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The trade impact of the UK's
exit from the EU Single
Market

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Abstract/Résumé

The trade impact of the UK's exit from the EU Single Market

This paper quantifies the sectoral trade impact in the United Kingdom and in EU countries of the UK's exit from the Single Market, using the OECD general-equilibrium METRO model. A comprehensive free-trade agreement could lead to a fall by about 6.1% of UK exports and 7.8% of UK imports in the medium term compared to a situation where the United Kingdom would stay in the Single Market. Cost would come essentially from rising technical barriers and sanitary and phytosanitary measures on goods and rising trade costs on services. Rules of origin and border transition costs would have a small effect. Output losses in the European Union (0.4-0.5%) are expected to be less pronounced, but would vary markedly across individual countries. Ireland would experience the largest losses. Losses would also vary across sectors. Accounting for the regulatory impact of ending free movement of people for EU nationals on services trade is expected to bring some additional costs to the services economy. Those losses could be partly compensated by growth-enhancing changes to UK regulations, but only to a limited extent.

Keywords: Brexit, free-trade agreement, general-equilibrium model.

JEL Classification: C68, F15; F47

L'impact commercial de la sortie du Royaume-Uni du marché unique de l'Union Européenne

Ce document quantifie l'impact commercial sectoriel au Royaume-Uni et dans les pays de l'UE de la sortie du Royaume-Uni du marché unique, en utilisant le modèle METRO d'équilibre général de l'OCDE. Un accord de libre-échange global pourrait entraîner une baisse d'environ 6,1% des exportations britanniques et de 7,8% des importations britanniques à moyen terme par rapport à une situation où le Royaume-Uni resterait dans le marché unique. Le coût proviendrait essentiellement de la hausse des barrières techniques et des mesures sanitaires et phytosanitaires sur les marchandises et de la hausse des coûts du commerce des services. Les règles d'origine et les coûts de transition à la frontière auraient un effet limité. Les pertes de production dans l'Union européenne seraient moins prononcées, mais varieraient considérablement d'un pays à l'autre et d'un secteur à l'autre. L'Irlande subirait les pertes les plus importantes. La prise en compte de l'impact réglementaire de la fin de la libre circulation des ressortissants de l'UE sur le commerce des services devrait entraîner des coûts supplémentaires. Ces pertes pourraient être en partie compensées par des modifications favorables à la croissance de la réglementation britannique, mais seulement dans une mesure limitée.

Mots Clefs: Brexit, accord de libre échange, modèle d'équilibre général.

Classification JEL : C68, F15; F47

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The trade impact of the UK's exit from the EU Single Market

By Christine Arriola, Sebastian Benz, Annabelle Mourougane and Frank Van Tongeren¹

Introduction

Leaving the European Union has been at the centre of the UK policy debate since the 2016 referendum. Existing analyses had to speculate on the modality of exit, given the lack of clarity on the shape of the future agreement between the United Kingdom and the European Union. With the entry into the transition phase and the start of the negotiations around the long-term relationships, the UK Government has indicated its willingness to move toward a Canada-style type of Free-Trade Agreement (FTA).

The objective of this paper is twofold. First, it focuses on the new direction the negotiations have been aiming at, namely the signature of an FTA, and compares it with a situation where the United Kingdom would remain in the EU Single Market. Although the precise details of the agreement are still to be pinned down and the magnitude of these costs are hard to estimate with precision, this paper seeks to provide an informed assessment of what the new FTA regime could imply and to identify the trade policy changes that are expected to bring the largest output losses. Second, while many existing assessments have focused on the economy-wide impact of Brexit, this paper highlights the heterogeneity of sectoral impacts, which reflects the production structure and degree of integration in global value chains both in the United Kingdom and in the EU countries.

This paper relies on the METRO model, the OECD computable general equilibrium (CGE) trade model, to quantify the impact of the United Kingdom leaving the EU Single Market under different assumptions. It builds on the model's detailed country and sectoral coverage to account for international and intersectoral spillovers. The work also updates the 2016 OECD estimates with more reliable information on the expected rise in non-tariff measures and their impact on trade costs, notably for services sectors building on a newly-designed services trade restriction index for intra-EU trade (Benz and Gonzales, 2019). While the METRO model is comprehensive in its coverage, it focuses solely on trade. FDI and productivity have been omitted from the analysis. In addition, the analysis is static in nature and focuses on the medium-term effects (5 to 10 years), omitting any transitional costs to a new trade agreement. Only the regulatory implications of migration flows on services trade have been incorporated in the analysis. Finally, the paper does not take into account stress on the economy as a result of COVID-19, which may result in structural changes in the economy in the medium to long term. Insights from the impact of the COVID-19 crisis on UK trade can be found in OECD (2020a).

