

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT
STRUCTURAL AND COHESION POLICIES **B**

Agriculture and Rural Development

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**Research for AGRI Committee -
EU - UK agricultural trade:
state of play and possible
impacts of Brexit**

STUDY



DIRECTORATE-GENERAL FOR INTERNAL POLICIES
Policy Department for Structural and Cohesion Policies

AGRICULTURE AND RURAL DEVELOPMENT

Workshop on
'Implications of 'Brexit' for the EU agri-food
sector and the CAP: budgetary, trade and
institutional issues'

Research for AGRI Committee - EU - UK
agricultural trade: state of play and
possible impacts of Brexit

STUDY

This document was requested by the European Parliament's Committee on Agriculture and Rural Development.

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LINGUISTIC VERSIONS

Original: EN

ABOUT THE PUBLISHER

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Manuscript completed in October 2017
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| | | | |
|-------|------------------------|--------------------|-------------------|
| Print | ISBN 978-92-846-1986-3 | doi:10.2861/927200 | QA-05-17-043-EN-C |
| PDF | ISBN 978-92-846-1985-6 | doi:10.2861/92351 | QA-05-17-043-EN-N |

This document is available on the internet at:

[http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602008/IPOL_STU\(2017\)602008_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2017/602008/IPOL_STU(2017)602008_EN.pdf)

Please use the following reference to cite this study:

Bellora, C., Emlinger, C., Fouré, J. And Guimbard, H. (2017), Research for AGRI Committee, EU – UK agricultural trade: state of play and possible impacts of Brexit, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels

Please use the following reference for in-text citations:

Bellora et al. (2017)

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DIRECTORATE-GENERAL FOR INTERNAL POLICIES
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Abstract

This report analyzes current UK-EU27 agri-food trade, and quantifies the impacts of a return to WTO rules after Brexit. Agri-food trade is likely to decrease steeply, especially for meat and dairy sectors. However, there might be an opportunity for an increase in production in a reduced number of European sectors, such as red meat, cattle or wheat, to replace imports from the UK. More generally, Ireland is likely to be the most negatively impacted country and deserves particular attention during the Brexit process.

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LIST OF ABBREVIATIONS

- AVE** *Ad Valorem* Equivalent
- BAU** Business-as-usual, the reference scenario without trade policy shock
- CAP** Common Agricultural Policy
- CES** Constant Elasticity of Substitution
- EU** European Union
- EU27** European Union, with 27 Member States
(Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden)
- GDP** Gross Domestic Product
- GTAP** Global Trade Analysis Project
- HS6** United Nations' Harmonized System 6-digits classification
- MAcMap-**HS6**** Market Access Map HS6 database
- MIRAGE** Modelling International Relationships in Applied General Equilibrium
- NEC** Not Elsewhere Classified
- NES** Not Elsewhere Specified
- NTM** Non-tariff measure
- SAM** Social Accounting Matrix
- UK** United Kingdom
- WTO** World Trade Organization

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EXECUTIVE SUMMARY

This document first presents the current state of the trade relationship between the European Union (EU27) and the United Kingdom (UK). It then produces a quantitative impact assessment of the UK's withdrawal from the EU27, with a specific focus on agri-food sectors. The main scenario assumes that (i) MFN tariffs will be imposed on bilateral trade in goods between the EU27 and the UK and (ii) the trade-restrictiveness of non-tariff measures will increase. In the absence of a consensual scenario regarding public policies other than those concerning the trade policy mentioned above, the status quo is assumed. In other terms, redistributive policies that could mitigate Brexit's negative impacts are not contemplated in our scenarios and no change in the Common Agricultural Policy is assumed. Results are given by the computable general equilibrium model developed by the CEPII, MIRAGE, and are expressed as a deviation from a baseline, in 2030.

The key-findings are the following:

- The relationship between the UK and the EU27 is characterized by a marked dissymmetry. The EU27, as a whole, is a large market (more than 445 million inhabitants and a GDP of USD 13.8 thousand billion in 2016), while the UK is relatively smaller (a population of 65.6 million people and a GDP of USD 2.6 thousand billion). Thus, the EU27 represents a large market and outlet for UK exporters, while the UK is, in comparison, a small market for EU27 (even if it represents the main export destination of some agri-food sectors in given EU27 countries). For these reasons, macroeconomic impacts on the UK are significantly larger (e.g. -2.3% in GDP) than for EU27 (-0.3%). Nevertheless, the UK is currently the second largest EU28 country and is highly integrated with the EU27 in terms of trade and value chains. As a result, all the EU27 countries will be negatively affected by Brexit, the magnitude of the impact increasing with economic proximity to the UK. Ireland in particular (-3.4% in GDP, USD -63.4 billion), and to a much lesser extent Belgium and Luxembourg (-0.7%) and the Netherlands (-0.5%), are the most affected countries.
- Agri-food products are less traded than manufactured ones and contribute less in total GDP. They will face however the largest increases in trade protection, both in terms of tariffs and non-tariff measures. Agri-food exports of the EU27 to the UK will decrease by USD 34 billion (62%) and imports by USD 19 billion (with the same relative decrease, 62%).
- Trade diversion will take place; part of the decrease in exports to the UK will be compensated by an increase in intra-EU27 trade (+1%) as well as in exports to third countries (+0.9%). This is partly explained by a loss of UK's competitiveness, due to higher prices of imported intermediary consumptions. In the end, agri-food exports of the EU27 to the world will decrease by 4.1% (USD -27 billion). The most affected sectors (in value terms) are processed food (USD -10.5 billion, -4.7%),¹ which is also the most exported (33% of EU27 agri-food exports), white meat (USD -5.2 billion, -10.5%) and dairy (USD -4.6 billion, -7%). The Netherlands (USD -6.7 billion, -66%), Ireland (USD -6.5 billion, -71%) and France (USD -4.7 billion, -51%) undergo the largest drops in exports.
- Agri-food production and value added are also affected by trade with other countries as well as domestic demand. The relative magnitude of each of these effects (bilateral

¹ These numbers correspond to the impacts on the most affected sector producing processed food, identified as "Other food" in the simulation results.

trade with the UK, trade with third countries and domestic demand) varies across countries and sectors and determines Brexit's impact heterogeneity. In the UK, agri-food value-added increases (+2%), mainly because local production partially substitutes imports from the EU27. This takes place at consumers expense since consumption prices increase by 4%. In the EU27 as a whole, agri-food value-added decreases by 0.8%; the increase in exports to third countries and in intra-EU trade do not compensate for the loss of exports to UK. Even if in all EU27 countries, overall agri-food value-added decreases, some sectors like Red meat (+2.1%) and Cattle (+1.3%) in France gain thanks to their capacity to fulfill the domestic demand, replacing imports from the UK. The wheat sector in France is one of the few where value added increases (+1.7%) thanks to an increase in exports to other EU countries. The fall in agri-food value-added is particularly large in Ireland (-16%, with a collapse in white meat, -58%), because of the decrease in exports to UK but also to general equilibrium effects leading to a strong decrease in domestic demand.

- Because of its tight relationship with the UK, of all EU27 countries, Ireland is affected the most by Brexit, and not only in agri-food sectors. In relative terms, its GDP decreases even more than UK's GDP (-3.4% vs -2.4%). This is explained by a drop in Irish agri-food exports to the UK and to the rest of the World, including EU27 countries as Irish production relies heavily on imported intermediates from the UK.

INTRODUCTION

In March 2017, the United Kingdom (UK) Government notified the European Council of its intention to withdraw from the European Union (EU). Negotiations on the modalities of Brexit have started and should not exceed two years, after which the withdrawal should be effective, as stipulated by the Treaty on European Union.

Agri-food sectors do not contribute much to national GDPs or bilateral trade flows (11% of EU27 exports to the UK in value), but the stakes are nevertheless high. The UK is an important destination for EU27 exports with a highly favorable agricultural trade balance with the UK (USD 29 billion).² Trade protection that could apply on agri-food goods in the absence of a free trade agreement is particularly high (64%, to be compared with 26% before Brexit, taking into accounts both tariffs and NTMs). Furthermore, agricultural production is managed at the European level by the Common Agricultural Policy, which benefits from one of the largest European budgets (€ 59 billion per year). This common policy relies partly on UK contributions and constitutes a significant support to farmers' revenues. In other words, agriculture and the food industry are an offensive interest for EU27 and an important subject for the UK, which depends on imports from the EU27. The UK negotiating position will therefore depend on the weight it will give to farmers or consumers' interests (Grant et al., 2015; Lang, 2016; Potton and Webb, 2017).

For the time being, the specific modalities of the post-Brexit EU27-UK relationship are unknown. The future of agricultural policies in the UK is naturally one of the main uncertainties. In terms of agri-food trade, which is our main focus, the issues are manifold. We briefly summarize below the main ones:

- **Tariffs:** Tariffs between the EU27 and the UK have to be determined during Brexit negotiations. The future of preferential access to third markets is also uncertain for the UK. Molinuevo (2017) suggests that trade agreements signed by the EU that concern only goods will not be binding anymore for the UK. This implies that the UK will have to negotiate its own preferential tariffs. Among these agreements, the EU- Turkey is the most important. The situation of other (mixed) trade agreements signed by the EU is more complex and uncertain. The UK could also negotiate trade agreements with new partners, the United States, for instance. These negotiations could have an impact on EU27 exports to the UK and to third countries, due to trade diversion effects.
- **Tariff Rate Quotas (TRQs):** What will happen to European TRQs after Brexit is crucial in relation to agricultural products. The EU27 and the UK have already agreed to divide existing (import) commitments within the WTO based on historical trade flows, since TRQs were negotiated by the European Commission on behalf of all EU member states. The agreement is however likely to be challenged by EU and UK partners. The uncertainty concerns also EU preferential (export) TRQs in third countries that are part of preferential agreements. Since TRQs are not currently allocated by member states (they are allocated on a first-come, first-served basis), the partition of the quotas could be particularly complex (Revells, 2017; Downes, 2017). The size of these TRQs is a major concern both for UK and EU27 farmers, especially in the livestock sector.

² Average year value over the period 2013 – 2015.

- **Non Tariff Measures (NTMs):** Currently, the trade restrictiveness of NTMs (e.g. sanitary and phytosanitary standards, technical barriers, certification procedures, etc.) within the EU is fairly limited, since many of these measures are common to all member states. After Brexit, any new NTM adopted without coordination between the EU27 and the UK will probably have a negative impact on bilateral trade. Furthermore, UK's exit from the EU will involve more border and custom controls, increasing in consequence prices of EU exports to the UK and of EU imports from the UK.
- **Geographical Indications (GIs):** In some sectors (in particular animal productions, wine and spirits, and fruit and vegetables), maintaining protection for food names is an important stake. Exit from the EU could potentially result in loss of protection for food names (or GIs) in the UK, the European³ and third countries' markets that recognize GIs (Roussel and Doherty, 2016). The UK will need to establish its own national approval scheme in order to protect these GIs.

In addition to these elements that both the EU27 and the UK will have to manage, issues on rules of origin (RoO) and bargaining power after Brexit will also influence the UK negotiating position:

- The question of **bargaining power** is posed both when we consider UK access to EU27 and third countries markets. The UK will not be involved anymore in the negotiations over the definition of new European norms and regulations. However, to lower the trade restrictiveness of future European NTMs, the UK could decide to continue following European standards, loosing part of the benefits of its independence. The UK, a relatively small country, would also lose bargaining power in trade negotiations with third countries, which could potentially take a long time.
- **Rules of Origin:** The rules of origin determine where (in which country) a product and its components have to be produced to benefit from preferential tariffs. Even if the EU27 and the UK reach a trade agreement, many products the UK exports to EU27 would not be eligible anymore to preferential access (if value chains remain unchanged), not enough value added being produced in the UK. More generally, compliance with European RoO requirements potentially could entail additional administrative costs for exporting to the EU in general, and particularly in the case of agri-food sectors, which are closely integrated in EU supply chains (Baker and Swales, 2016; UK House of Lords, 2016). The same problem could arise for the EU27, but most likely to a lesser extent.

Future negotiations between the EU27 and the UK encompass several different aspects, not exclusively trade related. In order to evaluate possible outcomes, the European Parliament Committee on Agriculture and Rural Development commissioned to the CEPPI/CIREM an analysis of the current state of UK - EU27 agri-food trade and the possible impacts of Brexit. Given the high uncertainty on the outcome of trade negotiations, the application of Most Favoured Nation (MFN) tariffs to bilateral trade between the UK and the EU27, as well as an increase in the trade restrictiveness of bilateral NTMs is the scenario retained to evaluate Brexit's impacts. Considering that a sector-by-sector negotiation is excluded, the impact assessment is conducted with a computable general equilibrium model, that accounts for direct trade impacts of the increased trade protection (not only on agri-food sectors but on all goods and services). The model also takes into consideration indirect trade impacts, due, for

³ Products of UK presently enjoying protection in the UE27 include Melton Mowbray pork pies, Cornish pasties, Yorkshire Wensleydale cheese, Welsh beef, Welsh lamb, Armagh bramley apples and Scotch whisky.

instance, to trade diversion brought about by changes in relative prices, and for general equilibrium effects triggered by changes in total revenues at the global level.

In the following, we first depict the current state of agri-food trade between the UK and the EU27, relative to trade in manufactured goods and to total European trade. Differences across European member states and sectors are stressed. Then, the impacts on trade and value-added of a scenario in which no trade deal would be reached by the EU27 and the UK are simulated and analyzed, as well as its macroeconomic consequences, taking into account the limitations of the model and the scenario adopted. Finally, a number of policy recommendations are drawn.

1. IMPACT ASSESSMENTS OF EXIT FROM EUROPE

Several studies were conducted before and after the referendum, to evaluate the potential economic impact of Brexit. *Ex ante* analyses include both academic and non-academic works, and use different approaches. Ottaviano et al. (2014) and Aichele and Felbermayr (2015) use standard quantitative static general equilibrium trade models *à la* Arkolakis, Costinot and Rodriguez-Clare (2012) based on a gravity model, to estimate the effect on the UK economy of leaving the EU. Ebell et al. (2016) evaluate the long-run macroeconomic impact of Brexit by employing a large scale structural global econometric model (NiGEM), while Brakman et al. (2017), HM Treasury (2016) and Connell et al. (2017) use gravity models to assess the effects on trade of Brexit. Computable general equilibrium models are the most commonly approaches used to predict the effect of Brexit on trade, value added and real income (see, e.g., Booth et al., 2015; Ciuriak et al., 2015; PwC, 2016; Rojas-Romagosa, 2016; Boulanger and Philippidis, 2015), while Davies and Studnicka (2017) and Hosoe (2016) discuss the potential impact of Brexit, employing general equilibrium models accounting for firm heterogeneity *à la* Melitz (2013).

These works vary in their methodological approaches and in terms of scenarios and focus, which makes it difficult to compare their output. Almost all these studies evaluate and compare the impacts of a “hard” and a “soft” Brexit (corresponding to a WTO scenario, and a UK-EU FTA in various balances); some focus on the impact of non-tariff measures and dynamic effects (Aichele and Felbermayr, 2015), others focus more on the post-Brexit trade policy that the UK should adopt (Ciuriak et al., 2015), or the role of global value chains (Connell et al., 2017).⁴ It is important to note that overall, in the available studies, the main focus is the impact of Brexit on the UK economy, with little attention paid to the effects on EU members. The exceptions are Bergin et al. (2016), Barrett et al. (2015) and Rojas-Romagosa (2016) which analyze the impact of Brexit on the Netherlands and Ireland. Lawless and Morgenroth (2016) compare trade and tariffs data to discuss the effect of Brexit on EU trade, and using sector level elasticity estimates they compute the tariff-induced price increases and trade reductions that might result from Brexit.

In almost all these works, Brexit is shown to have substantial negative impacts, for both the UK and the EU. The impact on British GDP ranges from -7% to -0.1%, depending on the assumptions made and the scenarios considered (see Bush and Matthes, 2016, for a review and a meta-analysis of the macroeconomic impacts of Brexit). All of these studies find that the most negative outcome would result from failure of the UK and the EU27 to negotiate the terms of the UK’s exit, *i.e.*, if they are unable to strike a trade agreement and apply WTO tariffs to their bilateral trade.

Studies focusing on the agricultural sector are relatively scarce, and essentially, evaluate the impact of Brexit on British agriculture, using descriptive evidence on trade, production and tariffs (Buckwell, 2016; Potton, 2017; Grant et al., 2015; Lang, 2015), or partial equilibrium modeling frameworks as in Davis et al. (2017) and Van Berkum et al. (2016). Davis et al. (2017) illustrate the heterogeneous impacts that Brexit could have on the UK’s agricultural sectors. They combine two partial equilibrium models, FAPRI-UK and FAPRI-EU, to examine different trade arrangements and show that imposing WTO tariffs on UK–EU bilateral trade would have a significant impact on the UK domestic market, with the magnitude of this impact across sectors depending on the trade balance in each sector. Imposing tariffs on those products that are mostly imported, e.g. dairy, pig and poultry products, by reducing

⁴ Connell et al. (2017) show that including sector-level input-output linkages in production using WIOD data in gravity estimates increases the losses to the UK induced by Brexit.

import volumes, would have a positive impact on UK domestic prices, and a resulting positive effect on production. Van Berkum et al. (2016), in their study, focus more on the public policies that the UK might adopt to cope with Brexit. Using the AGMEMOD partial equilibrium model, they conduct a sector analysis and assess the impacts on trade and farm incomes according to different UK agricultural policy scenarios. Donnellan and Hanrahan (2016) use the FAPRI-Ireland model to evaluate the potential impact of Brexit. Although their main focus is Ireland, they find notable negative impacts for the EU agri-food sector overall, and in some sectors and member states in particular (beef, dairy and lamb for Ireland, pig and dairy for Denmark, vegetables for the Netherlands and wine for France, Spain and Italy). Baker et al. (2017) also use partial equilibrium model to assess the impact of Brexit on farmers' income. They show that farm business income benefits from the Brexit, through higher prices, in the dairy and pig sector. On the other hand, producers of cereals and sheep meat will experience income reduction due to rising costs of trade to export to the EU. This result is consistent with, Freund et al. (2017) who show with the MAGNET CGE model that the impacts of Brexit is negative for UK, with the most pronounced effects in the meat and livestock sectors. Using general Equilibrium models to assess the impact of the Brexit on Agriculture allows to take the budget question into account. This issue is particularly crucial as the exit of UK from the EU will also entail a withdrawal from the 'CAP' that would results in budget saving for UK. Thus, Boulanger and Philippidis (2015) show that these gains exceed trade facilitation costs on agrifood trade.

