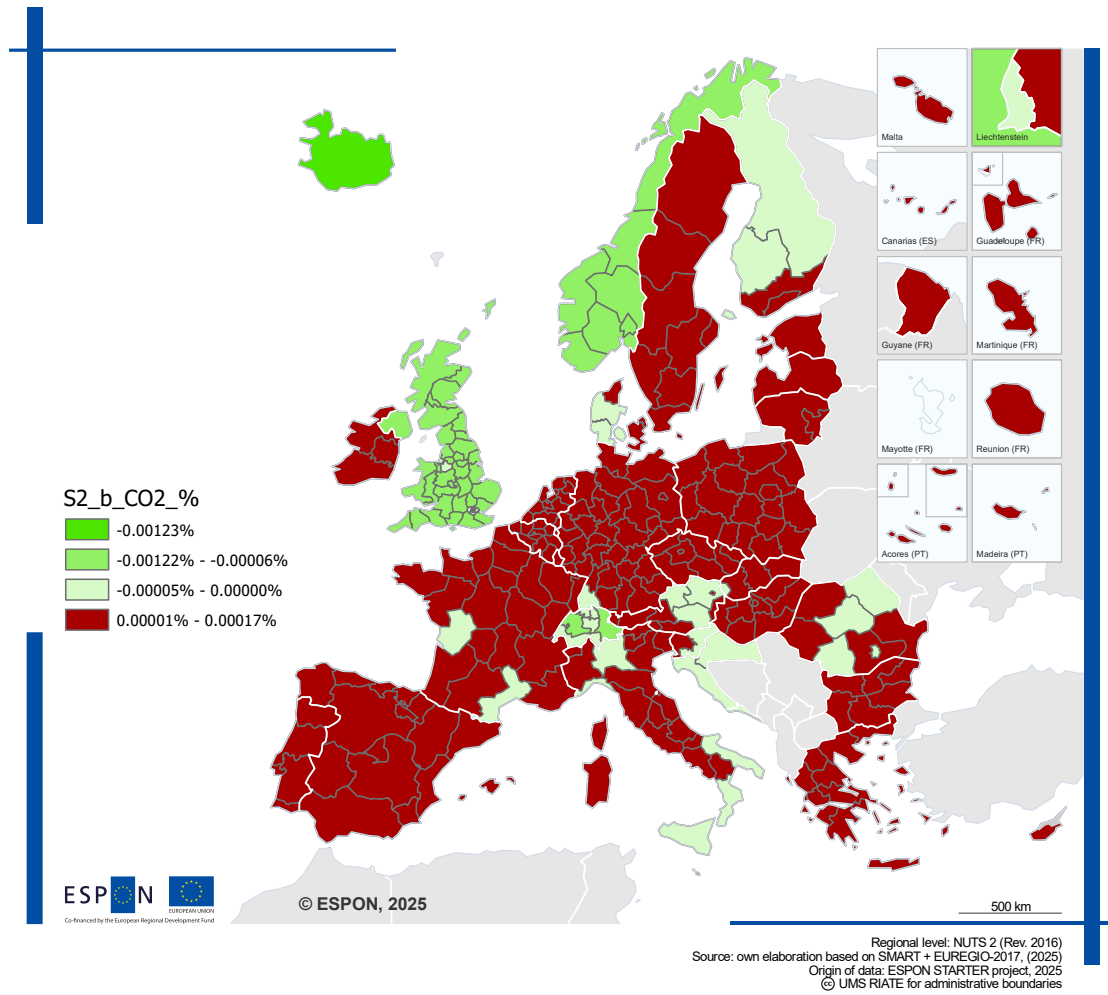
Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

**Figure 13. Regional effects in Europe. Scenario 2b: South Africa and Turkey. Employment (%)**



Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.

**Figure 14. Regional effects in Europe. Scenario 2b: South Africa and Turkey. CO2 (%)**



Source: Own elaboration, based on the results obtained using EUREGIO-2017 input-output framework.





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