A free trade agreement between the United Kingdom and the European Union could mean no tariff and no quotas applied on goods. However, trade will not be fully free but subject to a range of costs. Those include border costs (customs procedures), technical barriers to trade and sanitary and phytosanitary measures (to verify food and sanitary regulations of the country they enter into are met), rule-of-origin (to check the genuine origin of the imports and prevent fraud) and costs from behind the border regulations (to check imports meet standards and regulations to be sold in the country they enter into). For the sake of simplicity, financial services are assumed to experience a similar increase in trade costs as business services and a discussion on the negotiations regarding equivalence to access EU financial markets is beyond the scope

¹ The authors are from the OECD Trade and Agriculture Directorate. They would like to thank Sebastian Barnes, Sophie Guilloux-Nefussi, Donal Smith and colleagues from HMT for their comments, and Emanuele Mazzini, Eun Jung Kim and Michelle Ortiz for their excellent assistance.

of the paper. No new agreement between the United Kingdom and non-EU countries is assumed and existing market access to non-EU WTO members does not change. Strictly speaking, the agreement considered here could be classified as a preferential rather than a free trade agreement.

The main insights from the simulations are as follows:

- An agreement on a comprehensive FTA could lead to a fall by about 6.1% of UK exports and 7.8% of UK imports in the medium term compared to a situation where the United Kingdom would stay in the Single Market. The overall medium-term output loss would amount to 3.5%.
- About two-thirds of the output loss would come from rising technical barriers and sanitary and phytosanitary measures on goods, as related regulations between the United Kingdom and the European Union are assumed to diverge over time. The remaining one-third stems from higher restrictions on services. Rules of origin and higher border transactions costs (lower level of trade facilitation) would have an additional small negative effect.
- Accounting for the regulatory impact of ending free movement of people for EU nationals on services trade is expected to bring some additional 0.7 percentage point costs to the services economy, with output losses reaching 4.3% in the medium term. This is a lower bound, as the consequences on international migration and labour supply are omitted.
- Those losses could be partly compensated by growth-enhancing changes to UK regulations, but only to a limited extent. There is some room to take action on the cost and speed of visa deliverance, procurement rules, cross-border data and foreign direct investment screening. These reforms do not make up for the higher trade barriers with the European Union and output losses would still amount to 3.2% in the medium term.
- Output losses in the European Union are expected to be less pronounced than in the United Kingdom, ranging from 0.4 to 0.5% in the medium term, but would vary markedly across countries. Ireland would experience the largest losses, while countries with loose trade links with the United Kingdom would barely be affected.
- The decline in trade would not be uniform across sectors. European Union member states would import less professional services such as financial services and insurance, communication, and other business services. Ending the free movement of EU workers would further deepen the decline in services trade.

The paper is organised as follows. The next section reviews selected studies on Brexit, and highlights the main challenges in quantifying the impact of leaving the Single Market. The subsequent sections present the OECD METRO model and detail the underlying assumptions behind the various scenarios. Simulations outcomes are subsequently presented, for the United Kingdom and for the European Union and its individual members. A final section concludes.

Review of selected studies on the impact of Brexit

This review aims to underline the main insights from the literature on the impact of Brexit, without being exhaustive, and to highlight the main limits most empirical approaches face in estimating the impact of Brexit. Since the announcement of the 2016 Referendum, economic analyses have examined some of the likely economic consequences of Brexit for the United Kingdom and other European countries both in the near and long term. A number of official bodies, international organisations, academics (Dhingra et al. 2016; Levell et al., 2018, Dhingra and Sampson, 2019) as well as private banks have published estimates. Most authors have simulated a range of scenarios, including a free-trade agreement and a Norway-type of agreement (EEA, combining a free-trade with some form of Single Market), as well as a no-deal scenario i.e. trade between the United Kingdom and EU economies being conducted under the terms of the World Trade Organisation (WTO). There is also evidence that the announcement of Brexit has had an impact on the economy, in particular investment (Box 1).

Box 1. The effects of the announcement of Brexit on economic performance

Economic performance since 2016 has been marked by the decision to leave the European Union. Brexit is primarily a shock to the UK's long-run productivity and employment, but it is impacting demand in the nearer term through uncertainty and expectations.

While it is difficult to assess precisely the impact of the referendum on growth, comparing actual GDP with pre-referendum OECD projections for the United Kingdom and with developments in the United States, France and Germany gives a sense of how much UK performance has diverged from the path that might otherwise have prevailed. This suggests that UK GDP was between 1.5 and 2.8 % lower by the last quarter 2019 than might otherwise have been (Figure 1). This is consistent with other existing estimates (Vlieghe, 2019; Born et al., 2019; Dhingra and Sampson, 2019). Turning to prices, inflation has risen relative to pre-referendum expectations, reflecting mostly the large currency depreciation following the referendum. According to Breinlich et al. (2019), the depreciation of the pound following the 2016 referendum increased UK consumer prices by 2.9% by June 2018.