2. EUROPEAN UNION AND UNITED KINGDOM BILATERAL TRADE: STATISTICAL OVERVIEW

KEY FINDINGS

- The relationship between the EU27 and the UK is marked by **dissymmetry**: the EU27 is a large market (445 million inhabitants, GDP of USD 13,800 billion), while the UK is a relatively small country (65.6 million people, GDP of USD 2,600 billion).
- In the absence of any trade agreement stating otherwise, **MFN tariffs will apply to bilateral trade flows** between the EU27 and the UK, and **NTMs will increase** in the long term. Protection faced by EU27 exports to UK will be slightly higher than protection faced by UK exports to EU27: MFN of 18.3% and NTMs of 45.4% for EU27 agri-food exports and MFN of 14.2% and NTMs of 39.9% for UK agri-food exports.
- **Agri-food goods represent 11% of bilateral trade flows** between the UK and the EU27. The EU27's **trade balance with the UK is positive**: USD 47 billion worth of agricultural goods are exported to the UK, compared to USD 18 billion worth of agricultural imports.
- We rank sectors and countries by trade value weighted by potential protection, to highlight those potentially most impacted by Brexit. The three main EU27 agri-food sectors are **processed food, dairy and meat** (for both exports to and imports from UK). The EU27 countries that trade the most with the UK and will face the highest protection are **France, Netherlands and Ireland**.
- **The situation of Ireland deserves particular attention**. Its trade with the UK plays an important role, especially imports: 27% of Ireland's European imports are from the UK, and represent 46% of total Irish agri-food imports (compared to 4% on average for other European countries). Disruptions caused by Brexit may have particularly negative impacts on this country because of the large integration of UK products in Ireland's exports.

2.1. Macro-economic indicators: a marked dissymmetry

The relationship between the UK and the EU27 is characterized by a **marked dissymmetry**. The EU27, as a whole, is a large market with more than 445 million inhabitants and GDP of USD 13.8 thousand billion, while the UK is a relatively small country, with a population of 65.6 million people and a GDP of USD 2.6 thousand billion (see Table 1). Thus, the EU represents a very large market and outlet for UK exporters, while the UK, even though integrated with the EU in terms of trade and value chains, and with a large GDP per capita, is a relatively small market for European exporters in comparison.⁵ However, among the EU28, the UK is a large country: it is ranked third after Germany and France for number of inhabitants and second after Germany for GDP. Its GDP per capita is among the highest in this group, 33% higher than the EU27 average. This foreshadows large redistributions of economic activity across the EU27.

⁵ Sector and country specificities are discussed later but note that UK is nevertheless an important export market for some sectors. For instance, 12% of French exports of vegetables and fruits go to UK (10% for Spanish exports) as well as 14% of French vegetable oils and fats.

Table 1: Market size, EU27 (and its first ten Member States, by GDP value) and UK (2016)

| Country | GDP (USD bn) | GDP per capita (USD) | Population (mn people) |
|----------------|--------------|----------------------|------------------------|
| United Kingdom | 2,619 | 39,899 | 65.6 |
| EU27 | 13,779 | 30,905 | 445.9 |
| Germany | 3,467 | 41,936 | 82.7 |
| France | 2,465 | 36,855 | 66.9 |
| Italy | 1,850 | 30,527 | 60.6 |
| Spain | 1,232 | 26,528 | 46.4 |
| Netherlands | 771 | 45,295 | 17 |
| Sweden | 511 | 51,600 | 9.9 |
| Poland | 470 | 12,372 | 37.9 |
| Belgium | 466 | 41,096 | 11.3 |
| Austria | 386 | 44,177 | 8.7 |
| Denmark | 306 | 53,418 | 5.7 |

Source: World Development Indicators, The World Bank, Authors' calculations.

2.2. Trade protection

2.2.1. Tariffs: increase to their MFN level

Once the UK leaves the EU, if no relevant trade agreement has been signed to the contrary, the MFN tariff will apply to bilateral trade between the UK and the EU27.

Although MFN tariffs are the same across all EU countries, faced protection will depend on the trade patterns of each individual trade partner. For instance, a very high tariff imposed on a product that is not traded at all is less restrictive than a lower tariff on a much more traded good. The way applied protection is computed is detailed in Bouët et al. (2008). As a result, **the average MFN duty that EU27 could apply to imports from the UK is 18.3% and 3.2% for agricultural and manufactured goods respectively**, while **EU exports could face respective average tariffs of 14.2% and 2.6%** (Table 2). Agricultural products benefits from a higher MFN protection. This reflects the importance of sensitive sectors such as sugar, bovine products (meat and dairy) and animal products more generally (see Tables 4 and 5).

2.2.2. Non-tariff measures (NTMs): increase in their trade-restrictiveness

NTMs arguably play a dominant role in restraining imports. Table 2 shows that NTMs follow the same general pattern as protection used by European countries, being more restrictive in the case of agricultural goods compared to manufactured products. Thus, **EU27 agriculture exports to the UK face average NTMs trade restrictiveness of 26.01%** (14.37% for industrial goods), slightly **higher than those imposed by the EU27 on UK exports (22.78% and 13.37%, for agriculture and manufactured goods, respectively)**.

In the absence of any agreement between the EU27 and the UK after Brexit, new technical and non-technical measures applied by the two regions will probably diverge in the mid-term, accounting for different consumer preferences and trade policies. In the short term, certification procedures will be more complex with the end of the common market and anti-dumping procedures (or other temporary measures) could be applied to bilateral trade flows. This will result in NTMs whose trade restrictiveness will increase over time. It is difficult to quantify the extent of this increase but it is important to take it into account since NTMs represent the main trade protection. Table 2 reports the values used in the simulation exercises for present and 2030 projected trade restrictiveness of NTMs. These values for NTMs trade restrictiveness are documented in Annex B (pre-Brexit NTMs) and Section 4.2 (post-Brexit NTMs).

Table 2: Trade flows and protection, EU27 – UK

| | Trade flows | | | Protection | | |
|-------------------|---------------------|--------------|-----------------|---------------------|---------|----------------------|
| | Value (USD million) | %of EU trade | %of world trade | NTMs pre Brexit (%) | MFN (%) | NTMs post Brexit (%) |
| <i>EU exports</i> | | | | | | |
| Non Agric. goods | 305,864 | 6.67 | 1.86 | 14.37 | 3.22 | 26.15 |
| Agric. goods | 47,306 | 8.81 | 3.25 | 26.01 | 18.29 | 45.40 |
| Total | 353,170 | 6.90 | 1.97 | 15.62 | 4.85 | 28.23 |
| <i>EU imports</i> | | | | | | |
| Non Agric. goods | 196,122 | 4.35 | 1.19 | 13.37 | 2.59 | 24.17 |
| Agric. goods | 17,954 | 3.79 | 1.23 | 22.78 | 14.20 | 39.89 |
| Total | 214,076 | 4.29 | 1.2 | 14.07 | 3.45 | 25.34 |

Source: Authors' calculations based on tariffs from MACMap-HS6, NTMs from Kee et al. (2009) and trade from BACI (see Annex A for details on data sources).

Note: Trade flows are mean values for the period 2013–2015. Current tariff protection is not reported since it does not apply. The AVEs of the MFN tariffs refer to 2013. Two NTM values are reported, present AVE and projected AVE in the absence of a specific trade agreement when the UK leaves the EU.

2.3. Trade flows

The UK is the second largest (after the USA) EU export market (worth USD 353 billion, and 6.9% of EU exports, annual trade flow, average over the period 2013-2015, see Table 3) in trade value; EU trade is mainly among members. At the same time, the EU27 is the UK's largest export market (USD 214 billion and 46% of UK exports).

Trade consists mostly of non-agricultural goods (i.e., goods that are not covered by the WTO Agreement on Agriculture⁶), agri-food representing only 11% of trade flows. This structure of more manufactured goods than agricultural goods is not a specificity of the trade relationship with the UK but reflects a pattern that is common to most developed countries.

⁶ The exact product coverage is provided in Annex I of the Agreement on Agriculture: https://www.wto.org/english/docs_e/legal_e/14-ag_02_e.htm#annI

The EU27's trade balance with the UK is positive for both manufactured and agricultural goods.⁷ USD 47 billion worth of agricultural goods are exported to the UK, compared to USD 18 billion worth of agricultural imports. Additionally, the share of exports to the UK in total EU exports is larger than the share of imports, and especially in the case of agricultural goods (8.8% vs. 3.8%); also, the protection applied to exports (44.3% for agriculture) is higher than that imposed on imports (37% for agriculture). The combination of these three elements (positive trade balance, larger trade share, and protection), means that **larger impacts can be expected on European exports (producers) compared to European imports (consumers)**.

Table 3: Main export destinations of EU27 and UK, total trade

| EXPORTER: EU27 | | | EXPORTER: UK | | |
|----------------|----------------|---------------|-------------------|----------------|---------------|
| IMPORTER | VALUE (USD mn) | % TOT EXPORTS | IMPORTER | VALUE (USD mn) | % TOT EXPORTS |
| EU27 | 2,789,746 | 54.49 | EU27 | 214,076 | 46.45 |
| UK | 353,170 | 6.9 | USA | 52,038 | 11.29 |
| USA | 341,399 | 6.67 | Switzerland | 25,353 | 5.5 |
| China | 184,246 | 3.6 | China | 24,551 | 5.33 |
| Switzerland | 145,317 | 2.84 | Un. Arab Emirates | 12,066 | 2.62 |
| Russia | 116,929 | 2.28 | Hong Kong | 10,009 | 2.17 |
| Turkey | 86,429 | 1.69 | Canada | 7,805 | 1.69 |
| Japan | 67,452 | 1.32 | Saudi Arabia | 7,062 | 1.53 |
| Rep. of Korea | 53,041 | 1.04 | Rep. of Korea | 6,923 | 1.5 |
| Norway | 52,045 | 1.02 | Japan | 6,588 | 1.43 |

Source: Authors' calculations, using BACI.

Note: Trade flows are mean values over the period 2013–2015, for all goods (agri-food and manufacture).

2.3.1. Main trading sectors potentially impacted: processed food, dairy and meat.

In the context of agriculture, the most traded products between the EU27 and the UK, by value, are processed food products⁸, beverages and meat and dairy products. However, to estimate the impact of Brexit, it is relevant to also consider the protection faced by trade flows. Therefore, **we sort sectors by trade flow value multiplied by potential *ad valorem* protection**, were MFN and more restrictive NTMs to be applied, resulting in what we describe in what follows as "Protection Revenue". We also investigate trade patterns in more depth using information available at the HS6 level (the statistics at HS6 level are presented in Appendix D, see Annex A.4 for details on data sources).

⁷ For the sake of comparison, total UK trade imbalance amounts to € 29 billion per year on average over the period 2013 – 2015 (source: Eurostat)

⁸ The "Other food" sector discussed here is unfortunately a residual sector in the original GTAP database, gathering all processed food not classified elsewhere (i.e. different from vegetal oils, processed rice and sugar or dairy products).

Processed food products represent the main export flow to the UK and the most heavily protected – amounting to almost USD 17 billion, representing 10% of European food exports (see Table 4). At the HS6 level, the most protected goods which would generate the highest revenue within the processed food sectors are dog and cat food, France is the biggest exporter to the UK (25%) in these sectors, followed by various animal feed preparations (France, 20%). Imports of communion wafers, rice paper and baking materials from Germany (23%) have an export value of over USD 1.5 billion but attract a fairly low MFN tariff of 5.5%.

The next export sectors after processed food ranked by protection revenue are **Dairy products and Meat products n.e.c.** Despite their **smaller flows** in terms of value, these two sectors are ranked second and third since they would face **very high levels of protection**, with MFN duty of around 40% and NTMs increasing from 42% to 74% for dairy, and MFN of 22% and NTMs of 43% for meat products. In each of these sectors, exports to UK represent around 10% of total EU exports. In relation to dairy products, Ireland and France are the main exporters of what are likely to be most heavily affected HS6 products, such as cheese, fresh cheese, butter, buttermilk and some processed cheese. The GTAP category Meat Products is a residual category which includes all meat products not included in other GTAP sectors. It thus includes a variety of different products, some of which account for a significant part of European exports, e.g. swine meat, poultry, cuts and offal (frozen and fresh), swine cuts, sausages, meat offal and blood. The main exporters to the UK of these products are Denmark, the Netherlands and Germany.

Beverages and tobacco, and **Vegetables and fruit** are ranked respectively fourth and fifth for the most affected export products. Czech Republic exports one-third of the first HS6 product (cigarettes containing tobacco) in the Beverages and tobacco category. France ranks second accounting for almost 50% of exports of grape wines n.e.s. Netherlands is another important exporter, ranking first for non-alcoholic beverages (excluding vegetable and fruit juices), denatured ethyl alcohol and cigarette-pipe tobacco. Finally, the European trade flows at the HS6 level that will suffer the most in the Vegetables and fruit sector are tomatoes, cucumbers and gherkins, mushrooms, mandarins, clementines and citrus hybrids, cauliflowers and headed broccoli. The Netherlands is an important exporter to the UK of the first two products (48% and 55% of European exports), Ireland is the main exporter of mushrooms (55%) and Spain's exports to the UK of cauliflowers and broccoli amount to 88% and 79% of the total.

EU imports from UK follow a similar pattern (see Table 5). **The main imported products**, by value, are food products and beverages; however, if value is weighted by protection, dairy products, bovine meat and other meat products are among the most heavily affected products, because of the high level of protection they attract. For instance, the AVE protection would be of more than 130% for dairy products if both MFN and NTMs are considered. As already mentioned, the EU27's reliance on UK imports is less significant than their reliance on exports to the UK: for the first five sectors in Table 5, imports from the UK represent between 8% and 3% of total European imports in the sector considered. Table 7 shows that Ireland will be the most heavily affected country, as discussed more in details in the following section, since it is the main importer of HS6 products within the beverages and tobacco, the dairy and the bovine meat categories.⁹

⁹ In particular, Ireland is the main importer of cigarettes containing tobacco, water and non-alcoholic beverages n.e.s. (beverages and tobacco sector), milk not concentrated, cheese, fresh cheese and powdered milk and cream (dairy sector). In the bovine meat sector, Ireland import almost one-third of UK exports of boneless, fresh or chilled bovine cuts, and France imports 65% of fresh and chilled lamb carcasses and half carcasses.

Table 4: EU27 exports to the UK in agri-food sectors and faced protection

| SECTOR | TRADE | | PROTECTION | | | |
|--|-------------|---------------|---------------------|---------|----------------------|------------|
| | TRADE VALUE | % of EU TRADE | NTMs (% pre Brexit) | MFN (%) | NTMs (% post Brexit) | PROT. REV. |
| Food products nec | 16,917 | 9.76 | 35.32 | 13.64 | 61.87 | 12,773 |
| Dairy products | 4,095 | 7.59 | 42.32 | 41.05 | 74.14 | 4,717 |
| Meat products nec | 5,849 | 12.92 | 24.61 | 22 | 43.1 | 3,808 |
| Beverages and tobacco products | 7,186 | 9.18 | 14.28 | 13.24 | 25.02 | 2,749 |
| Vegetables fruit nuts | 5,147 | 11.03 | 18.13 | 11.81 | 31.76 | 2,243 |
| Bovine meat products | 1,520 | 8.64 | 24.09 | 55.76 | 42.2 | 1,489 |
| Vegetable oils and fats | 1,688 | 5.85 | 21.68 | 15.23 | 37.98 | 898 |
| Crops nec | 1,933 | 8.41 | 16.58 | 6 | 29.05 | 678 |
| Processed rice | 172 | 13.18 | 93.11 | 23.42 | 163.11 | 320 |
| Bovine cattle, sheep and goats, horses | 488 | 2.55 | 24.59 | 7.48 | 43.08 | 247 |
| Sugar | 490 | 8.7 | 10.98 | 29.67 | 19.24 | 240 |
| Animal products nec | 300 | 6.44 | 6.67 | 57.63 | 11.69 | 208 |
| Cereal grains nec | 419 | 3.7 | 15.67 | 13.27 | 27.45 | 171 |
| Fishing | 636 | 8.35 | 9.92 | 8.35 | 17.38 | 164 |
| Wheat | 178 | 2.33 | 32.33 | 0 | 56.63 | 101 |
| Oil seeds | 477 | 2.85 | 0.01 | 16.91 | 0.02 | 81 |
| Forestry | 155 | 2.95 | 8.41 | 0.38 | 14.73 | 23 |
| Paddy Rice | 50 | 14.51 | 7.57 | 17.44 | 13.26 | 15 |
| Sugar cane sugar beet | 7 | 12.48 | 0.21 | 170.45 | 0.36 | 12 |
| Wool silk worm cocoons | 21 | 8.18 | 0.21 | 0.43 | 0.37 | 0 |

Source: Authors' calculations based on tariffs from MAcMap-HS6, NTMs from Kee et al. (2009) and trade from BACI.

Note: Trade flows are mean values for the period 2013–2015. Current tariff protection is not reported since it does not apply. The AVEs of the MFN tariffs refer to 2013. Two NTM values are reported, present AVE and projected AVE in the absence of a specific trade agreement when the UK leaves the EU.

Table 5: EU27 imports from the UK in agri-food sectors and faced protection

| SECTOR | TRADE | | PROTECTION | | | |
|--------------------------------------|-------------|---------------|---------------------|---------|----------------------|------------|
| | TRADE VALUE | % of EU TRADE | NTMs (% pre Brexit) | MFN (%) | NTMs (% post Brexit) | PROT. REV. |
| Food products nec | 6,806 | 4.37 | 34.73 | 11.8 | 60.84 | 4,944 |
| Dairy products | 1,564 | 4.08 | 47.78 | 42.53 | 83.7 | 1,974 |
| Bovine meat products | 1,165 | 6.86 | 26.41 | 50.54 | 46.27 | 1,127 |
| Meat products nec | 1,234 | 3.63 | 32.94 | 21.09 | 57.7 | 972 |
| Beverages and tobacco products | 4,176 | 8.86 | 9.2 | 4.22 | 16.12 | 849 |
| Sugar | 303 | 4.69 | 28.88 | 66.88 | 50.58 | 355 |
| Vegetable oils and fats | 487 | 1.18 | 27.89 | 7.8 | 48.86 | 276 |
| Vegetables fruit nuts | 600 | 1.09 | 16.48 | 8.44 | 28.88 | 224 |
| Fishing | 848 | 7.53 | 9.78 | 6.85 | 17.13 | 203 |
| Bovine cattle sheep and goats horses | 348 | 9.19 | 28.24 | 5.74 | 49.47 | 192 |
| Animal products nec | 503 | 3.00 | 15.78 | 2.98 | 27.65 | 154 |
| Crops nec | 374 | 2.05 | 19.12 | 32.48 | 33.49 | 143 |
| Cereal grains nec | 214 | 1.04 | 11.41 | 4.8 | 19.99 | 112 |
| Processed rice | 41 | 2.44 | 94.63 | 23.89 | 165.77 | 77 |
| Oil seeds | 256 | 1.52 | 16.45 | 0 | 28.81 | 74 |
| Wheat | 179 | 2.14 | 0.98 | 18.61 | 1.72 | 36 |
| Forestry | 89 | 1.45 | 13.21 | 0.12 | 23.14 | 21 |
| Paddy Rice | 9 | 1.42 | 21.42 | 38.35 | 37.52 | 7 |
| Sugar cane sugar beet | 2 | 4.52 | 4.03 | 128.61 | 7.06 | 3 |
| Wool silk worm cocoons | 19 | 2.74 | 9.18 | 0.28 | 16.08 | 3 |

Source: Authors' calculations based on tariffs from MACMap-HS6, NTMs from Kee et al. (2009) and trade from BACI.