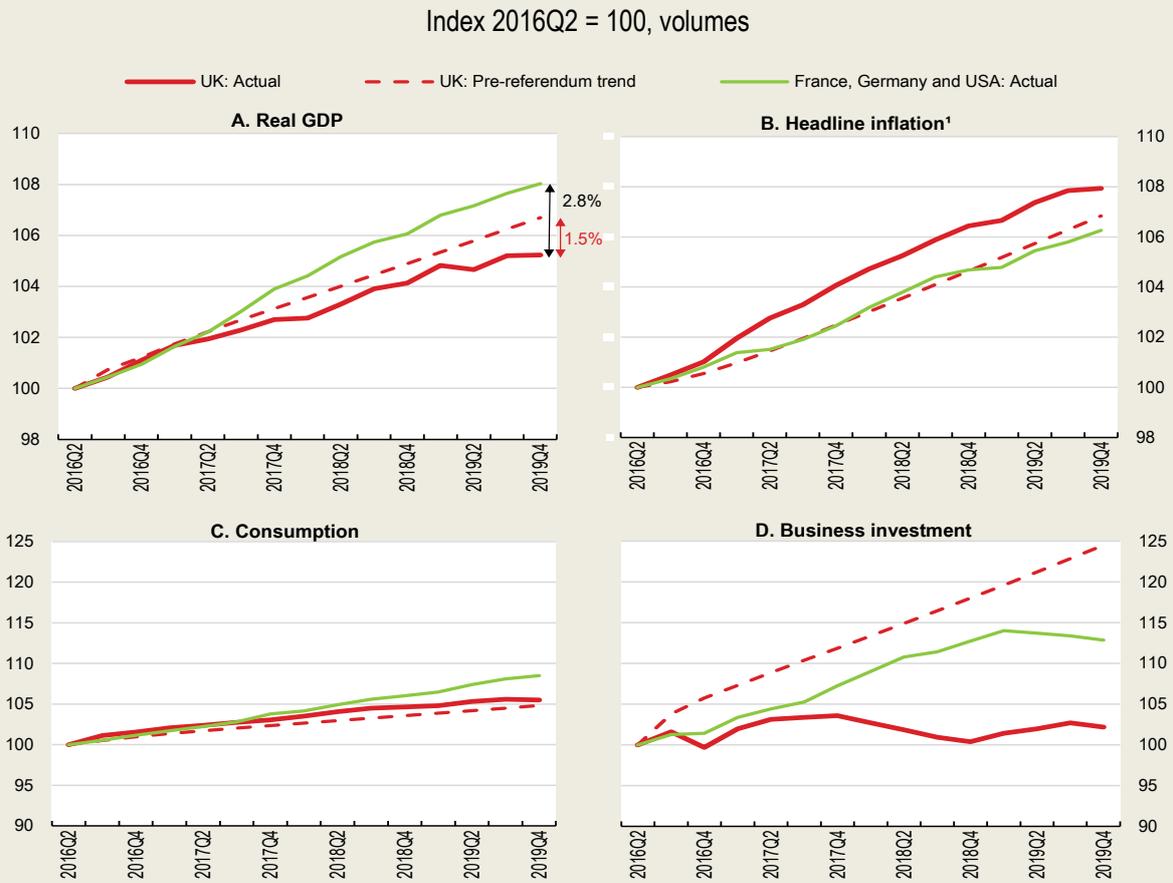
Stagnant business investment growth has led the slowdown. Private investment is estimated to be between 11 and 22 % lower than what it would have been without the Brexit vote (Figure 1). Firms were around 11 % less likely to increase expected expenditure on IT, vehicles, plants and machinery and on land and buildings in the period after the referendum (de Lyon and Dhingra, forthcoming). There is increasing evidence that the sluggishness in investment reflects to a large extent Brexit-related uncertainties (Melonina, Miller and Tatomir, 2018; Bloom et al., 2018; Bloom et al., 2019; Trapier, 2019). Brexit-related uncertainties are also estimated to have reduced UK productivity by between 2% and 5% over the three years after the referendum (Bloom et al., 2019).

By contrast, household consumption has been holding up, reflecting strong employment gains and a low and broadly stable saving ratio. Exports were stronger than expected before the 2016 referendum up until mid-2018 reflecting the fast currency depreciation that followed the vote. The effects of the depreciation have faded steadily over time and lower growth in key European trading partners is now weighing on UK exports. Another explanation for the lack of export growth is that the likelihood of future increases in trade barriers between the United Kingdom and the European Union has made firms reluctant to invest in increasing their export capacity (Crowley et al., 2018). Imports do not appear to have underperformed as would be expected given currency movements and the general slowdown in domestic demand.

Up until the COVID-19 shock, labour markets have been resilient, despite disappointing economic growth. Employment has been growing at a faster pace than previously expected. This could suggest that firms have responded to demand by hiring rather than investing. Businesses have also absorbed some of the increased costs of imports by lowering worker wages and investment in training (Costa et al., 2019).