Note: Trade flows are mean values for the period 2013–2015. Current tariff protection is not reported since it does not apply. The AVEs of the MFN tariffs refer to 2013. Two NTM values are reported, present AVE and projected AVE in the absence of a specific trade agreement when the UK leaves the EU.

2.3.2. Main European trading countries: France, Netherlands and the particular case of Ireland

If we consider total trade rather than just agri-food, the European countries that trade the most with the UK, and which will be most affected by Brexit, are Germany, the Netherlands and France. These countries' bilateral trade with the UK represents 50% of total EU27 bilateral exchanges. This ranking is unchanged if we consider exports and imports separately.

Ireland is in a particular position as noted above. Ireland is ranked fifth behind Belgium, as a European trading partner of the UK. Ireland's exports to the UK represent some USD 19 billion a year, and it is the seventh European exporter to UK by value, representing around 5% of European exports. In terms of imports, Ireland is more important: it is the fourth most important importer by value (USD 23.4 bn.) and its weight in European imports is larger (11%) than for exports. What is striking is the share of these flows in Ireland's total trade flows: Irish exports to the UK represents 13% of Ireland's total exports (compared to around 4% for the main European exporters to the UK), and 31% of Irish imports come from the UK. In the light of the important role of the UK as a destination market and as a source of imports, the impact of Brexit on Irish trade and the Irish economy will likely be very large.

When considering only **agri-food trade** (see Table 6 and Table 7), **France and the Netherlands are the main UK partners**, and **Ireland** replaces Germany in the top three by bilateral trade value. The three main partners account for half of UK imports and exports in the agri-food sectors. Again, trade with the UK is highly important for Ireland, especially imports: 27% of Ireland's European imports are from the UK, and represent 46% of total Irish agri-food imports (compared to 4% on average for other European countries). However, although Irish exports represent 15% of European agri-food exports to UK, they account for less than 5% of total Irish agri-food imports which, nevertheless, is higher than other European countries.

Combining country and sector details does not introduce different sectors in the list of top traded goods: the main importers and exporters trade mainly in processed food, dairy and meat products, and beverages and tobacco. The pattern at country level is in line with the pattern in Table 5: trade in dairy and meat products frequently follows trade in beverages for value although the former are likely to be more affected by high protection.

Table 6: EU27 exports to the UK in agri-food sectors and faced protection, by country (top ten, by protection revenue)

| COUNTRY | TRADE | | | PROTECTION | | |
|-------------|-------------|---------------|---|---------------------|-------|-----------------------|
| | TRADE VALUE | % of EU TRADE | % of total agri. exports of the country | NTMs (% pre Brexit) | MFN | NTMs (% after Brexit) |
| Netherlands | 9,519 | 20.12 | 1.89 | 26.54 | 17.84 | 46.5 |
| Ireland | 6,903 | 14.59 | 4.58 | 28.2 | 20.6 | 49.41 |
| France | 6,971 | 14.74 | 1.23 | 23.91 | 17.3 | 41.89 |
| Germany | 5,860 | 12.39 | 0.43 | 28.75 | 19.33 | 50.37 |
| Belgium | 3,602 | 7.62 | 0.95 | 32 | 16.97 | 56.06 |
| Italy | 3,807 | 8.05 | 0.77 | 28.27 | 16.63 | 49.53 |
| Spain | 4,051 | 8.56 | 1.35 | 19 | 18.08 | 33.28 |
| Poland | 1,801 | 3.81 | 0.89 | 28.19 | 21.33 | 49.38 |
| Denmark | 1,843 | 3.9 | 1.85 | 22.3 | 20.53 | 39.06 |
| Portugal | 437 | 0.92 | 0.69 | 23.6 | 18.48 | 41.35 |

Source: Authors' calculations based on tariffs from MACMap-HS6, NTMs from Kee et al. (2009) and trade from BACI.

Note: Trade flows are mean values for the period 2013–2015. Current tariff protection is not reported since it does not apply. The AVEs of the MFN tariffs refer to 2013. Two NTM values are reported, present AVE and projected AVE in the absence of a specific trade agreement when the UK leaves the EU.

Table 7: EU27 imports from the UK in agri-food sectors and faced protection, by country (top ten, by protection revenue)

| COUNTRY | TRADE | | | PROTECTION | | |
|-------------|-------------|---------------|---|---------------------|------|-----------------------|
| | TRADE VALUE | % of EU TRADE | % of total agri. exports of the country | NTMs (% pre Brexit) | MFN | NTMs (% after Brexit) |
| Ireland | 4796 | 26.71 | 46.01 | 23.68 | 14.2 | 41.47 |
| France | 2578 | 14.36 | 4.59 | 25.81 | 14.2 | 45.22 |
| Netherlands | 2462 | 13.72 | 3.81 | 21.57 | 14.2 | 37.78 |
| Germany | 1878 | 10.46 | 2.03 | 23.83 | 14.2 | 41.75 |
| Spain | 1236 | 6.89 | 3.82 | 21.93 | 14.2 | 38.42 |
| Belgium | 1086 | 6.05 | 2.68 | 21.68 | 14.2 | 37.98 |
| Italy | 745 | 4.15 | 1.57 | 24.44 | 14.2 | 42.81 |
| Sweden | 519 | 2.89 | 3.99 | 19.38 | 14.2 | 33.94 |
| Denmark | 470 | 2.62 | 3.82 | 20.79 | 14.2 | 36.42 |
| Poland | 478 | 2.66 | 2.64 | 17.17 | 14.2 | 30.08 |

Source: Authors' calculations based on tariffs from MACMap-HS6, NTMs from Kee et al. (2009) and trade from BACI.

Note: Trade flows are mean values for the period 2013–2015. Current tariff protection is not reported since it does not apply. The AVEs of the MFN tariffs refer to 2013. Two NTM values are reported, present AVE and projected AVE in the absence of a specific trade agreement when the UK leaves the EU.

2.3.3. High integration of agri-food value chains through trade

The **value chains of UK and EU27 agri-food sectors are highly integrated**; for instance, almost half of the value-added in UK's food exports that is generated outside the UK, is produced in the EU27, amounting to 12.58% of total exported value-added (Table 9). Due to the difference in the size of the UK and the EU27, the UK's share in European agricultural and agri-food exported value added is lower (1.45% for agriculture, and 2.11% for food in 2011, see Table 8) than the EU27 in the UK's exported value added (10.53% for agriculture and 12.58% for food, see Table 9).

The UK's share of value added is slightly higher in European exports of food, beverages and tobacco than of agricultural products since agricultural production is less dependent on inputs than manufacturing.

The intensity of the linkages with UK varies across EU countries (Table 8). The UK accounts for a high share of Ireland's export value-added (particularly in relation to the agricultural sector – 11.58%), followed by the Netherlands (2.37%), Denmark (2.24%) and Belgium (2.06%). Ireland is also a particular case when considering the evolution in time of the share of value added generated by the UK which is included in its exports: during 2000-2011, Ireland's dependence on imports from the UK's agricultural sector increased (its dependence on agri-food sector decreased slightly) from 8% to 12%, while the dependence of other EU27 countries remained almost constant.

The share of EU27 value added in UK exports is large and increased significantly between 2000 and 2011, evidence of further integration of UK agricultural and agri-food production with EU members (Table 9). These linkages are particularly important with Germany, France and Netherlands, in the case of both agriculture and food products

Table 8: UK value-added in EU27 exports (% of gross export of EU27 countries)

| EXPORTING COUNTRY | AGRICULTURE, HUNTING, FORESTRY AND FISHING | | FOOD PRODUCTS, BEVERAGES AND TOBACCO | |
|--------------------|--|--------------|--------------------------------------|--------------|
| | 2000 | 2011 | 2000 | 2011 |
| EU 27 | 1.42% | 1.45% | 2.09% | 2.11% |
| <i>Netherlands</i> | 2.13% | 2.37% | 2.65% | 2.44% |
| <i>France</i> | 1.34% | 1.16% | 1.47% | 1.36% |
| <i>Spain</i> | 1.07% | 1.19% | 1.76% | 1.90% |
| <i>Germany</i> | 1.09% | 1.42% | 1.16% | 1.41% |
| <i>Ireland</i> | 7.97% | 11.58% | 9.33% | 8.81% |
| <i>Denmark</i> | 1.39% | 2.24% | 1.71% | 2.70% |
| <i>Belgium</i> | 2.30% | 2.06% | 2.80% | 2.10% |
| <i>Italy</i> | 0.49% | 0.58% | 0.94% | 0.82% |
| <i>Hungary</i> | 0.75% | 0.92% | 0.61% | 0.98% |
| <i>Sweden</i> | 1.49% | 1.20% | 1.92% | 1.65% |

Source: OECD-WTO, Trade in Value Added database (2016).

Note: EU27 countries are ranked by the value of their imports from UK, in 2011.

Table 9: Breakdown of the value-added contained in exports of the UK, by origin

| | AGRICULTURE, HUNTING, FORESTRY AND FISHING | | FOOD PRODUCTS, BEVERAGES AND TOBACCO | |
|--------------------|--|----------------------|--------------------------------------|----------------------|
| | 2000 | 2011 | 2000 | 2011 |
| Domestic | 85.32% | 75.98% | 83.05% | 73.70% |
| Foreign | 14.68% | 24.02% | 16.95% | 26.30% |
| <i>EU27</i> | <i>7.33%</i> | <i>10.53%</i> | <i>8.73%</i> | <i>12.58%</i> |
| <i>Germany</i> | 1.42% | 2.09% | 1.61% | 2.52% |
| <i>Netherlands</i> | 1.01% | 1.51% | 1.25% | 1.65% |
| <i>France</i> | 1.44% | 1.48% | 1.63% | 1.75% |
| <i>Spain</i> | 0.58% | 1.02% | 0.75% | 1.25% |
| <i>Ireland</i> | 0.54% | 0.87% | 0.61% | 1.11% |
| <i>Italy</i> | 0.68% | 0.83% | 0.83% | 1.07% |
| <i>Belgium</i> | 0.44% | 0.51% | 0.49% | 0.57% |
| <i>Sweden</i> | 0.30% | 0.46% | 0.36% | 0.46% |
| <i>Denmark</i> | 0.21% | 0.39% | 0.30% | 0.47% |
| <i>Poland</i> | 0.06% | 0.36% | 0.07% | 0.46% |
| <i>rest of EU</i> | 0.64% | 1.01% | 0.84% | 1.27% |

Source: OECD-WTO, Trade in Value Added database (2016).

Note: EU27 countries are ranked by the value of their exports to UK, in 2011.

3. MODEL AND SCENARIOS

SUMMARY OF SCENARIOS FOR BREXIT

Return to WTO rules and sensitivity analysis

The scenarios in this report include:

- “WTO”: Tariffs between the UK and the EU, and between the UK and Turkey, are increased up to their MFN levels. Trade restrictiveness of NTMs is increased at these borders.
- “WTO (Ireland NTM)”: In addition to “WTO” assumptions, this scenario considers that trade between Ireland and the EU is subject to additional friction, in particular because of the disruption caused by transport routes passing through the UK.
- “WTO (Tariff only)”: This scenario considers only the increase in bilateral tariffs (and not the trade restrictiveness of NTMs) up to the MFN level between the UK and EU, and between the UK and Turkey.

3.1. Modelling framework

The results presented in this impact assessment are based on the MIRAGE model¹⁰, a recursive-dynamic computable general equilibrium model designed for trade policy analysis (Bchir et al., 2002; Decreux and Valin, 2007; Fontagné et al., 2013). The model is shortly described in Annex B and a more thorough documentation is available online.¹¹

The MIRAGE model is flexible and can be tailored to different policy questions. In the present case, we **model the agricultural sectors in as much detail as possible**. We include 31 distinct sectors (19 agri-food industries, 14 manufacturing sectors and 8 services sectors) and 35 geographical areas. The EU is split into 11 countries or country groups (Belgium and Luxembourg, France, Germany, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, Rest of EU27), the UK and Turkey are treated as separate, and the rest of the world is aggregated on a regional basis. Details are provided in Annex B.

3.2. Scenarios

3.2.1. The WTO scenario

A return to WTO rules for EU-UK trade means a return to the MFN tariff rate but is likely also to influence the trade restrictiveness of NTMs. Therefore, for the WTO scenario we assume:

- **Tariff rates** between the UK and EU, and between the UK and Turkey, are set at their **MFN values** (see Appendix A for details on data).¹²
- **Trade restrictiveness of NTMs** increases for EU-UK and Turkey-UK trade with the result that the **UK loses two-thirds of its preferential access** to the single

¹⁰ The version used in this study is MIRAGE-e version 1.0.4. Environment and energy specific features are not considered in this exercise.

¹¹ <http://www.mirage-model.eu>

¹² Molinuevo (2017) analyzes the legal implications of the UK’s withdrawal from the EU for third countries. The consequences for bilateral trade agreements are highly uncertain, in many cases requiring amendments to continue to cover trade with the UK. However, there is more certainty in the case of the few bilateral agreements referring only to goods: since they fall within EU exclusive competences, they were negotiated only by the EU, and will cease to apply to the UK on its withdrawal from the EU. The most significant such agreement, on the basis of which we make our assumption for the scenarios, is the agreement with Turkey. In this case, we consider a return to MFN tariffs. Bilateral investment treaties fall into a different category and probably will remain valid also for UK.

market.¹³ In agri-food sectors, this could result, for instance, from the introduction of different conformity procedures on both sides of the Channel, or divergence in the regulations on substances authorized for inclusion in food products.

While tariffs could be increased in the year that Brexit comes into effect (2019 in our simulations), the increase in the trade restrictiveness of NTMs is likely to be gradual: on day 1 after Brexit, all rules in the UK will remain the same as in the EU, and divergences will emerge only in succeeding years as Great Britain and EU27 implement new regulations. A time frame for this is difficult to predict. As a consequence, we introduce tariffs and NTM shocks in 2021, and observe their outcome in 2030. The results for the final year of the analysis should be interpreted as **long-term outcomes**, after all adjustments have taken place, independent of the time horizon, and **with no adjustment cost** other than the slow adaptation of capital location. In particular, displacement of workers from one sector to the other happens at zero cost.

As already mentioned, the only two changes we consider after Brexit are related to tariffs and NTMs. First, this implies that trade policy elements other than tariffs and NTMs are not modified in our scenarios. In particular, we make no assumptions about tariff rate quotas, meaning that there is no reallocation of import or export quotas presently allocated to UK among other EU members, for example.¹⁴ The evolution of these TRQs is important for exporters, particularly in the agri-food sectors but is highly uncertain and may require negotiations with trade partners other than the UK. We do not consider any agreement that the UK or the EU might negotiate between them, or with third parties. Second, the Common Agricultural Policy and other public policies apart from trade policy, are assumed to remain constant at their present level in the UK and the EU.¹⁵ Again, we do not consider any policy that might mitigate the negative impacts we identify (Section 1 refers to analyses available in the literature on possible mitigating policies).

3.2.2. Alternative specifications and sensitivity analysis

NTMs and the amount they might increase by as a consequence of Brexit, are taken from the literature and are subject to discussion. To cope with this uncertainty, we implemented two sensitivity scenarios. The outcome of these scenarios is not discussed in detail here. However, the results which differ from those from the central scenario are useful to highlight the implications of some of the assumptions we make. The two sensitivity analyses are:

- **WTO (Tariff Only):** In this scenario, only the tariffs increase, up to their MFN level taken from the MACMap-HS6 database (see Tables in Section 2.3). The NTMs do not change compared to the BAU case. This scenario depicts the role played by NTMs (and the value of their estimated trade restrictiveness).
- **WTO (Ireland NTM):** As mentioned above, Ireland's trade with the UK follows a specific pattern for several reasons which include geographical proximity. Matthews (2017) suggests that a decrease in trade with the UK would imply higher transport costs for Ireland, with cargoes not fully loaded in both directions, for instance. To account for these specificities, we consider an additional simple scenario similar to the WTO scenario but where Ireland is assumed to face higher AVE for NTMs when trading with the EU. That is, the increase in NTMs will be equal to half of the increase incurred by the UK.

¹³ This assumption is sourced from the literature, e.g. in Ottaviano et al. (2014) or Dhingra et al. (2016a, 2016b). Our approach however differs from these studies in the way we calibrate initial NTMs trade restrictiveness, as detailed in Annex B.

¹⁴ More specifically, we assume that TRQs that were not binding in 2013 remain non-binding for both the EU and UK, and binding TRQs remain binding for both the UK and EU.

¹⁵ In other words, we assume that after Brexit, the UK (and the EU27) will continue to grant the same subsidies and impose the same constraints as currently.

4. IMPACTS OF A WTO SCENARIO ON THE AGRI-FOOD SECTOR IN THE EUROPEAN UNION

KEY FINDINGS

- A return to WTO rules would imply **significantly less agri-food trade** between the EU and UK in both directions (around -62%). Some EU exports almost **completely collapse**, like those of Rice, White meat, Sugar, Dairy and Red meat (more than -90% in trade).
- **Ireland, the Netherlands and France** are the EU27 countries that lose the most in terms of trade.
- Brexit also implies **more room for EU27 products** on their domestic markets and other EU27 markets – replacing UK products. Nevertheless, this effect **fails to compensate** the incurred losses in value-added (see footnote 16 for details on value-added), **with the exception of a few sectors**, such as Red meat and Cattle in France, or Sugar and Wheat in Spain, in which value-added increases.
- Brexit could be an opportunity for the UK's agri-food sectors as a whole.
- Excepted in Ireland, **consumers are hardly affected** by changes in overall consumption prices or economic activity.