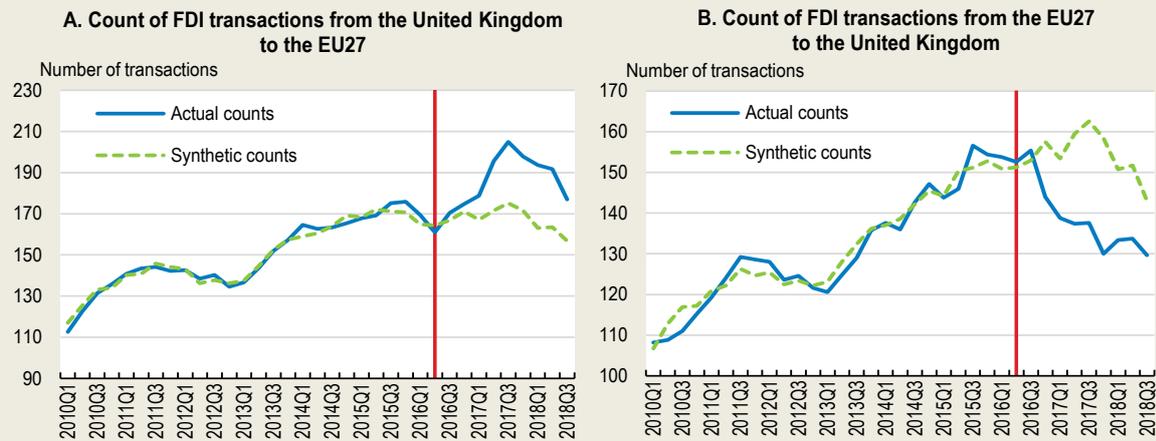
Abstracting from mergers and acquisitions, greenfield investment flows into the United Kingdom were weak throughout 2016 and 2017. Estimates from Breinlich et al. (2019) suggest that the 2016 referendum has led to a 12 % increase in the number of new foreign direct investments made by UK firms in EU countries (Figure 2). At the same time, the number of announced investments in the United Kingdom from the European Union is estimated to have declined by 11 %. Although other factors may be at play, developments in FDI flows since the referendum have been consistent with the idea that UK firms are offshoring production to the European Union because they expect Brexit to increase barriers to trade and migration.

Figure 1. GDP is lower than it would have been without the Brexit vote



1. Harmonised consumer price index. Unweighted average of France, Germany and United States.
 Source: Calculations based on OECD (2020), OECD Economic Outlook: Statistics and Projections (database).

Figure 2. FDI transactions into the United Kingdom have fallen



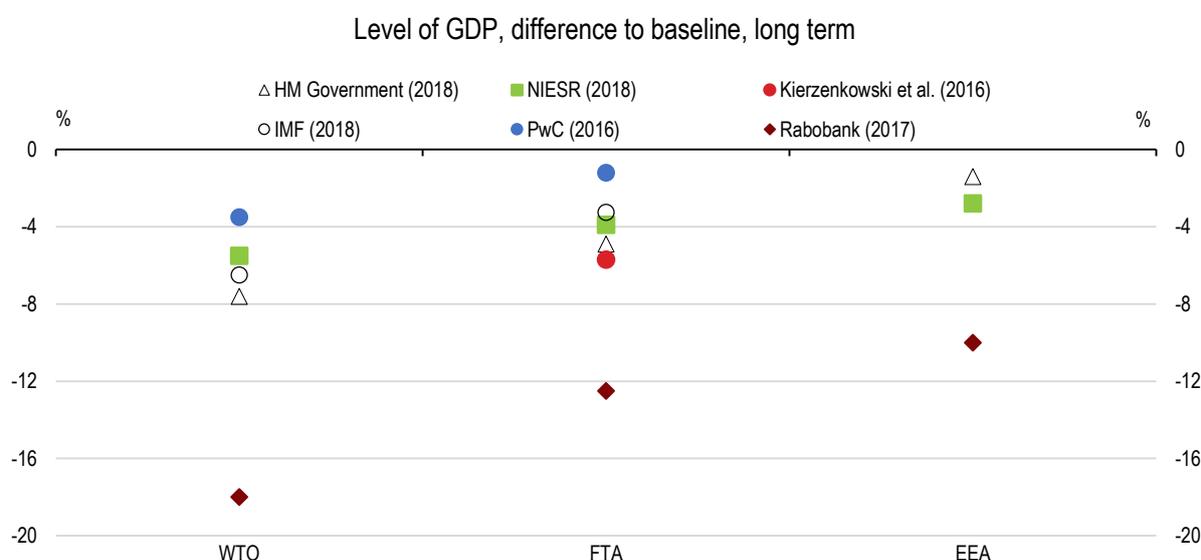
Source: Breinlich et al. (2019).

Those exercises are extremely challenging, one reason being that it is hard to predict the depth of economic relationship between the European Union and the United Kingdom that will emerge from the negotiations. Even if this information was known, the precise effects of exiting the EU Single Market are hard to quantify, not least because there is no relevant precedent for a major developed economy leaving such a large and highly-integrated trading bloc, after almost 50 years of membership. Using the various studies that looked at the gains of entering the Single Market are unlikely to be very informative, as UK firms have built up close economic relationships within the European Union that may not be reversed once the United Kingdom leaves.

Despite those caveats, a number of insights have emerged from the literature. Estimates around the long-term impact of Brexit for the United Kingdom vary a lot across institutions and authors, but all those reviewed point to some costs (Figure 3; Bisciari, 2019). Some analyses have found positive impact, but reflect assumptions of a significant fall in MFN tariffs in the United Kingdom, of strong positive output effect from moving away from EU regulations, of gains from ending free movement of low-skilled EU nationals and from ending UK contributions to the European Unions after the transition period (Minford, 2019).

A second feature that is common in most studies is that the ranking between the different options is always similar, implying that the more integrated the United Kingdom stays in the Single Market the less costly Brexit is expected to be (Figure 3, ECB, 2020). There is also evidence that sectors, such as the automobile sector, whose supply chains are highly integrated with EU countries, will experience the most severe losses (Arriola et al., 2018).