To present and discuss the simulation results, this report focuses first on the most direct impacts of Brexit, namely the changes to bilateral trade between the EU27 and the UK, and then studies the more aggregate or indirect impacts (e.g., on total EU27 agri-food value added or gross domestic product). The following tables and figures may include the results of the three scenarios described above but only the WTO scenario is discussed in detail in the text; the other two are cited when highlighting original elements. Most results are presented in percentage deviation from the BAU scenario, in 2030, both in percentage change and in volumes. The variations in volume are actually measured in constant 2011 USD, i.e. at the prices of the initial year.

4.1. A large decrease in EU27-UK agri-food trade flows unevenly distributed across sectors and EU27 countries

4.1.1. Strong decrease in EU27 exports to UK, compensated by exports to other countries only in a few sectors

As expected, the direct effect of applying WTO rules to European **agri-food exports to the UK is large and negative**, as shown in Figure 1. These exports decrease by -62% (which corresponds to USD -33.7 billion - see Table C.1 in Annex C). Depending on the value of MFN and trade restrictiveness of NTMs, impacts vary widely across sectors, from almost unaffected sectors (Fiber crops, Wool, Forestry) to the **near complete collapse of trade flows for Rice, White meat, Sugar, Dairy and Red meat**, which decrease by more than 90%. The most affected sectors are also the most traded in the BAU, leading to a loss of trade in volume by **USD -470 million for White meat, Dairy, Red meat, Sugar and Rice** taken together. The least traded sectors before Brexit are the least affected, and their decrease represents a loss in volume more than ten times smaller at USD -34 million for Fiber crops, Wool and Forestry combined. This result is in line with Lawless and Morgenroth (2016) who

find similar decreases in EU27 exports to the UK for Sugar, Meat and Dairy. Finally, the largest decrease in volume concerns Other foods (which consists mainly of dog and cat food, Pastry and Orange juice).

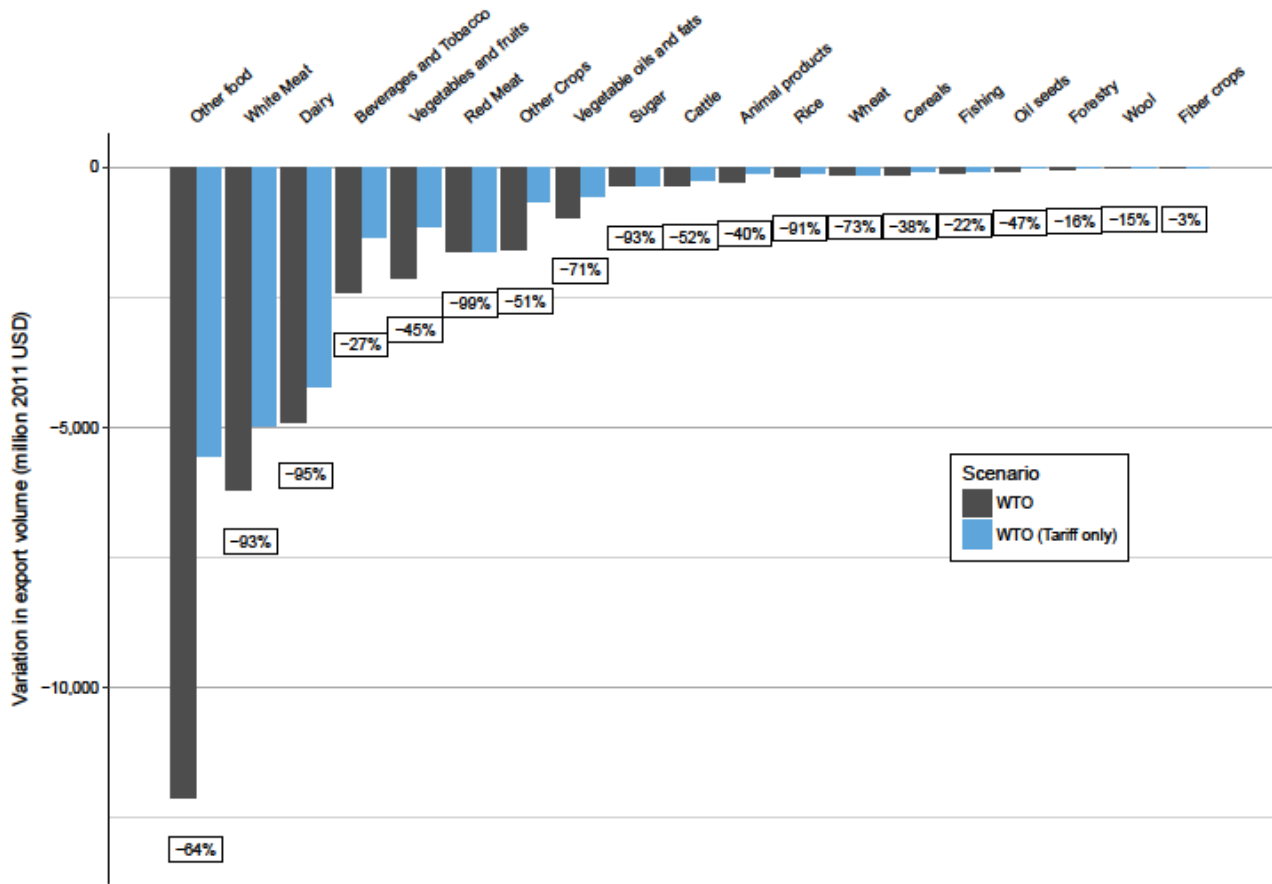
In terms of magnitude, it is important to note that **if only tariffs increase** (WTO (Tariff only) scenario), **the impacts of Brexit on EU27-UK trade will be almost halved** but the ranking of the sectors at risk remains similar to the ranking in the WTO scenario. **A notable exception is Red meat** (and to a lesser extent Sugar and Dairy products), for which a tariff-only scenario has almost the same impact as the WTO scenario. This underlines that in these compared to other sectors, protection comes mainly from the MFN tariff, not NTMs.

These direct impacts on European agri-food exports to UK are **mitigated by increased exports towards all other trade partners** (see Table C.1 in Annex C). EU27 products tend to replace former UK exports to the EU27 and to the rest of the World. Indeed, **Great Britain will suffer a loss of competitiveness** since its imported inputs, which for the most part come from the EU27, become more expensive (UK production prices increase, as already mentioned in Donnellan and Hanrahan, 2016 and depicted in Table 10) ; while at the same time the decreasing UK demand for EU27 goods make some of their prices decrease. However, **increased exports to countries other than the UK** are not of the same order of magnitude as EU27-UK trade flows, and **fail to compensate for the export losses** incurred by the EU27 after Brexit.

At the sector level, **two effects will compete**, especially in relation to intra-EU27 trade. On the one hand, as noted above, EU27 **exports become more competitive** than UK goods, and EU27 countries tend to gain market shares in destination countries (other than the UK). On the other hand, a general equilibrium effect is at play: as described below, on average, EU27 **countries become slightly poorer** after Brexit, resulting in decreased overall consumption including in intra-EU27 goods. While the first effect dominates in the majority of sectors (i.e., exports to the EU27 and to the rest of the world increase), for Animal products, Cereals, Forestry, the second effect is larger (intra-EU27 exports decrease). This reverse tendency can be explained by the conjunction of two factors: these goods are at the same time not much exported by the UK and less substitutable between origins, leaving no room for trade deviations to the benefit of EU27 countries.

At the global level, **trade decreases in the majority of sectors**, with only a few increasing their exports (Wheat, Forestry, Fiber crops, Wool). Finally, recall that agri-food sectors represent only a small share of EU27 exports. Thus, the impacts are greater on manufacturing and services, especially in terms of volume.

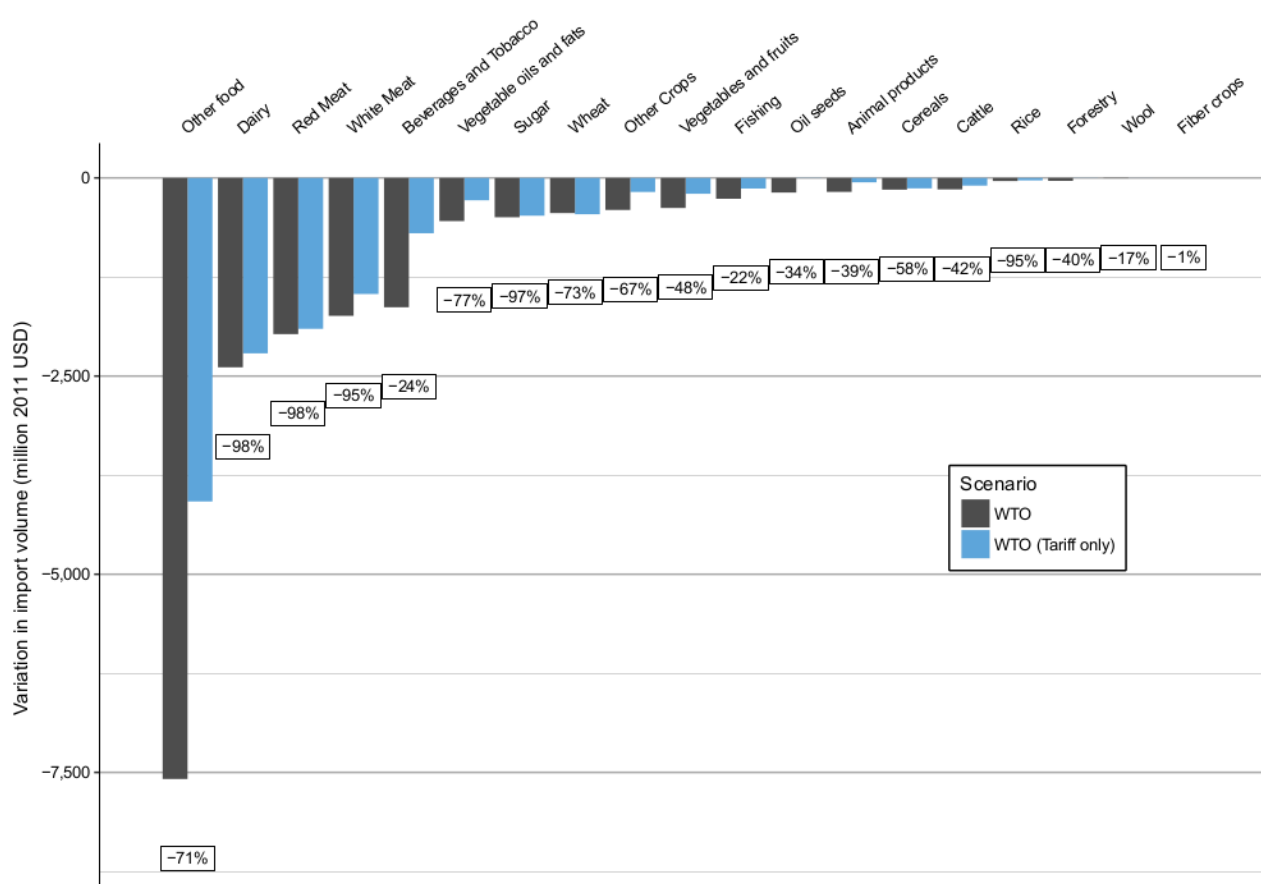
Figure 1: Variations in EU27 export volume to the UK, by sector, 2030



Source: Authors' calculations using MIRAGE-e. Percentage changes indicated in boxes relate to the WTO scenario only.

4.1.2. EU27 agri-food imports from the UK: same mechanisms as for imports

The mechanisms at play on EU27 imports from the UK are about the same as for exports. The level of the MFN tariff is the same for both sides at the HS-6 level, and the trade-restrictiveness of NTMs varies very little. **In value, the impacts are smaller**, as shown in Figure 2, because the UK is not a major exporter of agri-food products. However, the **percentage change in trade is comparable**, as are the sector rankings. It should be stressed that the UK is more specialized in Red meat exports than the rest of the EU27, and this sector is one of those that faces the largest percentage decrease due to large MFN tariffs and NTMs, hence making the **UK proportionally more vulnerable**.

Figure 2: Variations in aggregate EU27 imports volume from the UK, by sector, 2030

Source: Authors calculations using MIRAGE-e. Variations with respect to the BAU scenario. Percentage changes indicated in boxes refer to the WTO scenario.

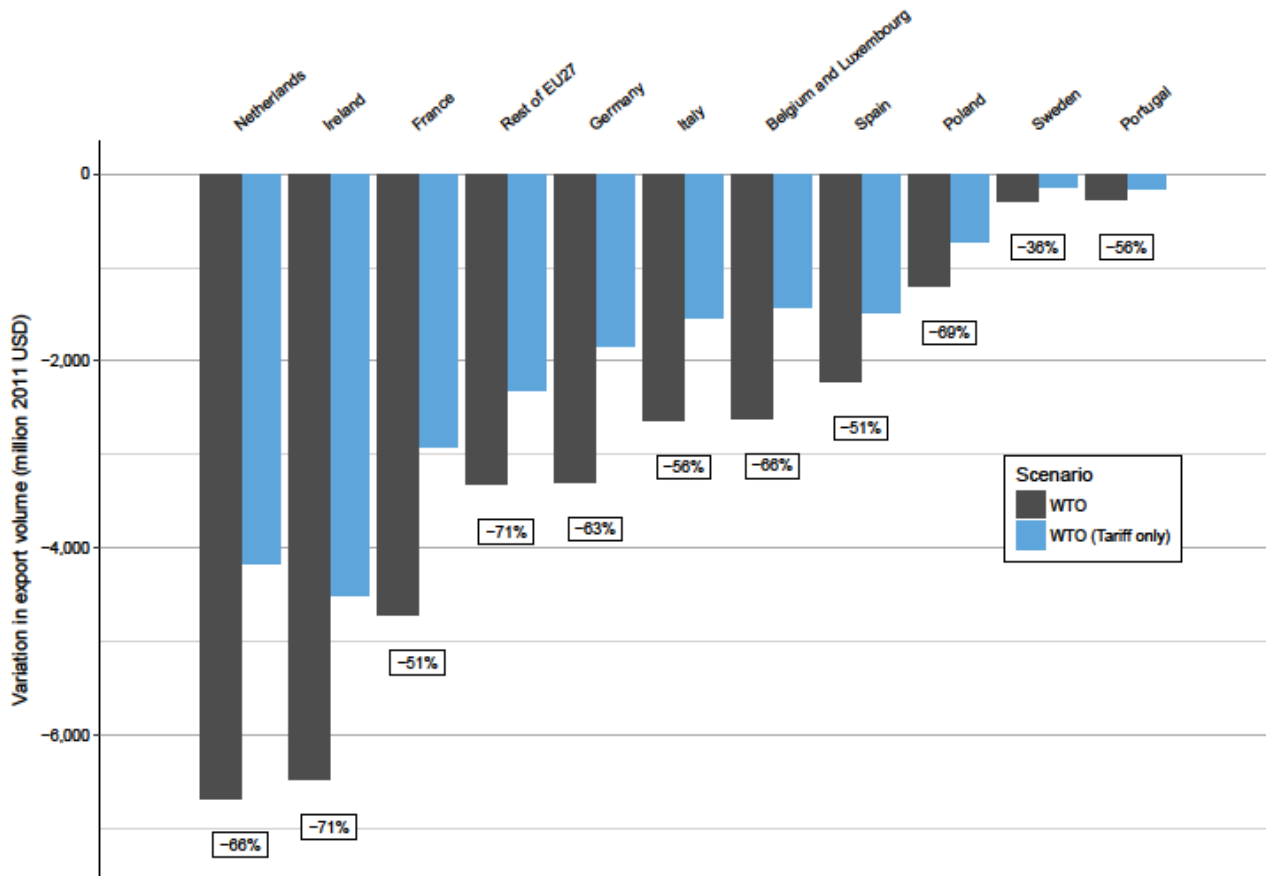
4.1.3. Most impacted EU27 exporters: the Netherlands, France and Ireland

Country and region-level impacts, depicted in Figure 3, are driven by the level of initial trade and the export specialization of EU27 countries in their agri-food trade with the UK. **The most affected countries by volume are the Netherlands, Ireland and France**; the least impacted are Sweden and Portugal. This ranking corresponds to the initial trade integration with the UK: unsurprisingly, the most (resp. least) impacted countries are those with the closest (resp. loosest) ties with the UK in the agri-food sectors. In terms of volume, the largest decreases in exports are experienced by the largest exporters to the UK. The variation in relative impacts (percentage) is more heterogeneous across countries: EU27 countries having exports concentrated in sectors with the largest tariff and NTM increases, such as **Ireland or Poland** (see Table 6), **face a very significant decrease** in their exports (around 70%). On the contrary, countries like **Spain or France face lower additional barriers** on the UK market due to their specialization, their trade flows decrease by around 50%. This result echoes the findings in Lawless and Morgenroth (2016) and Davis et al. (2017); these authors show that the significant concentration of Irish exports to and imports from the UK in a small number of products with potentially high protection, makes Ireland the most affected country in terms of trade.

The most affected sectors in each EU27 region, i.e., those with the largest variations in export volume, are presented in Table C.2 in Annex C. Similar to the EU27 aggregation, each and every trade flow towards the UK decreases with Brexit. **The biggest impacts** are observed either because the **sector was heavily traded** so that even a small percentage decrease

leads to high losses in volume, for instance, **Beverages and Tobacco from France** (only 16% decrease in exports but corresponding to USD 0.5 billion); or because the sector was not heavily traded but the **trade flow almost disappears**, e.g., in the case of **White meat exports from Germany** which were worth USD 0.5 billion and decrease by 91%.

Figure 3: Variations in EU27 agri-food exports to the UK, by country, 2030



Source: Authors calculations using MIRAGE-e. Variations with respect to the BAU scenario. Percentage changes indicated in boxes refer to the WTO scenario.

4.2. Agri-food value-added decreases within the EU27, though exposure of countries is heterogeneous

The economic situation in the agri-food sectors is determined only partially by trade. **Domestic demand plays a significant role**, in particular because domestic production is often consumed mostly locally with only a small share traded. This section examines agri-food value-added and the sources of its variation.¹⁶

¹⁶ Formally, value-added gathers payments to production factors, in the agri-food sectors in our case. In our modeling framework it is equivalent to consider value-added or production because they are proportional. However, magnitude in value-added represents more the contribution of each sector to GDP and the potential impacts on consumers' revenues.