Figure 3. Brexit costs decrease with the degree of UK-EU integration



Note: Mid points are used when ranges are presented in the analysis.

Source: HM Government (2018), NIESR (2018), Kierzenkowski et al. (2016), IMF (2018), PwC (2016), and Rabobank (2017).

By leaving the EU Single Market, the United Kingdom will regain the capacity to negotiate trade agreements with non-EU countries. However, the potential gains from these deals are estimated to be small and far from being able to compensate from the loss of the current market access to the European Union market and increase in trade costs (Kierzenkowski et al., 2016; HM Government, 2018). In addition negotiating a set of comprehensive agreements is likely to take some time.

The scope of further liberalising UK markets once the United Kingdom is no longer required to meet EU rules is also estimated to be relatively limited, as the United Kingdom already has one of the OECD's least regulated product and labour markets (Kierzenkowski et al., 2016; Dhingra et al., 2016). An exception to this is the services sector, where there is scope to liberalise in most OECD countries. In particular, the United Kingdom could make greater use of existing margins to liberalise policies related to movement of people (OECD, 2020b). However, leaving the EU Single Market will necessarily translate into an increase in restrictions for EU migrants to enter the UK markets.

Long-term estimates of leaving the EU Single Market are conditioned on several key assumptions regarding international migration flows, movements in foreign-direct investment and the assumed impact of trade on productivity. The latter assumption is particularly important. Accounting for productivity effects could double or triple the cost of Brexit for the United Kingdom, as productivity directly impacts long-term output (Migration Advisory Committee, 2018; Boubtane, Dumont and Rault, 2014; Dhingra and Sampson, 2019).

Estimates around the short-term effects are even more difficult to compute than long-term effects. In addition to making assumption on the nature of the agreement that is going to prevail, the quantification of short-term effect requires to speculate about the nature and the length of the transition path toward the new equilibrium. This is particularly challenging, as there is little insight on how the different agents - households, firms, investors – are going to react to this unprecedented situation.

All the studies found that the United Kingdom is expected to suffer from much more pronounced losses than the combined EU countries (Dhingra et al. 2016; Arriola et al., 2017; Smith et al., 2018; Smith et al., 2019, Levell et al., 2018). Most analyses identify Ireland as the EU country which will experience the most pronounced negative impact, reflecting the Irish geographical proximity and deep economic integration with the United Kingdom (Arriola et al., 2017). Other economies such as Denmark or the Netherlands would also suffer from some significant losses, given their integration in UK supply chains (Smith et al., 2018; and Smith et al., 2019). In all these countries, losses stem from a reduction in trade with the United Kingdom, absent any change in foreign direct investment (FDI) or productivity, but there is also a decline in exports to the other remaining EU countries.

Another common feature of those analyses that report a sectoral breakdown is to underline the high degree of heterogeneity in the impact across sectors. In Ireland, Denmark and the Netherlands, agriculture and food sectors appear to be amongst the most affected sectors. A number of sectors are expected to benefit from diverted trade such as the EU motor vehicles sector, as well as the financial sectors which could benefit from the loss of UK passporting rights.

Main features of the METRO model

The METRO model is a computable general equilibrium (CGE) model calibrated for this analysis to 30 regions (with most of the remaining EU members disaggregated), 19 sectors, and 8 production factors (OECD, 2020b). The simulations represent medium-term shocks where production factors are mobile across sectors, but the overall endowment of labour and capital remain fixed.

METRO, like many CGE models, rely on a comprehensive specification of all economic activity within and sometimes between countries (and therefore the different inter-linkages that tie these together). The model builds on the GLOBE model developed by McDonald and Thierfelder (2013). The novelty and strength of METRO lies in the detailed trade structure and the differentiation of commodities by end use. Specifically, commodities and thus trade flows are distinguished by whether they are destined for intermediate use, for use by households, for government consumption, or as investment commodities.

The underlying framework of METRO consists of a series of individually specified economies interlinked through trade relationships. As is common in CGE models, the price system is linearly homogeneous, with a focus on relative, not absolute, price changes. Each region has its own numeraire, typically the consumer

price index, and a nominal exchange rate (an exchange rate index of reference regions serves as model numeraire). Prices between regions change relative to the reference region.

The database of the model relies on the GTAP v10 database (Aguilar et al., 2019) in combination with the OECD Inter-Country Input-Output Tables, which are the main source of the OECD Trade in Value Added Indicators and allows the model to distinguish trade for use in intermediate production or final demand. Policy information combines tariff and tax information from GTAP with OECD estimates of non-tariff measures on goods (Cadot et al, 2018), services (Benz and Gonzales, 2019; Benz and Jaax, 2020), trade facilitation (OECD, 2018) and export restricting measures. The METRO database contains 65 countries and regional aggregates and 65 commodities.

The model is firmly rooted in microeconomic theory, with firms maximising profits and creating output from primary inputs (i.e. land, natural resources, labour and capital), which are combined using constant elasticity of substitution (CES) technology, and intermediate inputs in fixed shares (Leontief technology). Households are assumed to maximise utility subject to a Stone-Geary utility function, which allows for the inclusion of a subsistence level of consumption. All commodity and activity taxes are expressed as *ad valorem* tax rates, and taxes are the only income source to the government.

Monetary and fiscal policies are assumed to remain unchanged. Nominal interest rates are unchanged. The UK Government is assumed to maintain its pre-simulation fiscal position by adjusting expenditures as necessary. The impact of the divorce Bill and of the benefits to the UK public finances of removing future contributions are not incorporated in the various scenarios, given the focus on trade impacts and the lack of information on policy choices on how benefits are going to be used. As revenues are also likely to fall, following the decline in output, some estimates point to a substantial reduction in funds available for public spending (Bevington et al., 2019). Those estimates are nevertheless surrounded by large uncertainties.

In the simulations, the trade balance is fixed and the nominal exchange rate is flexible. Wages are assumed downwardly rigid, but remuneration rates of all other factors (land, capital, natural resources) are assumed to adjust

Simulation design

This section presents the assumptions underlying the simulations of the economic consequences for the United Kingdom of leaving the Single Market and enter a free trade agreement (FTA) with the European Union. Three scenarios are considered and compared to a baseline where the United Kingdom would have stayed within the Single Market:

- Scenario 1: the European Union and the United Kingdom agree on a FTA, with no change on free movement of people
- Scenario 2: FTA combined with the impact on services regulations of ending free movement of people for EU nationals into the United Kingdom
- Scenario 3: Scenario 2 combined with some regulatory liberalisation in the United Kingdom

The analysis focuses on the trade impact, leaving aside non-EU migration flows, movements in foreign-direct investment and the possible impact of trade on productivity. The focus of the analysis is on medium-term effects. Short-term transitional behavioural changes to adapt to the new agreement are not considered in the analysis.

No new agreement between the United Kingdom and non-EU countries is assumed and existing market access to non-EU WTO members does not change. The UK Government's own analysis suggests that, even on optimistic assumptions about the UK's ability to conclude new trade agreements in addition to rolling over all existing agreements, the positive impact on GDP after 15 years would only be about 0.1-0.2%. In the simulations, access to the UK market by non-EU WTO members is governed by the UK MFN

schedule submitted to WTO in 2018. New schedules have been submitted in 2019 and 2020, but changes have been punctual and would not alter qualitatively the findings.

In a first scenario, the European Union and the United Kingdom agree on an FTA

Even if it entails zero tariff and quota, leaving the Single Market for an FTA entails costs for export and import firms in both the United Kingdom and the European Union. These include non-tariff measures (NTM), such as technical barriers to trade and sanitary and phytosanitary measures for goods and services, costs from rules-of-origin and border-crossing costs. As the two regions would no longer be bound to maintain the same regulations and rules, regulatory divergence could add additional costs to producers engaging in trade between the United Kingdom and the European Union.

The increase in trade cost due to divergence of non-tariff measures is assumed to be 50%² of the *ad valorem* equivalent of these measures³ on goods imported into the European Union from third countries. The increase in NTM costs on goods, which covers technical barriers to trade (TBT) and sanitary and phytosanitary (SPS) measures, have been calibrated using Cadot et al. (2018) and are presented in Table 1. Amongst the NTMs on goods, motor vehicles, part and transport equipment, agriculture and food and textiles, wearing apparel and leather products display the higher expected increase in trade costs.

Table 1. Increase in non-tariff measures in goods sectors

Per cent, Difference to baseline

Commodity	Assumed trade cost increase
Agriculture and food	6.9
Natural resources including coal and petro products	0.0
Textiles, wearing apparel, and leather products	6.1
Other manufacturing	5.3
Chemical rubber plastic products	4.8
Pharmaceutical products	2.0
Minerals, metals, & metal products	2.3
Computer, electronic and optical products	3.3
Machinery and equipment not elsewhere classified	2.8
Motor vehicles, parts, and transport equipment	8.9

Note: Non-tariff measures include technical barriers to trade and sanitary and phytosanitary measures applied to goods imported into the European Union. The assumed increase in import costs related to these measures is equivalent to half the traded weighted average of the NTM AVE estimates in each sector.

Source: OECD calculation using Cadot et al (2018).

As with trade in goods, services exporters face increasing cost of complying with regulations if they diverge. Expected services trade costs have been computed using half of the difference between the intra-EEA Services Trade Restrictiveness Index (STRI) and the STRI which applies to most-favoured nations (Benz and Gonzales, 2019; OECD, 2020c; Figure 4). In the telecommunication sector for instance this would

² The motivation for the 50% rate on the estimated tariffs is outlined in Kierzenkowski et al. (2018) and Berden et al. (2009) who estimated that in an optimistic scenario looking at a transatlantic trade deal that a 50% reduction in NTMs across goods and services could be achieved.

³ The *ad valorem* equivalent (AVE) of an NTM is the proportional rise in the domestic price of the good due to the presence of the NTM (Cadot et al., 2018), and it represents the additional cost of importing the good because of the measure.

represent an increase of more than 50% in the STRI. Those differences are subsequently translated into trade costs using Benz and Jaax (2020) and estimates from gravity models. This approach could not be followed for financial services which are not well covered by the STRI. Given the lack of clarity on the likely outcome of the negotiations with the EU regarding equivalence, a simple assumption has been made and, the cost increase in this sector is calibrated using information on other business services. No increase in trade costs is assumed in other services (real estate activities; recreational and other services; and dwellings). Resulting costs are reported for the United Kingdom and the European Union in Table 2. Implied increases in trade costs are substantial, especially for the transport, business services and finance and insurance sectors.