4.2.1. **Agri-food value-added in the EU27: large negative impact in Ireland, very limited in other EU27 countries**

In terms of value-added in the agri-food sectors, **Ireland is the most negatively affected** European country by Brexit, with a decrease of 16.3% in value added (see Figure 4). This can be explained by the large share of **Ireland's production that is exported to the UK**, and the **high level of dependence of Ireland on intermediates imported from the UK** (see Table 8) which is highlighted also in Matthews (2015, 2017). In contrast, the agri-food sectors in the Netherlands and France are less integrated with UK production; thus, despite the large variations in agri-food exports depicted in Figure 3 (-66% and -51.4% respectively), value-added in agri-food sectors decreases by a lower order of magnitude, i.e., by 2.7% and 0.3% respectively for these countries.

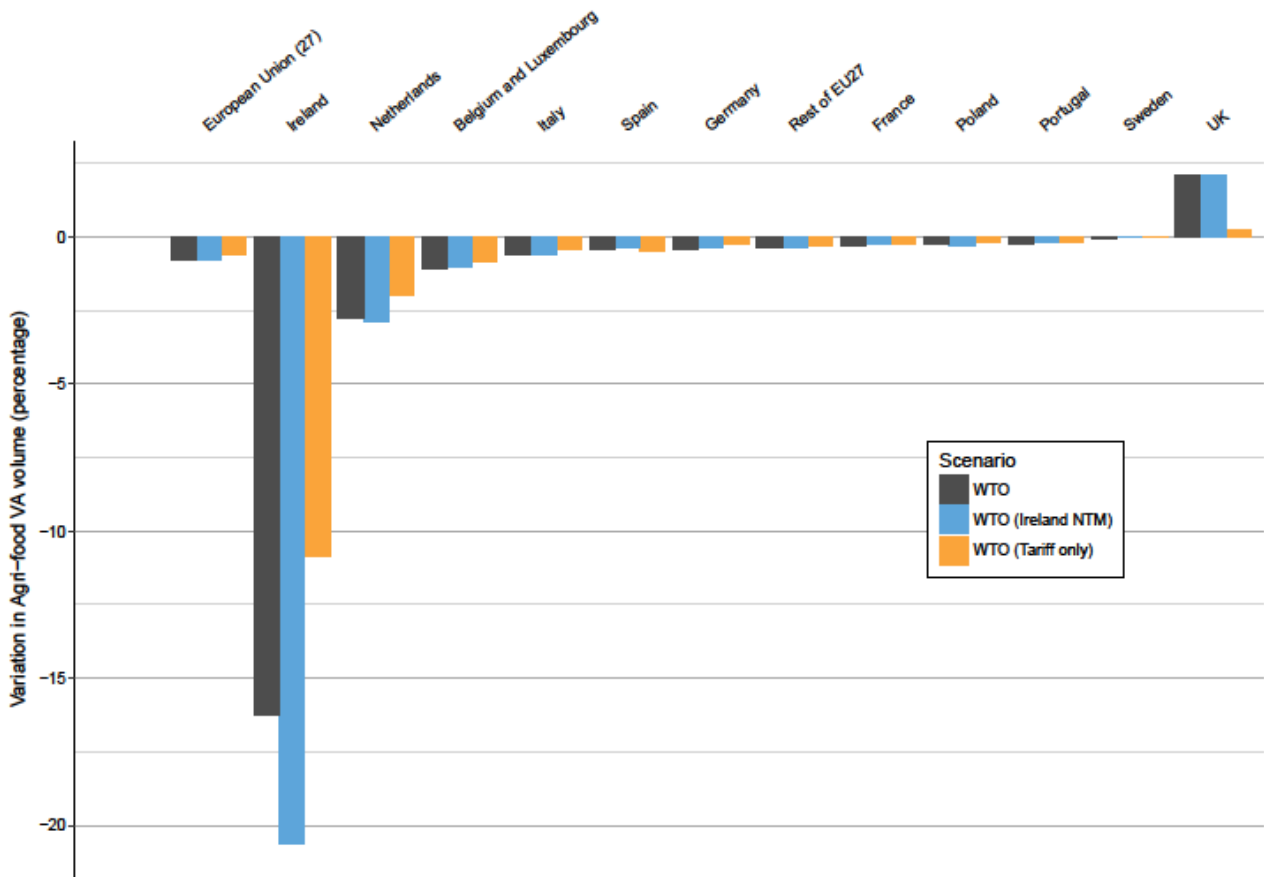
The case of the UK is worthy of mention because **Brexit would cause British agri-food value-added to increase by 2.1%**. The UK's imports from the EU27 will be replaced by domestic production more than by imports from other countries, anyway at the expense of consumers who face higher prices in both cases (domestic or imported), as discussed below. These results hide large heterogeneity among the sectors within each country. Table C.3 in Annex C summarizes the variations in value-added for each country for overall agri-food production, and for the five most affected (positive or negative impact on volume) sectors.

Other food seems systematically to be the most negatively affected sector with other sectors at risk varying from one EU27 country to another. **In Ireland, Dairy and Cattle are the sectors most at risk** (after Other food), and the reduction in their value-added is highly significant compared to the initial size of these sectors (-45% and -26% respectively).¹⁷ In other countries, the magnitude of the impacts is lower compared to the sector size: **White meat and Other crops are the most affected sectors in the Netherlands**, as are **White meat and Dairy for the rest of the EU27, Vegetables and fruits and Dairy in Italy**, and **Dairy in France**.

However, **a return to WTO rules with Great Britain could represent an opportunity** for those sectors where production replaces former imports from the UK, in their domestic markets and/or in other EU27 markets. This applies particularly to **Red meat, Wheat and Cattle in France**, and **Wheat and Sugar in Spain**. These results are to be discussed in more detail below.

¹⁷ Although taken from a global model not focused specifically on Ireland, this result is in line with the conclusions in Donnellan and Hanrahan (2016) which specifically estimates the impact of Brexit on Irish agriculture.

Figure 4: Variations in total agri-food value-added by EU27 country and UK, 2030



Source: Authors calculations using MIRAGE-e.

4.2.2. Decomposition of the impacts on value-added in the EU27: losses from the Brexit are only partly compensated by exports to other countries

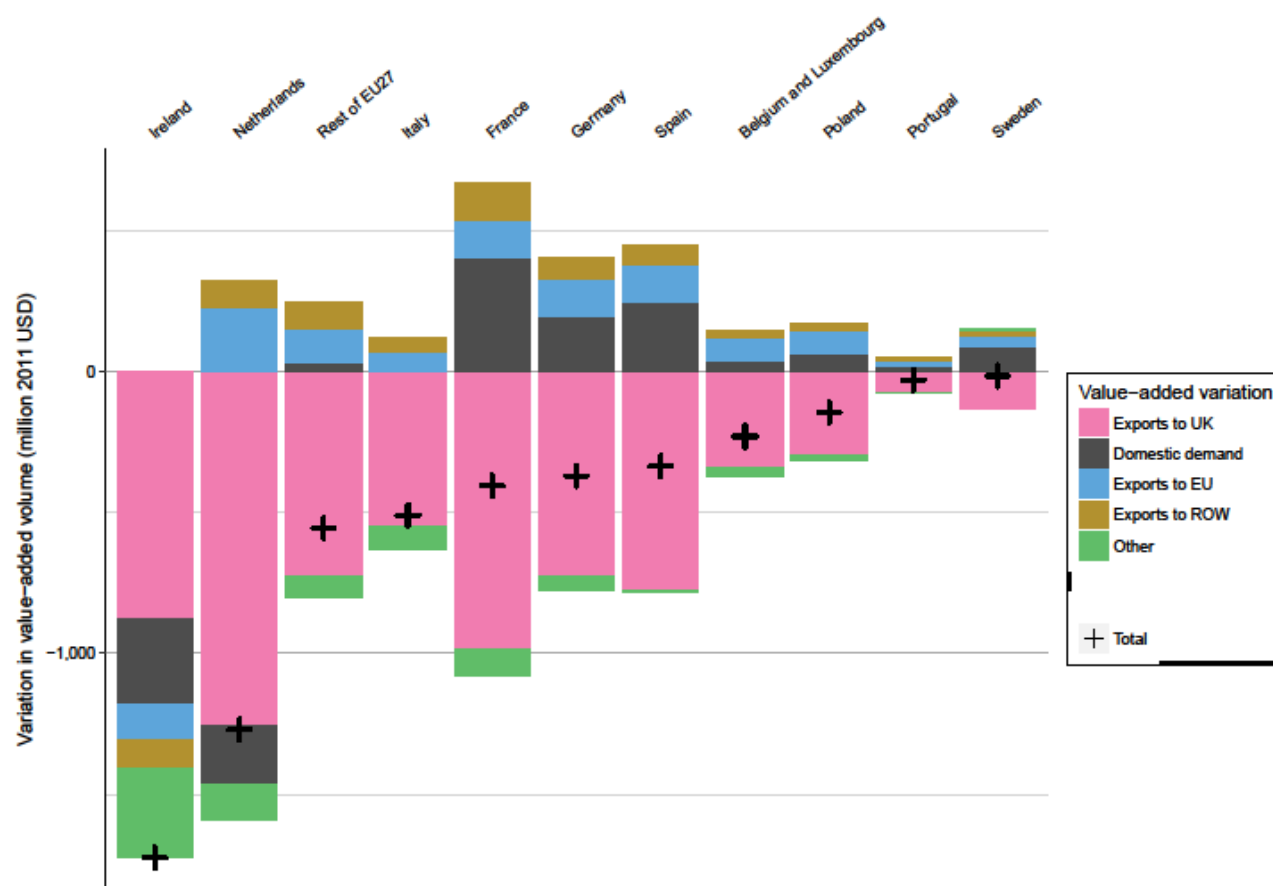
There are three sources of variation in sector value-added within the EU27: first, the volume of **exports lost on the UK market**; the volume of **exports gained on other EU27 markets** and **other foreign markets**, but more marginally, (see above); and more significantly the ability of a given sector, in a given country, to replace UK imports with **domestic supply**. Figure 5 presents an accounting decomposition of the variation in value-added by source of variation, separating out the value-added used to satisfy domestic demand, and exports to the UK, EU27 and the rest of the world, and other sources.¹⁸

For every country, **value-added losses are driven by the direct effect** of decreased exports to the UK. **Ireland and the Netherlands** are the countries where agricultural value added will decrease the most, respectively by 16.3% and 2.7%. In addition, these two countries experience also a pattern which is different from other EU27 countries. **Ireland** is the only country where WTO rules would imply **loss of exports to both the EU27 and the rest of the world** and this is due to Ireland’s dependency on intermediates from the UK, which implies loss of competitiveness in all export markets. In the Netherlands, exports to the EU27 increase on average although not supply to the domestic market. For other EU27

¹⁸ In our case, trade restrictiveness of NTMs is represented as an iceberg cost. Iceberg costs imply that part of the production is lost in the trade process. Therefore, increasing trade protection has some particular impacts on production, since new trade barriers are partially paid by production. This effect is added to the more classical price increase due to tariffs.

members, **exports to non-UK partners will help to mitigate the losses** from the direct effect of Brexit but will **not compensate for it completely**. Interestingly, France, Spain and Germany are the countries where losses in exports to the UK are compensated the most by exports to other EU27 markets and domestic demand.

Figure 5: Variations in agri-food value-added volume and decomposition by source in the WTO scenario, 2030



Source: Authors calculations using MIRAGE-e.

These results for EU27 agri-food value-added are in fact the aggregation of the different sectors. The last five columns in Table C.3 in Annex C present the same decomposition of value-added variation for the five most impacted sectors (in terms of absolute variation in volume). For **almost every sector in every country**, the interpretation is similar to the aggregate level: **results are driven by the loss of exports to the UK**. In some sectors however, a **return to WTO rules could represent an opportunity**, when **domestic demand replaces UK imports** in an amount greater than the losses suffered on the UK market, as it is the case for **Red meat and Cattle in France** or **Wheat in Spain**. Regarding Red meat and Cattle, this exception can be explained by the high initial specialization of UK in these sectors, leaving room for trade deviation after Brexit. Wheat production increases may also be a consequence of such UK specialization: while beef production increase in many EU27 countries to replace UK products, Wheat is demanded to feed cattle. Besides, Wheat production in France benefits more from opportunities in other EU27 markets than those related to the domestic market.

4.3. At the macroeconomic level, the impact on EU27 countries is marginal, except for Ireland

The evolution of European production prices is driven by different forces. On the one hand, **increased prices for intermediate inputs** from the UK (due to tariff and NTM increases) tend to **increase production prices**. On the other hand, the decrease in UK imports **reduces demand for EU27 goods**, and **drives prices down**. Table 10 shows that, on average, **this second effect dominates** in all European countries **except Ireland**, and production prices decrease. Because of the agri-food production sector in Ireland's high dependence on UK intermediates, the first effect mentioned above prevails and results in increased production prices.

Table 10: Variations in consumption and production price indexes for agri-food goods and all goods in the WTO scenario, 2030

| REGION | CONSUMPTION | | PRODUCTION | |
|------------------------|-------------|-------|------------|-------|
| | AGRI-FOOD | TOTAL | AGRI-FOOD | TOTAL |
| Ireland | + 5.4 | -0.4 | + 2.0 | -0.4 |
| Sweden | + 0.0 | -0.3 | -0.4 | -0.3 |
| France | + 0.0 | -0.2 | -0.2 | -0.3 |
| Portugal | + 0.0 | -0.2 | -0.2 | -0.2 |
| Belgium and Luxembourg | + 0.0 | -0.4 | -0.4 | -0.5 |
| Netherlands | + 0.0 | -0.5 | -0.4 | -0.5 |
| Spain | + 0.0 | -0.3 | -0.2 | -0.3 |
| Rest of EU27 | -0.1 | -0.1 | -0.2 | -0.2 |
| Germany | -0.1 | -0.2 | -0.2 | -0.2 |
| Italy | -0.1 | -0.2 | -0.2 | -0.2 |
| Poland | -0.2 | -0.2 | -0.3 | -0.3 |
| UK | + 4.0 | -0.9 | + 0.2 | -1.6 |

Source: Authors calculations using MIRAGE-e.

Note: Variations are given in percentage with respect to the BAU scenario.

The two opposite forces described above also affect consumption prices. Increases in **tariffs and trade restrictiveness of NTMs** lead directly to an **increase in consumption prices**, through the prices of imported goods. On the other hand, **consumption prices will follow possible decreases in production prices**. The overall effect on consumption prices is shown in Table 10. These results contrast with the results for production prices. First, note that the **total consumption price index** (including non-agri-food goods) **decreases in all EU27 countries**, Ireland included. Indeed, in the manufacture sectors, EU27 MFN tariffs and NTMs levels are lower, hence, the "market effect" of decreased overall demand dominates. For four EU27 countries or regions (Poland, Italy, Germany, Rest of EU27) the same mechanism is in operation in agri-food sectors too because none of them is very dependent on imports from the UK.

On the contrary, in other EU27 regions, the "tariff effect" dominates although the impacts are very small (less than 0.1%). However, the high dependency of Ireland on goods from the UK makes consumption prices increase much more (by 5.4%).

Finally, although this report focuses on agri-food issues, a detour to overall GDP impacts – that could be better evaluated if the industry and services, which represents the majority of economic activity, were represented with more detail – is useful to understand general equilibrium effects: **Brexit means a small decrease in EU27 purchasing power in general**, and this is one of the reasons why domestic and intra-EU27 demand fail to compensate losses suffered on the UK market by EU27 producers. Indeed, Table C.4 in Annex C shows that WTO rules would have a **moderate impact on EU27 GDP (-0.3%)**, and this is the case for most EU27 members (less than a 0.7% decrease). This result is in line with results in the literature, in particular Booth et al. (2015) which finds a 0.33% decrease in GDP in 2030.

In contrast, **Ireland is strongly affected by Brexit**, and its GDP decreases by 3.4% and might even reach 9.4% if Brexit affects Ireland's access to EU27 market as in the "WTO (Ireland NTM)" scenario. Finally, if only tariffs are at stake, all impacts on the EU27 and on the UK will be marginal.

5. CONCLUDING REMARKS

The UK is the second largest EU27 export market (worth USD 353 billion, and 6.9% of EU27 total exports) in trade value; at the same time, the EU27 is the UK's largest export market (USD 214 billion and 46% of the UK exports). Agri-food sectors represent 11% of the bilateral trade and their trade balance is favorable to the EU27. The first three EU27 agri-food sectors, ranked by the traded value weighted by the protection that could be imposed in a WTO scenario, are processed food, dairy and meat (both exports to and imports from UK). The EU27 countries that trade the most with the UK and that will face the highest protection are France, the Netherlands and Ireland. The large market shares and possible protection, combined with specialization patterns, foreshadows heterogeneous impacts across countries and sectors, as well as the redistribution of production across the EU27.

Considering the present situation as a starting point, we simulated the impact of the application of MFN tariffs on bilateral trade between the UK and the EU27 combined with a decrease by 2/3s in preferential access of the UK to the EU27 market. These are two crucial traits of the scenario that could occur after Brexit, in the absence of a trade agreement stating otherwise. We do not consider any other change in public policies: the CAP remains unchanged (meaning that EU27 and UK farmers continue to receive the same payments), no policies are implemented to cope with the possible impacts of Brexit and the UK does not sign any new trade agreements.

The result of this scenario is a decrease in bilateral EU27-UK trade: in 2030, as compared to a situation in which UK remains an EU member state, EU27 agri-food exports to the UK will decrease by USD 34 billion as will imports by USD 19 billion. The increase in trade among EU27 countries (+1%) and with other regions (+0.9%) does not compensate for the decrease between the EU27 and the UK, and EU27 total exports diminish by 4.1% (USD -28 billion). Despite the sizeable impacts on trade flows, overall agri-food production and value-added fall by a relatively small 0.8%, which corresponds to USD 5.6 billion. Indeed, domestic demand plays a predominant role in agri-food production. Overall impacts on agri-food exports and value added are negative in every EU27 country, but their magnitude varies among them. Ireland, the Netherlands and France lose the largest trade volumes. Impacts are also heterogeneous across sectors: as far as value added is considered at the EU27 level, the most negatively affected sectors (by volume) are processed food (USD -10.5 billion, -4.7%), white meat (USD -5.2 billion, -10.5%) and dairy (USD -4.6 billion, -7%). Nevertheless, Brexit is an opportunity for a few sectors: for instance, French Red Meat and Cattle respectively increase their value added by 2.1% and 1.3%, replacing former imports from the UK. It is interesting to note that agri-food value added increases in the UK (+2%), domestic production replacing imports from EU27. This is made at the expense of consumers, prices increasing by 4%. Overall GDP, to which agri-food sectors contribute less than manufacture, is slightly negatively affected in all countries apart from Ireland and the UK, where GDP significantly decreases by 3.4% and 2.4%, respectively.