Table 2. Increase in trade costs in services sectors

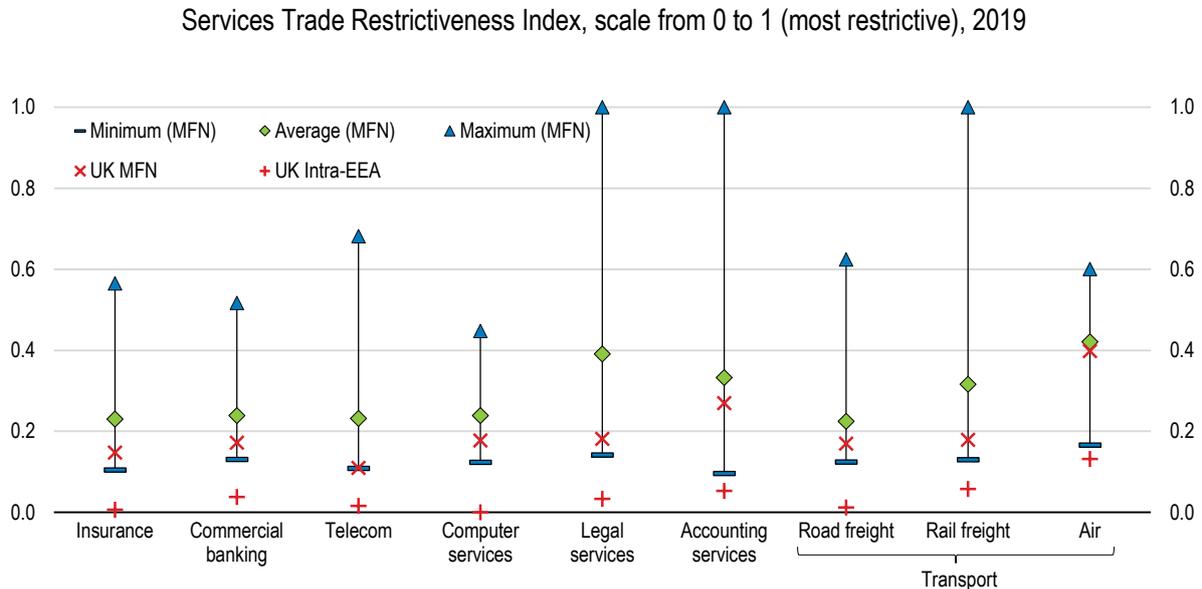
Per cent, difference to baseline

	FTA	+end of free movement of people	+further service liberalisation	
United Kingdom				
	Vis-à-vis EU27	Vis-à-vis EU27	Vis-à-vis EU27	MFN
Communication	7.4	11.7	0.9	-11.5
Business services not elsewhere classified	10.1	18.1	7.0	-13.2
Finance and insurance	10.1	18.1	7.0	-13.2
Transport	13.1	19.1	9.0	-11.3
Construction	10.2	16.3	5.6	-12.0
Trade	10.2	16.3	5.6	-12.0
Public Services	10.2	16.3	5.6	-12.0
European Union				
	Vis-à-vis United Kingdom	Vis-à-vis United Kingdom	Vis-à-vis United Kingdom	MFN
Communication	7.7	12.5	12.4	0.0
Business services not elsewhere classified	11.4	21.3	21.3	0.0
Finance and insurance	11.4	21.3	21.3	0.0
Transport	13.2	20.1	20.1	0.0
Construction	10.8	18.0	17.9	0.0
Trade	10.8	18.0	17.9	0.0
Public Services	10.8	18.0	17.9	0.0

Note: The cost increase of financial services is calibrated using information on business services not elsewhere classified. Estimates for the first scenario capture the increase in services trade costs due to regulatory divergence. The second set of estimates include the additional cost related to ending the free movement of EU workers. The third scenario assumes that while there may be some regulatory divergence, certain UK regulations in the services sector are less restrictive than even before Brexit. For example, costs and amount of time to process visas are reduced as well as regulations related to procurement, cross-data transfers and screening. Estimates of the trade cost increase for the European Union presented in the table is a simple average of those applied in the model which varies by individual member states.

Source: Calculations using Benz and Jaax (2020) and Benz and Gonzales (2019).

Figure 4. Restrictions on trade in the services sector will rise when the United Kingdom leaves the Single Market



Note: STRI indices are calculated on the basis of the STRI regulatory database which contains information on regulation for the 37 OECD Members, Brazil, China, Costa Rica India, Indonesia, Malaysia, Russia, Thailand and South Africa. The Intra European Economic Area STRI covers 25 countries and 22 sectors. For more methodological information, refer to Benz, S. and F. Gonzales (2019).

Source: OECD (2020), "Service Trade Restrictions Index by services sector" and "Intra-EEA Services Trade Restrictiveness Index" in OECD Industry and Services Statistics (database).