The increase in both NTMs and tariffs contribute to these results: impacts are much smaller if only tariffs increase. In the majority of sectors, the increase in NTMs is nearly twice the one in tariffs and drives the impacts on trade. Nevertheless, this is not the case for Red Meat, and to a lesser extent Sugar and Dairy, which are mainly protected by tariffs. Since Red Meat and Dairy are among the most impacted sectors, the decrease in overall EU27 agri-food value added is not much different between our main scenario and a scenario considering only an increase in tariffs (-0.8% vs -0.6%).

It is important to note that all the impacts considered here do not account for adjustment costs. For instance, the reallocation of production factors, with the exception of capital stocks, is made without frictions. Furthermore, the results have to be interpreted as long-term ones, once reallocations are completely done.

Expected impacts on Ireland are particularly concerning: Irish GDP loss exceeds the British one. Indeed, Irish agri-food sectors (and more generally the economy as a whole) are highly dependent on trade with the UK, especially on intermediate consumptions' imports. As a consequence, Ireland deserves particular attention when considering redistributive policies to mitigate Brexit's negative impacts. More generally, trade policy options to alleviate the negative impacts we report may consist in limiting the increase in protection on EU27-UK bilateral trade for sectors at risk, and addressing trade impacts of NTMs in a potential trade agreement.

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ANNEX A: DATA

This annex briefly describes the databases used for the descriptive analysis and the quantitative assessment in this report.

A.1. The BACI database

BACI (Gaulier et al. 2010) is a world trade database developed by CEPII.¹⁹ Original data are provided by the United Nations Statistical Division (available from the COMTRADE database). BACI is constructed using an original procedure which for each bilateral trade flow which ensures the consistency between the exporters' and importers' declarations. This harmonization procedure increases the number of countries for which trade data are available compared to the original data. BACI provides trade bilateral values and quantities for each product as defined in the 6-digit United Nations Harmonized System (hereafter HS6), for more than 200 countries since 1995. In this report, we use BACI data from the 1996 revision of the HS6 classification. In what follows, we examine average trade flows during the period 2013–2015 (the three most recent years for which BACI data are available) in order to consider a stable reference situation that does not reflect the particular economic situation in a given year. This choice is also motivated by our interest in the long term effects of Brexit.

A.2. The MAcMap-HS6 database

The MAcMap-HS6 database (Bouët et al. 2008, Guimbard et al. 2012) provides *ad valorem* equivalents (percentage, AVE) of the tariffs applied by 190 importing countries to 220 exporting countries on 5,113 HS6 products, in 2011 and 2013. The database also contains MFN (most favored nation) and bounds tariffs (upper bound tariff for each country, negotiated at WTO ministerial meetings). This database allows detailed tariff scenarios to be calculated. For this purpose, reference groups' weighting schemes are used to preserve the heterogeneity of tariffs and to limit the endogeneity bias between trade flows and customs duties.

A.3. Non-Tariff Measures

Trade protection involves both tariffs and other measures that can limit market access. Non-tariff measures (NTMs) are a heterogeneous set of "policy measures other than ordinary customs tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both."²⁰ This is a broad definition, and it is not uncommon for the more detailed classification provided by the MAST group²¹ to be considered in order to distinguish among technical measures, non-technical measures and measures applied to exports (the first two categories concern only imports). For instance, some frequently used technical measures include sanitary and phytosanitary measures (e.g., tolerance limits for pesticide residues, or labeling requirements), and pre-shipment inspection obligations. Non-technical measures can include other traditional trade policy instruments such as rules of origin, quotas, price controls etc., and behind-the-border measures such as public procurement and trade-related investment measures.

To account for the impact of these three categories of NTMs on goods, in the following we consider their AVE, based on the estimations in Kee et al. (2009). Kee et al. employ a two-step approach: first, they estimate the impact of NTMs on trade flows; second, they calculate the AVE of these impacts (i.e., the duty that would have the same effect on trade flows) using

¹⁹ See also http://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=1

²⁰ UNCTAD/DITC/TAB/2009/3,

²¹ <http://unctad.org/en/Pages/DITC/Trade-Analysis/Non-Tariff-Measures/MAST-Group-on-NTMs.aspx>,

import demand elasticities taken from Kee et al. (2008). They propose AVEs for NTMs imposed by 78 countries on 4,575 products in the HS6 nomenclature.

Although the focus in this report is on the agri-food sectors, we account also for the possible broader consequences of Brexit on trade policies. In particular, our scenarios consider changes in the non-tariff measures applied to services. We use the MIRAGE model which relies on Fontagné et al.'s (2016) data on trade restrictiveness in the services sectors which provide AVEs of restrictions on cross-border trade in services for 118 countries and 9 sectors, using the GTAP database of trade in services for 2011.

A.4. The GTAP database

GTAP 9²² brings together the social accounting matrices (SAMs) of 140 countries (or groups of countries) covering the world economy, in a 57 sector nomenclature, for the year 2011. A SAM is an extension of the input-output tables in national accounts, merged with a trade matrix that links countries. In order to reduce the calculation dimension to a manageable level, the GTAP database is aggregated on its two dimensions (country-sectors). Aggregations are specific to each study; the one used here is presented above in Table B.1 and B.2.

The 21 traded GTAP agricultural sectors (raw milk is a non-traded sector) can also be mapped to the HS6 international trade classifications. To maintain consistency between the descriptive analysis of the actual trade statistics (Section 3) and the Brexit impact assessment (Section 5), the report presents trade statistics for GTAP sectors.²³ These statistics are based on aggregating BACI data using the available correspondence tables²⁴ between GTAP sectors and HS6 products. Table D.1 shows that some sectors contain only a few products (e.g., Processed Rice includes only two HS6 lines, 100630 and 100640) others contain numerous HS6 lines (e.g., among others, Meat products n.e.c. – 43, Vegetable, oils and fats – 47), while Food products n.e.c. sectors include nearly 250 products. We take advantage of the HS6 dimension of our trade data by identifying the most traded HS6 products in the sectors that will be most affected by the negative impacts of Brexit on trade. Thus, we retain the first five GTAP sectors in Table 4 (exports) and 5 (imports). For each of these sectors, we rank the first five HS6 products in order of importance, based on trade flows weighted by future trade protection. We also identify the countries with the highest level of trade in each of these five HS6 products. Tables D.2 and D.3 report imports and Tables D.4 and D.5 report exports. We comment on the figures wherever necessary.

²² See <https://www.gtap.agecon.purdue.edu>.

²³ Complete trade statistics at the HS6 product level are also provided, in the Annex.

²⁴ See: http://wits.worldbank.org/product_concordance.html

ANNEX B: MODEL DESCRIPTION

B.1. The MIRAGE model

The MIRAGE model²⁵ is a recursive-dynamic computable general equilibrium model designed for trade policy analysis (Bchir et al., 2002; Decreux and Valin, 2007; Fontagné et al., 2013). It relies on the GTAP9 database for social accounting matrices; tariff protection is taken from MAcMap-HS6 database (Guimbard et al., 2012), trade restrictiveness of non-tariff measures is sourced from Kee et al. (2009) for goods, and from Fontagné et al. (2016) for services. Finally, the trade costs related to time delays and delivery uncertainties due to infrastructure and administration problems are from Minor (2013).²⁶

Supply side

On the supply side, each sector in MIRAGE is modeled as a representative firm, whose production function combines value-added and intermediate consumption in fixed shares. Value-added is a bundle of imperfectly substitutable primary factors (capital, skilled and unskilled labor, land and natural resources); intermediates are represented by a bundle of imperfectly substitutable goods.

MIRAGE-e assumes full employment of primary factors. Skilled and unskilled labor is perfectly mobile across sectors but immobile across countries while natural resources are sector specific, and land is only (imperfectly) mobile between agricultural sectors. Installed capital is assumed to be immobile (sector-specific) while investments are allocated across sectors according to their rates of return. The overall stock of capital evolves through a combination of capital formation and a 6% constant rate of capital depreciation. Gross investment is determined by combining the saving and current accounts. Finally, while total investment is savings-driven, its allocation is determined by the rate of return from the various activities.

Consumers

On the demand side, the representative consumer from each country/region maximizes instantaneous utility under a budget constraint. Expenditure is allocated to commodities and services according to a LES-CES (linear expenditure system – constant elasticity of substitution) function. This implies that above a minimum consumption of the goods produced by each sector, consumption choices among the goods produced by different sectors are made according to a CES utility function.

Trade

Within each sector, total demand for each good (final, intermediate and investment) is differentiated by origin. A nested CES function assigns a particular status for domestic products according to the usual Armington hypothesis: consumers' and firms' choices are biased towards domestic production, and therefore, domestic and foreign goods are imperfectly substitutable according to a CES specification.

²⁵ The version used in this study is MIRAGE-e version 1.0.4. Environment and energy specific features are not considered in this exercise.

²⁶ Minor (2013) follows the methodology in Hummels and Schaur (2013).

Business-as-usual (BAU) scenario

Before considering counterfactual scenarios, a **business-as-usual growth path** for the world economy, referred to as the “reference” simulation (or “BAU”), is simulated up to 2030 in our case. In this BAU scenario, the MIRAGE model is calibrated to match the trajectories obtained from the EconMap baseline database (Fouré et al., 2013). More precisely, in the MIRAGE model, total factor productivity is computed in order to allow GDP to match the growth path derived from EconMap, under constraints on population, skilled and unskilled labor, savings and current account evolutions. The model is calibrated on 2011 data, therefore, we update the tariff levels for 2013 to match most recent MAcMap-HS6 data.

B.2. Aggregation of regions and sectors for the present study

Table B.1: Aggregation of regions

| MIRAGE region | GTAP region |
|------------------------|--|
| Africa | |
| Middle East | Bahrain (BHR), Iran Islamic Republic of (IRN), Israel (ISR), Jordan (JOR), Kuwait (KWT), Oman (OMN), Qatar (QAT), Saudi Arabia (SAU), United Arab Emirates (ARE), Rest of Western Asia (XWS) |
| North Africa | Egypt (EGY), Morocco (MAR), Tunisia (TUN), Rest of North Africa (XNF) |
| SACU | Botswana (BWA), Namibia (NAM), South Africa (ZAF), Rest of South African Customs Union (XSC) |
| Sub-saharan Africa | Benin (BEN), Burkina Faso (BFA), Cameroon (CMR), Cote d'Ivoire (CIV), Ghana (GHA), Guinea (GIN), Nigeria (NGA), Senegal (SEN), Togo (TGO), Rest of Western Africa (XWF), Central Africa (XCF), South Central Africa (XAC), Ethiopia (ETH), Kenya (KEN), Madagascar (MDG), Malawi (MWI), Mauritius (MUS), Mozambique (MOZ), Rwanda (RWA), Tanzania United Republic of (TZA), Uganda (UGA), Zambia (ZMB), Zimbabwe (ZWE), Rest of Eastern Africa (XEC) |
| Turkey | Turkey (TUR) |
| Asia | |
| ASEAN | Cambodia (KHM), Indonesia (IDN), Lao People's Democratic Republic (LAO), Malaysia (MYS), Philippines (PHL), Singapore (SGP), Thailand (THA), Viet Nam (VNM), Rest of Southeast Asia (XSE) |
| China and Hong-Kong | China (CHN), Hong Kong (HKG) |
| India | India (IND) |
| Japan | Japan (JPN) |
| Korea | Korea Republic of (KOR) |
| Rest of Asia | Mongolia (MNG), Taiwan (TWN), Rest of East Asia (XEA), Brunei Darussalam (BRN), Bangladesh (BGD), Nepal (NPL), Pakistan (PAK), Sri Lanka (LKA), Rest of South Asia (XSA) |
| EU27 | |
| Belgium and Luxembourg | Belgium (BEL), Luxembourg (LUX) |
| France | France (FRA) |
| Germany | Germany (DEU) |
| Ireland | Ireland (IRL) |
| Italy | Italy (ITA) |
| Netherlands | Netherlands (NLD) |

| MIRAGE region | GTAP region |
|---------------------------|--|
| Poland | Poland (POL) |
| Portugal | Portugal (PRT) |
| Rest of EU27 | Austria (AUT), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), Greece (GRC), Hungary (HUN), Latvia (LVA), Lithuania (LTU), Malta (MLT), Slovakia (SVK), Slovenia (SVN), Bulgaria (BGR), Croatia (HRV), Romania (ROU) |
| Spain | Spain (ESP) |
| Sweden | Sweden (SWE) |
| North America | |
| Canada | Canada (CAN) |
| Mexico | Mexico (MEX) |
| USA | United States of America (USA) |
| Oceania | |
| Australia and New Zealand | Australia (AUS), New Zealand (NZL) |
| Oceania | Rest of Oceania (XOC) |
| Rest of Europe | |
| CIS countries | Belarus (BLR), Ukraine (UKR), Rest of Eastern Europe (XEE), Kazakhstan (KAZ), Tajikistan (TJK), Kyrgyzstan (KGZ), Rest of Former Soviet Union (XSU), Armenia (ARM), Azerbaijan (AZE), Georgia (GEO) |
| EFTA | Switzerland (CHE), Norway (NOR), Rest of EFTA (XEF) |
| Russia | Russian Federation (RUS) |
| Rest of the World | |
| Rest of the World | Rest of North America (XNA), Albania (ALB), Rest of Europe (XER), Rest of the World (XTW) |
| South America | |
| Brazil | Brazil (BRA) |
| Rest of Latin America | Bolivia, Plurinational Republic of (BOL), Chile (CHL), Colombia (COL), Ecuador (ECU), Peru (PER), Venezuela (VEN), Rest of South America (XSM), Costa Rica (CRI), Guatemala (GTM), Honduras (HND), Nicaragua (NIC), Panama (PAN), El Salvador (SLV), Rest of Central America (XCA), Dominican Republic (DOM), Jamaica (JAM), Puerto Rico (PRI), Trinidad and Tobago (TTO), Caribbean (XCB) |
| Rest of Mercosur | Argentina (ARG), Paraguay (PRY), Uruguay (URY) |
| United Kingdom | |
| UK | United Kingdom (GBR) |

Table B.2: Aggregation of sectors

| MIRAGE sector | GTAP sector | MIRAGE sector | GTAP sector |
|-------------------------|---|----------------------------|--|
| Agriculture | | Industry | |
| Animal products | Animal products nec (oap) | Chemistry | Chemical.rubber.plastic prods (crp) |
| Beverages and Tobacco | Beverages and tobacco products (b_t) | Electronic | Electronic equipment (ele) |
| Cattle | Cattle.sheep.goats.horses (ctl) | Energy | Coal (coa), Oil (oil), Gas (gas), Petroleum. coal products (p_c), Electricity (ely), Gas manufacture. distribution (gdt) |
| Cereals | Cereal grains nec (gro) | Ferrous Metals | Ferrous metals (i_s) |
| Dairy | Dairy products (mil) | Machinery | Machinery and equipment nec (ome) |
| Fiber crops | Plant-based fibers (pfb) | Metal products | Metal products (fmp) |
| Fishing | Fishing (fsh) | Metals n.e.c. | Metals nec (nfm) |
| Forestry | Forestry (frs) | Minerals | Minerals nec (omn), Mineral products nec (nmm) |
| Oil seeds | Oil seeds (osd) | Other Manufacturing | Manufactures nec (omf) |
| Other Crops | Crops nec (ocr) | Paper | Paper products. publishing (ppp) |
| Other food | Raw milk (rmk), Food products nec (ofd) | Textile | Textiles (tex), Wearing apparel (wap), Leather products (lea) |
| Red Meat | Meat: cattle.sheep.goats.horse (cmt) | Transport equipment n.e.c. | Transport equipment nec (otn) |
| Rice | Paddy rice (pdr), Processed rice (pcr) | Vehicles and parts | Motor vehicles and parts (mvh) |
| Sugar | Sugar cane. sugar beet (c_b), Sugar (sgr) | Wood | Wood products (lum) |
| Vegetable oils and fats | Vegetable oils and fats (vol) | | |
| Vegetables and fruits | Vegetables. fruit. nuts (v_f) | | |
| Wheat | Wheat (wht) | | |
| White Meat | Meat products nec (omt) | | |
| Wool | Wool. silk-worm cocoons (wol) | | |
| | | Services | |
| | | Business Services | Business services nec (obs) |
| | | Communication | Communication (cmn) |
| | | Finance | Financial services nec (ofi) |
| | | Insurance | Insurance (isr) |
| | | Other Services | Water (wtr), Construction (cns), Recreation and other services (ros), Dwellings (dwe) |
| | | Public Services | PubAdmin/Defence/Health/Educat (osg) |
| | | Trade | Trade (trd) |
| | | Transport | Transport nec (otp), Sea transport (wtp), Air transport (atp) |

Note: ^a Raw milk (rmk) is not aggregated with Dairy Products (mil) because this product is not traded at all and an aggregation would lead to difficulties in interpreting the results.

B.3. Non-tariff measures in the MIRAGE model

Estimations of the trade restrictiveness of non-tariff measures for goods are taken from Kee et al (2009). However, rather than being bilateral, these measures are only importer-specific, and cannot represent the preferential access enjoyed by EU countries. To deal with this limitation we adopt a dual strategy. First, we introduce exporter-importer variation during aggregation of NTM trade restrictiveness indices as in Disdier et al. (2016), using reference group weights to aggregate from the HS-6 level to the sector level considered in this study. Second, we adjust the level of trade restrictiveness within the EU: we assume that between EU countries, all the restrictiveness that could have been withdrawn in a potential EU-US trade agreement ("actionable" measures) has already been removed, based on the estimates in Berden et al. (2009). The resulting reduction in NTMs trade restrictiveness within the EU, compared to NTMs related to extra-EU trade partners, is presented in Table B.3. In particular, this approach results in NTMs in the agri-food sectors that are, on average, 53% less restrictive within the EU than between EU and non-EU countries.

Table B.3: Reduction in intra-EU trade restrictiveness of NTMs

| MIRAGE sector | Sector from Berden et al. (2009) | Reduction (%) |
|--|---|---------------|
| Agriculture | | |
| Animal products, Beverages and Tobacco, Cattle, Cereals, Dairy, Fiber crops, Fishing, Forestry, Oil seeds, Other Crops, Other food, Red Meat, Rice, Sugar, Vegetable oils and fats, Vegetables and fruits, Wheat, White Meat, Wool | Food & beverages | 53.0 |
| Industry | | |
| Energy, Minerals, Other Manufacturing | All Industry | 52.0 |
| Transport equipment n.e.c., Vehicles and parts | Automobile | 48.0 |
| Chemistry | Chemicals | 63.0 |
| Electronic | Electronics | 41.0 |
| Machinery | Machinery | 55.0 |
| Paper | Office equipment | 52.0 |
| Ferrous Metals, Metal products, Metals n.e.c. | Steel | 62.0 |
| Textile | Textiles | 50.0 |
| Wood | Wood | 60.0 |
| Services | | |
| Public Services | All Services | 47.6 |
| Communication | Communication | 70.0 |
| Finance | Financial | 49.0 |
| Insurance | Insurance | 52.0 |
| Business Services, Trade | Other business services | 51.0 |
| Other Services | Personal, recreational services, Construction | 37.5 |
| Transport | Travel services | 40.0 |

Source: Berden et al. (2009)

ANNEX C: ADDITIONAL TABLES

Table C.1: EU27 sector exports by destination and ranked by largest decrease in exports towards the world, WTO scenario, 2030

| Sector | Total World | | | European Union (27) | | | United Kingdom | | | Rest of the World | | |
|-------------------------|--------------------|------------------|-------------|---------------------|------------------|-------------|------------------|------------------|-------------|--------------------|------------------|-------------|
| | BAU (USD mn) | Var. (USD mn) | Var. (%) | BAU (USD mn) | Var. (USD mn) | Var. (%) | BAU (USD mn) | Var. (USD mn) | Var. (%) | BAU (USD mn) | Var. (USD mn) | Var. (%) |
| Total Agri-food | 672,808 (8%) | -27,786 | -4.1 | 395,860 (9%) | + 3,878 | + 1.0 | 54,389 (10%) | -33,714 | -62.0 | 222,558 (6%) | + 2,051 | + 0.9 |
| Other food | 222,952 (33%) | -10,529 | -4.7 | 129,501 (33%) | + 1,139 | + 0.9 | 19,019 (35%) | -12,110 | -63.7 | 74,433 (33%) | + 442 | + 0.6 |
| White Meat | 50,286 (7%) | -5,276 | -10.5 | 32,588 (8%) | + 698 | + 2.1 | 6,676 (12%) | -6,203 | -92.9 | 11,022 (5%) | + 229 | + 2.1 |
| Dairy | 65,878 (10%) | -4,641 | -7.0 | 41,954 (11%) | + 430 | + 1.0 | 5,207 (10%) | -4,921 | -94.5 | 18,718 (8%) | -150 | -0.8 |
| Beverages and Tobacco | 104,631 (16%) | -1,975 | -1.9 | 48,550 (12%) | + 183 | + 0.4 | 8,931 (16%) | -2,421 | -27.1 | 47,149 (21%) | + 263 | + 0.6 |
| Vegetables and fruits | 46,832 (7%) | -1,590 | -3.4 | 31,961 (8%) | + 336 | + 1.1 | 4,768 (9%) | -2,128 | -44.6 | 10,103 (5%) | + 202 | + 2.0 |
| Red Meat | 19,966 (3%) | -1,249 | -6.3 | 14,322 (4%) | + 338 | + 2.4 | 1,658 (3%) | -1,636 | -98.7 | 3,986 (2%) | + 49 | + 1.2 |
| Other Crops | 39,425 (6%) | -843 | -2.1 | 21,867 (6%) | + 351 | + 1.6 | 3,137 (6%) | -1,586 | -50.6 | 14,420 (6%) | + 392 | + 2.7 |
| Vegetable oils and fats | 26,082 (4%) | -740 | -2.8 | 17,186 (4%) | + 136 | + 0.8 | 1,380 (3%) | -985 | -71.4 | 7,516 (3%) | + 110 | + 1.5 |
| Cattle | 5,961 (1%) | -350 | -5.9 | 3,331 (1%) | + 4 | + 0.1 | 679 (1%) | -355 | -52.3 | 1,951 (1%) | + 1 | + 0.1 |
| Animal products | 20,072 (3%) | -341 | -1.7 | 10,856 (3%) | -125 | -1.2 | 707 (1%) | -286 | -40.4 | 8,510 (4%) | + 70 | + 0.8 |
| Sugar | 8,169 (1%) | -189 | -2.3 | 5,827 (1%) | + 145 | + 2.5 | 391 (1%) | -364 | -92.9 | 1,950 (1%) | + 30 | + 1.5 |
| Rice | 1,594 (0%) | -157 | -9.9 | 1,153 (0%) | + 15 | + 1.3 | 195 (0%) | -177 | -90.9 | 245 (0%) | + 5 | + 2.1 |
| Cereals | 12,265 (2%) | -131 | -1.1 | 8,590 (2%) | -10 | -0.1 | 389 (1%) | -148 | -38.1 | 3,285 (1%) | + 27 | + 0.8 |
| Fishing | 9,419 (1%) | -39 | -0.4 | 7,374 (2%) | + 64 | + 0.9 | 561 (1%) | -121 | -21.6 | 1,484 (1%) | + 17 | + 1.2 |
| Oil seeds | 8,926 (1%) | -18 | -0.2 | 7,180 (2%) | + 29 | + 0.4 | 139 (0%) | -65 | -46.9 | 1,607 (1%) | + 18 | + 1.1 |
| Wool | 751 (0%) | + 5 | + 0.7 | 70 (0%) | + 1 | + 1.3 | 51 (0%) | -8 | -15.1 | 631 (0%) | + 12 | + 1.9 |
| Fiber crops | 574 (0%) | + 6 | + 1.1 | 142 (0%) | + 0 | + 0.2 | 13 (0%) | 0 | -3.1 | 419 (0%) | + 7 | + 1.6 |
| Forestry | 14,154 (2%) | + 120 | + 0.8 | 6,255 (2%) | -19 | -0.3 | 274 (1%) | -43 | -15.8 | 7,625 (3%) | + 182 | + 2.4 |
| Wheat | 14,871 (2%) | + 151 | + 1.0 | 7,155 (2%) | + 162 | + 2.3 | 213 (0%) | -157 | -73.5 | 7,503 (3%) | + 145 | + 1.9 |
| Total Industry | 5,970,967 (71%) | -122,484 | -2.1 | 3,145,487 (74%) | +58,182 | + 1.8 | 378,051 (71%) | -207,897 | -55.0 | 2,447,428 (69%) | +27,231 | + 1.1 |
| Total Services | 1,718,543 (21%) | -4,086 | -0.2 | 719,211 (17%) | + 2,873 | + 0.4 | 97,946 (18%) | -20,093 | -20.5 | 901,386 (25%) | +13,134 | + 1.5 |

Notes: Sectors are ranked by decreasing loss (in value) of total exports to the World. Levels are given in 2011 USD million and percentages. For instance, Other food represents 33% of EU agri-food exports to the world, while EU agri-food exports to the world represent 8% of total EU exports to the world. Variations in USD million and percentage points with respect to the BAU scenario.

Source: Authors calculations using MIRAGE-e.

Table C.2: EU27 subregions export to UK in Agri-food sectors: aggregate and three sectors with the largest variations, 2030

| Country/Sector | BAU Level | WTO | | WTO (Tariff only) | | WTO (Ireland NTM) | |
|-----------------------|-----------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | | Var. (USD mn.) | Var. (%) | Var. (USD mn.) | Var. (%) | Var. (USD mn.) | Var. (%) |
| Netherlands | | | | | | | |
| Total Agri-food | 10,104 (23%) | -6,666 | -66.0 | -4,154 | -41.1 | -6,667 | -66.0 |
| White Meat | 2,289 (23%) | -2,148 | -93.9 | -1,718 | -75.1 | -2,149 | -93.9 |
| Other food | 2,854 (28%) | -1,832 | -64.2 | -919 | -32.2 | -1,832 | -64.2 |
| Other Crops | 2,339 (23%) | -1,207 | -51.6 | -527 | -22.5 | -1,207 | -51.6 |
| Ireland | | | | | | | |
| Total Agri-food | 9,145 (22%) | -6,476 | -70.8 | -4,497 | -49.2 | -6,436 | -70.4 |
| Other food | 2,377 (26%) | -1,462 | -61.5 | -423 | -17.8 | -1,465 | -61.6 |
| Dairy | 1,529 (17%) | -1,455 | -95.2 | -1,271 | -83.1 | -1,460 | -95.5 |
| Red Meat | 1,271 (14%) | -1,255 | -98.8 | -1,235 | -97.2 | -1,254 | -98.7 |
| France | | | | | | | |
| Total Agri-food | 9,180 (12%) | -4,717 | -51.4 | -2,913 | -31.7 | -4,720 | -51.4 |
| Other food | 2,694 (29%) | -1,860 | -69.0 | -978 | -36.3 | -1,860 | -69.1 |
| Dairy | 1,169 (13%) | -1,102 | -94.2 | -924 | -79.0 | -1,102 | -94.2 |
| Beverages and Tobacco | 3,430 (37%) | -553 | -16.1 | -257 | -7.5 | -555 | -16.2 |
| Rest of EU27 | | | | | | | |
| Total Agri-food | 4,685 (7%) | -3,322 | -70.9 | -2,319 | -49.5 | -3,323 | -70.9 |
| Other food | 1,716 (37%) | -1,082 | -63.0 | -557 | -32.5 | -1,082 | -63.1 |
| White Meat | 1,071 (23%) | -979 | -91.5 | -798 | -74.6 | -979 | -91.5 |
| Dairy | 817 (17%) | -772 | -94.5 | -666 | -81.6 | -772 | -94.5 |
| Germany | | | | | | | |
| Total Agri-food | 5,239 (5%) | -3,297 | -62.9 | -1,846 | -35.2 | -3,299 | -63.0 |
| Other food | 2,840 (54%) | -1,702 | -59.9 | -709 | -25.0 | -1,703 | -60.0 |
| White Meat | 533 (10%) | -486 | -91.1 | -393 | -73.7 | -486 | -91.1 |
| Beverages and Tobacco | 802 (15%) | -378 | -47.0 | -248 | -31.0 | -378 | -47.1 |
| Italy | | | | | | | |
| Total Agri-food | 4,708 (13%) | -2,633 | -55.9 | -1,532 | -32.5 | -2,635 | -56.0 |
| Other food | 1,800 (38%) | -1,250 | -69.4 | -589 | -32.7 | -1,251 | -69.5 |
| Dairy | 349 (7%) | -329 | -94.2 | -275 | -78.8 | -329 | -94.2 |

| Country/Sector | BAU Level | WTO | | WTO (Tariff only) | | WTO (Ireland NTM) | |
|-------------------------------|----------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | | Var. (USD mn.) | Var. (%) | Var. (USD mn.) | Var. (%) | Var. (USD mn.) | Var. (%) |
| White Meat | 319 (7%) | -293 | -91.9 | -233 | -73.1 | -293 | -91.9 |
| Belgium and Luxembourg | | | | | | | |
| Total Agri-food | 3,957 (8%) | -2,619 | -66.2 | -1,417 | -35.8 | -2,619 | -66.2 |
| Other food | 2,182 (55%) | -1,371 | -62.8 | -616 | -28.2 | -1,372 | -62.9 |
| Dairy | 361 (9%) | -339 | -94.1 | -288 | -79.9 | -340 | -94.1 |
| White Meat | 282 (7%) | -255 | -90.3 | -192 | -68.1 | -255 | -90.3 |
| Spain | | | | | | | |
| Total Agri-food | 4,336 (10%) | -2,216 | -51.1 | -1,475 | -34.0 | -2,218 | -51.2 |
| Vegetables and fruits | 1,664 (38%) | -742 | -44.6 | -459 | -27.6 | -742 | -44.6 |
| Other food | 1,155 (27%) | -702 | -60.8 | -388 | -33.6 | -702 | -60.8 |
| Vegetable oils and fats | 230 (5%) | -214 | -92.9 | -198 | -86.1 | -214 | -92.9 |
| Poland | | | | | | | |
| Total Agri-food | 1,747 (8%) | -1,200 | -68.7 | -733 | -42.0 | -1,200 | -68.7 |
| Other food | 960 (55%) | -590 | -61.5 | -270 | -28.1 | -591 | -61.5 |
| White Meat | 353 (20%) | -332 | -94.1 | -256 | -72.7 | -332 | -94.1 |
| Dairy | 111 (6%) | -105 | -94.8 | -90 | -81.1 | -105 | -94.8 |
| Sweden | | | | | | | |
| Total Agri-food | 793 (4%) | -288 | -36.3 | -135 | -17.0 | -288 | -36.4 |
| Other food | 259 (33%) | -145 | -56.0 | -55 | -21.4 | -145 | -56.0 |
| Beverages and Tobacco | 175 (22%) | -54 | -30.8 | -22 | -12.5 | -54 | -30.8 |
| Fishing | 239 (30%) | -24 | -10.0 | -13 | -5.5 | -24 | -10.1 |
| Portugal | | | | | | | |
| Total Agri-food | 498 (8%) | -281 | -56.5 | -167 | -33.5 | -281 | -56.5 |
| Other food | 182 (37%) | -114 | -62.6 | -54 | -29.5 | -114 | -62.6 |
| White Meat | 63 (13%) | -59 | -93.3 | -44 | -70.1 | -59 | -93.3 |
| Beverages and Tobacco | 147 (29%) | -52 | -35.4 | -37 | -25.0 | -52 | -35.5 |

Note: Levels are given in million 2011 USD, Variations in percentage points. BAU percentages for Total Agri-food are percentages of total exports to the UK, while for sectors it represents the percentage within agri-food exports.

Source: Authors' calculations using MIRAGE-e.

Table C.3: Agri-food value-added in EU27 regions, in the WTO scenario: aggregate, five most impacted sectors and decomposition of variation, 2030

| Country/Sector | BAU Level | WTO | | VA decomposition | | | | |
|----------------------------|-----------|---------------|---------|------------------|------------|------------|-------------|--------------|
| | | Var (USD mn.) | Var (%) | Dom. demand | Exp. to UK | Exp. to EU | Exp. to Row | Iceberg cost |
| European Union (27) | | | | | | | | |
| <i>Total Agri-food</i> | 736,581 | -5,597 | -0.8 | + 295 | -6,795 | + 908 | +616 | -621 |
| Other food | 254,129 | -2,536 | -1.0 | + 213 | -2,586 | + 236 | + 77 | -475 |
| Vegetables and fruits | 67,669 | -750 | -1.1 | + 75 | -1,157 | + 179 | + 85 | + 67 |
| White Meat | 34,393 | -705 | -2.0 | + 92 | -755 | + 90 | + 32 | -164 |
| Dairy | 42,993 | -552 | -1.3 | + 32 | -501 | + 71 | + 7 | -159 |
| Animal products | 48,103 | -379 | -0.8 | -315 | -56 | -36 | + 25 | + 3 |
| Ireland | | | | | | | | |
| <i>Total Agri-food</i> | 10,596 | -1,724 | -16.3 | -376 | -851 | -101 | -100 | -296 |
| Other food | 5,550 | -732 | -13.2 | -133 | -319 | -49 | -61 | -170 |
| Dairy | 478 | -216 | -45.3 | -2 | -95 | -30 | -24 | -65 |
| Cattle | 720 | -184 | -25.6 | -133 | -45 | -2 | -2 | -3 |
| White Meat | 273 | -159 | -58.1 | + 3 | -110 | -5 | -6 | -40 |
| Red Meat | 385 | -141 | -36.6 | + 9 | -111 | -17 | -2 | -21 |
| Netherlands | | | | | | | | |
| <i>Total Agri-food</i> | 46,458 | -1,269 | -2.7 | -189 | -1,374 | + 250 | +121 | -77 |
| Other food | 17,980 | -456 | -2.5 | -90 | -384 | + 49 | + 19 | -51 |
| White Meat | 1,710 | -270 | -15.8 | + 1 | -234 | + 24 | + 2 | -62 |
| Other Crops | 8,925 | -223 | -2.5 | + 4 | -405 | + 94 | + 66 | + 18 |
| Vegetables and fruits | 4,133 | -131 | -3.2 | + 1 | -195 | + 35 | + 15 | + 13 |
| Beverages and Tobacco | 5,527 | -89 | -1.6 | -19 | -85 | + 10 | + 4 | + 1 |
| Rest of EU27 | | | | | | | | |
| <i>Total Agri-food</i> | 156,621 | -557 | -0.4 | -28 | -709 | + 117 | +117 | -55 |
| Other food | 42,551 | -149 | -0.4 | + 78 | -270 | + 44 | + 20 | -22 |
| White Meat | 7,772 | -143 | -1.8 | + 15 | -161 | + 17 | + 12 | -25 |
| Dairy | 10,122 | -141 | -1.4 | -13 | -119 | + 17 | + 7 | -33 |
| Animal products | 13,106 | -87 | -0.7 | -101 | -3 | -6 | + 16 | + 7 |
| Forestry | 15,109 | -36 | -0.2 | -56 | -4 | -9 | + 30 | + 4 |
| Italy | | | | | | | | |
| <i>Total Agri-food</i> | 86,429 | -509 | -0.6 | -17 | -561 | + 61 | + 65 | -57 |
| Other food | 26,009 | -226 | -0.9 | + 0 | -206 | + 18 | + 12 | -50 |
| Vegetables and fruits | 16,563 | -143 | -0.9 | + 4 | -175 | + 11 | + 13 | + 3 |
| Dairy | 4,621 | -40 | -0.9 | -1 | -38 | + 8 | + 2 | -11 |
| White Meat | 2,966 | -35 | -1.2 | -2 | -32 | + 4 | + 1 | -6 |
| Animal products | 4,961 | -27 | -0.5 | -26 | -1 | -2 | + 1 | + 0 |

| Country/Sector | BAU Level | WTO | | VA decomposition | | | | |
|-------------------------------|--------------|------------------|---------|------------------|---------------|---------------|----------------|-----------------|
| | | Var (USD mn.) | Var (%) | Dom. demand | Exp. to UK | Exp. to EU | Exp. to Row | Iceberg cost |
| France | | | | | | | | |
| <i>Total Agri-food</i> | 149,002 | -406 | -0.3 | + 453 | -1,103 | + 149 | +179 | -84 |
| Other food | 61,387 | -371 | -0.6 | + 129 | -483 | + 46 | + 33 | -97 |
| Dairy | 9,421 | -108 | -1.1 | + 18 | -122 | + 23 | + 8 | -35 |
| Cattle | 5,960 | + 79 | + 1.3 | + 87 | -11 | + 2 | + 1 | + 0 |
| Wheat | 4,768 | + 79 | + 1.7 | + 11 | -14 | + 30 | + 51 | + 1 |
| Red Meat | 6,168 | + 129 | + 2.1 | + 123 | -8 | + 11 | + 1 | + 2 |
| Germany | | | | | | | | |
| <i>Total Agri-food</i> | 94,838 | -372 | -0.4 | + 149 | -674 | + 104 | + 88 | -39 |
| Other food | 42,124 | -270 | -0.6 | + 101 | -411 | + 54 | + 23 | -38 |
| Animal products | 6,484 | -49 | -0.8 | -24 | -10 | -15 | + 3 | -3 |
| Beverages and Tobacco | 9,578 | -43 | -0.5 | + 3 | -55 | + 4 | + 4 | + 1 |
| Vegetables and fruits | 4,012 | -27 | -0.7 | + 3 | -44 | + 7 | + 3 | + 4 |
| White Meat | 3,690 | -26 | -0.7 | + 18 | -55 | + 14 | + 4 | -7 |
| Spain | | | | | | | | |
| <i>Total Agri-food</i> | 81,067 | -336 | -0.4 | + 203 | -744 | + 134 | + 57 | + 14 |
| Vegetables and fruits | 11,313 | -320 | -2.8 | + 29 | -483 | + 87 | + 23 | + 24 |
| Other food | 22,135 | -68 | -0.3 | + 42 | -123 | + 12 | + 9 | -9 |
| Rice | 521 | -23 | -4.3 | -1 | -16 | + 1 | + 0 | -6 |
| Sugar | 593 | + 28 | + 4.8 | + 27 | -1 | + 3 | -1 | -0 |
| Wheat | 1,485 | + 45 | + 3.0 | + 40 | -3 | + 7 | + 1 | + 0 |
| Belgium and Luxembourg | | | | | | | | |
| <i>Total Agri-food</i> | 21,746 | -230 | -1.1 | + 34 | -383 | + 101 | + 37 | -19 |
| Other food | 7,891 | -172 | -2.2 | + 7 | -185 | + 25 | + 7 | -25 |
| Beverages and Tobacco | 4,856 | -38 | -0.8 | -4 | -48 | + 7 | + 4 | + 3 |
| Animal products | 998 | -18 | -1.8 | -11 | -4 | -3 | + 1 | -1 |
| White Meat | 675 | -17 | -2.5 | + 2 | -28 | + 11 | + 2 | -3 |
| Red Meat | 491 | + 20 | + 4.1 | + 14 | -3 | + 8 | + 0 | + 1 |
| Poland | | | | | | | | |
| <i>Total Agri-food</i> | 55,551 | -147 | -0.3 | + 33 | -256 | + 62 | + 28 | -14 |
| Other food | 18,474 | -90 | -0.5 | + 28 | -142 | + 27 | + 8 | -11 |
| White Meat | 4,021 | -21 | -0.5 | + 25 | -45 | + 8 | + 3 | -11 |
| Vegetables and fruits | 4,963 | -14 | -0.3 | -1 | -22 | -0 | + 5 | + 5 |
| Animal products | 5,205 | -13 | -0.2 | -11 | -1 | -2 | + 1 | + 0 |
| Forestry | 2,721 | -12 | -0.4 | -14 | -0 | + 2 | + 0 | + 0 |
| Portugal | | | | | | | | |
| <i>Total Agri-food</i> | 13,011 | -31 | -0.2 | + 18 | -69 | + 11 | + 9 | -0 |

| Country/Sector | BAU Level | WTO | | VA decomposition | | | | Iceberg cost |
|------------------------|-----------|---------------|---------|------------------|------------|------------|-------------|--------------|
| | | Var (USD mn.) | Var (%) | Dom. demand | Exp. to UK | Exp. to EU | Exp. to Row | |
| Other food | 3,934 | -11 | -0.3 | + 13 | -26 | + 3 | + 2 | -3 |
| White Meat | 494 | -10 | -2.0 | + 0 | -9 | + 1 | + 0 | -2 |
| Vegetables and fruits | 1,610 | -10 | -0.6 | + 1 | -15 | + 2 | + 1 | + 1 |
| Beverages and Tobacco | 2,137 | -6 | -0.3 | + 3 | -14 | + 2 | + 1 | + 2 |
| Animal products | 672 | -6 | -0.9 | -6 | -0 | -0 | + 0 | + 0 |
| Sweden | | | | | | | | |
| <i>Total Agri-food</i> | 21,262 | -16 | -0.1 | + 14 | -71 | + 21 | + 14 | + 7 |
| Forestry | 7,589 | -34 | -0.5 | -44 | -2 | + 4 | + 6 | + 2 |
| Beverages and Tobacco | 1,774 | -4 | -0.2 | + 5 | -15 | + 1 | + 2 | + 3 |
| Dairy | 831 | -2 | -0.3 | + 1 | -3 | + 0 | + 0 | -1 |
| Red Meat | 501 | + 6 | + 1.2 | + 5 | -0 | + 0 | + 0 | + 0 |
| Other food | 6,094 | + 12 | + 0.2 | + 36 | -36 | + 7 | + 4 | + 0 |

Note: Levels and decomposition are given in million USD, Variations in percentage points.

Source: Authors' calculations using MIRAGE-e.

Table C.4: Gross Domestic Product (volume) and variation in 2030

| Region | BAU Level | WTO | | WTO (Tariff only) | | WTO (Ireland NTM) | |
|------------------------|-----------|---------------|----------|-------------------|----------|-------------------|----------|
| | | Var. (\$ bn.) | Var. (%) | Var. (\$ bn.) | Var. (%) | Var. (\$ bn.) | Var. (%) |
| <i>EU27</i> | 20,009 | -63.4 | -0.3 | -3.0 | -0.0 | -87.7 | -0.4 |
| Germany | 4,168 | -11.4 | -0.3 | -0.8 | -0.0 | -12.0 | -0.3 |
| France | 3,821 | -9.1 | -0.2 | -0.5 | -0.0 | -9.7 | -0.3 |
| Rest of EU27 | 3,539 | -7.4 | -0.2 | -0.1 | -0.0 | -8.1 | -0.2 |
| Italy | 2,367 | -3.7 | -0.2 | -0.1 | -0.0 | -3.9 | -0.2 |
| Spain | 1,897 | -3.4 | -0.2 | + 0 | + 0.0 | -3.6 | -0.2 |
| Netherlands | 1,055 | -5.7 | -0.5 | -0.8 | -0.1 | -6.0 | -0.6 |
| Poland | 1,004 | -2.1 | -0.2 | -0.1 | -0.0 | -2.2 | -0.2 |
| Sweden | 762 | -2.8 | -0.4 | -0.2 | -0.0 | -3.0 | -0.4 |
| Belgium and Luxembourg | 746 | -5.1 | -0.7 | -0.2 | -0.0 | -5.5 | -0.7 |
| Ireland | 349 | -12.0 | -3.4 | -0.3 | -0.1 | -32.8 | -9.4 |
| Portugal | 300 | -0.8 | -0.3 | 0.0 | -0.0 | -0.9 | -0.3 |
| UK | 3,627 | -87.7 | -2.4 | -11.5 | -0.3 | -87.6 | -2.4 |
| Rest of the World | 102,474 | + 14 | + 0.0 | + 3 | + 0.0 | + 17 | + 0.0 |

Note: Levels are given in billion 2011 USD, Variations in billion 2011 USD and percentage points.

Source: Authors calculations using MIRAGE-e.

ANNEX D: ADDITIONAL TABLES – HS6 DETAILS

Table D.1: Number of HS6 products, by GTAP sector

| GTAP sectors | Number of HS6 products |
|---|------------------------|
| Animal products n.e.c. (oap) | 48 |
| Beverages and tobacco products (b_t) | 31 |
| Bovine, cattle, sheep, and goats horses (ctl) | 8 |
| Bovine meat products (cmt) | 30 |
| Cereal grains n.e.c. (gro) | 10 |
| Crops n.e.c. (ocr) | 63 |
| Dairy products (mil) | 24 |
| Fishing (fsh) | 41 |
| Food products n.e.c. (ofd) | 248 |
| Forestry (frs) | 25 |
| Meat products n.e.c. (omt) | 43 |
| Oil seeds (osd) | 16 |
| Paddy Rice (pdr) | 2 |
| Plant based fibers (pfb) | 8 |
| Processed rice (pcr) | 2 |
| Sugar (sgr) | 7 |
| Sugar cane and sugar beet (c_b) | 2 |
| Vegetable oils and fats (vol) | 47 |
| Vegetables, fruit and nuts (v_f) | 89 |
| Wheat (wht) | 2 |
| Wool, silk, worm cocoons (wol) | 6 |

Sources: GTAP, United Nations' HS6 classification (revision 1996), Authors' calculations.

Table D.2: EU27 imports, HS6 level (1/2)

| GTAP | HS6 | LABEL | MFN | IMPORTS FROM UK (1) | IMPORTS FROM ROW (2) | % | MAIN IMPORTER FROM UK | VALUE OF IMPORTS |
|----------------------|--------|---|------|---------------------|----------------------|----|-----------------------|------------------|
| Food products n.e.c. | 230910 | Dog or cat food (retail) | 37.9 | 364 | 5,593 | 7 | Germany | 78 |
| | 230990 | Animal feed preparations n.e.s. | 34.3 | 370 | 5,563 | 7 | Ireland | 163 |
| | 190410 | Cereal foods obtained by swelling, roasting of cereal | 19.2 | 384 | 1,695 | 23 | Ireland | 132 |
| | 110100 | Wheat or meslin flour | 44.9 | 104 | 983 | 11 | Ireland | 78 |
| | 190590 | Communion wafers, rice paper, bakers wares n.e.s. | 5.5 | 524 | 7,814 | 7 | Ireland | 283 |
| Dairy products | 040120 | Milk not concentrated nor sweetened 1-6% fat | 47.6 | 244 | 3,868 | 6 | Ireland | 228 |
| | 040690 | Cheese except fresh, grated, processed or blue-veined | 36.7 | 298 | 11,291 | 3 | Ireland | 86 |
| | 040610 | Fresh cheese, unfermented whey cheese, curd | 63.4 | 147 | 3,385 | 4 | Ireland | 63 |
| | 040510 | Butter | 49.1 | 98 | 2,818 | 3 | France | 26 |
| | 040221 | Milk and cream powder unsweetened > 1.5% fat | 48.9 | 92 | 836 | 11 | Belgium | 61 |
| Bovine meat products | 020130 | Bovine cuts boneless, fresh or chilled | 68.6 | 311 | 5,681 | 5 | Ireland | 90 |
| | 020410 | Lamb carcasses and half carcasses, fresh or chilled | 48.0 | 342 | 620 | 55 | France | 222 |
| | 020230 | Bovine cuts boneless, frozen | 84.6 | 66 | 1,823 | 4 | Ireland | 16 |
| | 020110 | Bovine carcasses and half carcasses, fresh or chilled | 59.9 | 77 | 1,771 | 4 | Netherlands | 40 |
| | 020120 | Bovine cuts bone in, fresh or chilled | 60.6 | 72 | 3,238 | 2 | Netherlands | 30 |

Source: MAcMap-HS6 (2013) and BACI (Average flow 2013-2014-2015), Trade data expresses in millions of USD, MFN tariffs are expressed in percentage and aggregated MAcMap-HS6's weighting schemes. Authors' calculations.

Table D.3: EU27 imports, HS6 level (2/2)

| GTAP | HS6 | LABEL | MFN | IMPORTS FROM UK (1) | IMPORTS FROM ROW (2) | % | MAIN IMPORTER FROM UK | VALUE OF IMPORTS |
|--------------------------------|--------|--|------|---------------------|----------------------|---|-----------------------|------------------|
| Meat products n.e.c. | 020714 | Fowls, cuts & offal, frozen | 44.9 | 155 | 2,147 | 7 | Ireland | 37 |
| | 020319 | Swine cuts, fresh or chilled, n.e.s. | 26.8 | 151 | 5,614 | 3 | Poland | 77 |
| | 020713 | Fowls, cuts & offal, fresh or chilled | 20.7 | 129 | 2,556 | 5 | Ireland | 61 |
| | 021019 | Swine meat, salted/dried/smoked not ham/shoulder/belly | 23.6 | 48 | 1,246 | 4 | Ireland | 43 |
| | 160250 | Bovine meat, offal n.e.s., not livers, prepared/preserved | 34.8 | 31 | 668 | 5 | Ireland | 19 |
| Beverages and tobacco products | 240310 | Cigarette or pipe tobacco and tobacco substitute mixes | 74.9 | 111 | 1,920 | 6 | Germany | 18 |
| | 240220 | Cigarettes containing tobacco | 33.8 | 162 | 8,568 | 2 | Ireland | 31 |
| | 220710 | Undenatured ethyl alcohol > 80% by volume | 21.2 | 223 | 2,568 | 9 | Netherlands | 67 |
| | 220210 | Beverage waters, sweetened or flavoured | 9.6 | 297 | 3,267 | 9 | Ireland | 210 |
| | 220290 | Non-alcoholic beverages n.e.s., except fruit, vegetable juices | 14.4 | 101 | 2,784 | 4 | Ireland | 32 |

Source: MAcMap-HS6 (2013) and BACI (Average flow 2013-2014-2015), Trade data expresses in millions of USD, MFN tariffs are expressed in percentage and aggregated MAcMap-HS6's weighting schemes. Authors' calculations.

Table D.4: EU27 exports, HS6 level (1/2)

| GTAP | HS6 | LABEL | MFN | EXPORTS TO UK (1) | EXPORTS TO ROW (2) | % | MAIN EXPORTER TO UK | VALUE OF EXPORTS |
|----------------------|--------|--|------|-------------------|--------------------|----|---------------------|------------------|
| Food products n.e.c. | 230910 | Dog or cat food (retail) | 37.9 | 760 | 6,457 | 12 | France | 190 |
| | 230990 | Animal feed preparations n.e.s. | 34.3 | 388 | 7,718 | 5 | France | 71 |
| | 190590 | Communion wafers, rice paper, bakers wares n.e.s. | 5.5 | 1,597 | 10,381 | 15 | Germany | 374 |
| | 200919 | Orange juice, not fermented, spirited, or frozen | 24.9 | 351 | 1,650 | 21 | Belgium | 194 |
| | 170230 | Glucose, glucose syrup < 20% fructose | 64.0 | 119 | 1,381 | 9 | Belgium | 54 |
| Dairy products | 040690 | Cheese except fresh, grated, processed or blue-veined | 36.7 | 1,150 | 14,745 | 8 | Ireland | 426 |
| | 040610 | Fresh cheese, unfermented whey cheese, curd | 63.4 | 592 | 4,386 | 13 | France | 167 |
| | 040510 | Butter | 49.1 | 311 | 3,578 | 9 | Ireland | 163 |
| | 040390 | Buttermilk, curdled milk, cream, kephir, etc. | 45.3 | 334 | 1,338 | 25 | France | 164 |
| | 040630 | Cheese processed, not grated or powdered | 41.0 | 329 | 1,869 | 18 | Ireland | 143 |
| Meat products n.e.c. | 021019 | Swine meat, salted/dried/smoked not ham/shoulder/belly | 23.6 | 855 | 2,371 | 36 | Denmark | 320 |
| | 020714 | Fowls, cuts & offal, frozen | 44.9 | 430 | 2,816 | 15 | Netherlands | 238 |
| | 020319 | Swine cuts, fresh or chilled, n.e.s. | 26.8 | 655 | 6,419 | 10 | Germany | 214 |
| | 020713 | Fowls, cuts & offal, fresh or chilled | 20.7 | 756 | 3,247 | 23 | Netherlands | 455 |
| | 160100 | Sausages, similar products of meat, meat offal & blood | 26.3 | 556 | 3,281 | 17 | Germany | 173 |

Source: MAcMap-HS6 (2013) and BACI (Average flow 2013-2014-2015), Trade data expresses in millions of USD, MFN tariffs are expressed in percentage and aggregated MAcMap-HS6's weighting schemes. Authors' calculations.

Table D.5: EU27 exports, HS6 level (2/2)

| GTAP | HS6 | LABEL | MFN | EXPORTS TO UK (1) | EXPORTS TO ROW (2) | % | MAIN EXPORTER TO UK | VALUE OF EXPORTS |
|--------------------------------|--------|--|------|-------------------|--------------------|----|---------------------|------------------|
| Beverages and tobacco products | 240220 | Cigarettes containing tobacco | 33.8 | 302 | 11,840 | 3 | Czech Republic | 100 |
| | 220421 | Grape wines n.e.s., fortified wine or must, pack < 2l | 4.3 | 2,310 | 16,317 | 14 | France | 1,038 |
| | 220290 | Non-alcoholic beverages n.e.s., except fruit, vegetable juices | 14.4 | 624 | 3,957 | 16 | Netherlands | 256 |
| | 220710 | Undenatured ethyl alcohol > 80% by volume | 21.2 | 340 | 2,326 | 15 | Netherlands | 145 |
| | 240310 | Cigarette or pipe tobacco and tobacco substitute mixes | 74.9 | 88 | 2,473 | 4 | Netherlands | 53 |
| Vegetables, fruit and nuts | 070200 | Tomatoes, fresh or chilled | 21.2 | 572 | 4,261 | 13 | Netherlands | 274 |
| | 070700 | Cucumbers and gherkins, fresh or chilled | 28.1 | 178 | 1,351 | 13 | Netherlands | 98 |
| | 070951 | Mushrooms, fresh or chilled | 10.4 | 336 | 1,256 | 27 | Ireland | 186 |
| | 080520 | Mandarin, clementine & citrus hybrids, fresh or dried | 16.0 | 199 | 2,147 | 9 | Spain | 176 |
| | 070410 | Cauliflowers and headed broccoli, fresh or chilled | 13.6 | 188 | 695 | 27 | Spain | 149 |

Source: MAcMap-HS6 (2013) and BACI (Average flow 2013-2014-2015), Trade data expresses in millions of USD, MFN tariffs are expressed in percentage and aggregated MAcMap-HS6's weighting schemes. Authors' calculations.

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PHOTO CREDIT: iStock International Inc., Photodisk, Phovoir



ISBN 978-92-846-1986-3 (paper)
ISBN 978-92-846-1985-6 (pdf)

doi:10.2861/927200 (paper)
doi:10.2861/92351 (pdf)