Under any FTA, rules of origin are required to ensure that the favourable access granted between countries is not used for trade from third-parties to bypass their arrangements with either of the economies concerned. Rules of origin are generally used to determine the national source of a product and, together with maximum import content requirements, determine whether it qualifies for tariff-free entry. Under a new UK-EU FTA, UK firms would face rules-of-origin obligations when exporting to the European Union. In the simulations, rules-of-origin costs are borne by the exporter and applied as an export tax. Following Petri and Plummer (2016), the increase in export taxes are assumed to equal 10% of the tariff reductions achieved when entering a FTA (10% of EU MFN tariffs). The assumed cost increase due to rules of origin is small (1% or less). The top sectors facing increased costs include the textile and wearing apparel industry, agriculture and food, chemicals, and the motor vehicles and parts (1.0%, 0.6%, 0.5% and 0.5% respectively).

Increased customs checks and border delays between the European Union and the United Kingdom are expected to weigh on border costs. The OECD Trade Facilitation Indicator (TFI) is used to measure the cost of border disruptions. The trade facilitation policy changes are captured through *ad valorem* equivalents which express the value associated to a reduction in clearance delays triggered by improvements in border procedures (OECD, 2016). For the simulation, the increase in cost from border delays are computed as the difference between the *ad valorem* equivalent of the OECD TFI of EU countries and non EU countries and is applied as an iceberg cost where, at a given price, only a portion of the goods shipped arrive at the destination. The cost increase is the portion of the shipment exported but not received by producers in the importing country. The estimated border costs increases are reported in Table 3. Those costs tend to be small, for most products. They are higher for some manufacturing products, in particular sectors with complex global value chains such as motor vehicles, and nil or close to zero for agriculture, food natural and pharmaceuticals products.

Table 3. Border cost increase

Per cent, 2015

United Kingdom importing from European Union 27 (EU27)	
Agriculture and food	0.2
Natural resources including coal and petro products	0.0
Textiles, wearing apparel, and leather products	0.4
Other manufacturing	0.5
Chemical rubber plastic products	0.6
Pharmaceutical products	0.0
Minerals, metals, & metal products	0.3
Computer, electronic and optical products	0.4
Machinery and equipment not elsewhere classified	0.5
motor vehicles, parts, and transport equipment	0.7
EU27 importing from the United Kingdom	
Agriculture and food	0.2
Natural resources including coal and petro products	0.0
Textiles, wearing apparel, and leather products	0.4
Other manufacturing	0.5
Chemical rubber plastic products	0.6
Pharmaceutical products	0.0
Minerals, metals, & metal products	0.3
Computer, electronic and optical products	0.4
Machinery and equipment not elsewhere classified	0.5
motor vehicles, parts, and transport equipment	0.6

Note EU 27 is averaged across uses and EU partners for presentation purposes.

Source: Calculations using the OECD TFI.

A second scenario adds the regulatory impact of ending free movement of EU nationals on services costs

Ending free movement for EU nationals, as clearly stated in the political declaration, is estimated to bring additional output losses (HM Government, 2019). The UK Authorities have announced they will overhaul the UK immigration system, with changes expected to be put in place from 2021 (HM Government, 2020). These are expected to end free movement of EU nationals, who will be subject to the same rules as non-EU nationals. This will mean in practise a marked fall in EU low-skilled workers migration to the United Kingdom, who used to have free access to the UK labour market. Experience to date suggests that work-related migration from outside the EU may partially compensate for lower EU migration. These changes are likely to impact sectors differently. Sectors, such as the hospitality and personal care sectors, which rely disproportionately on EU migrants are likely to be particularly affected in the short to medium term.

Against this background, this scenario focuses on the implications of ending free movement of EU nationals on services trade costs. It adds to the move into a FTA the consequences on service trade costs of adding labour-market tests and quotas for intra-corporate transferees, contractual services suppliers and independent services suppliers. The scenario assumes that services providers can only enter the United Kingdom based on a list of shortage occupations, economic impact test, domestic advertisement of a position, salary threshold or similar mechanisms and that the number of such providers entering in a given year is limited by a binding quota. This is calibrated using the STRI framework. Similarly to what is done in the first scenario, trade costs in the services sectors are then derived following Benz and Jaax (2020). They are reported in Table 2.

An important caveat to keep in mind is that those estimates are only a lower bound of the estimates of ending free movement of people, as the consequences on international migration and labour supply are not accounted for and only trade in services is assumed to be affected in this scenario.

A last scenario examines the effect of some services liberalisation in the United Kingdom

A third scenario combines the second scenario with the liberalisation of some UK regulations in services sectors. These relate to the costs and speed of the visa process, but also to procurement rules, cross-data transfers and foreign investment screening. Regulations in these areas are assumed to be fully liberalised. About 70% of these reforms could have been introduced while staying in the European Union (e.g. measures related to public procurement). Such policy moves would affect trade with all UK partners, not just the European Union. Across sectors, services costs vis-à-vis MFN partners would decline by more than 10% (Table 2). The approach to calibrate those costs is similar to the one used in the previous scenarios, using the STRI framework to infer the impact on the stringency of regulation and translating this decrease into trade costs following Benz and Jaax (2020).

Simulation outcomes

Effects on the United Kingdom

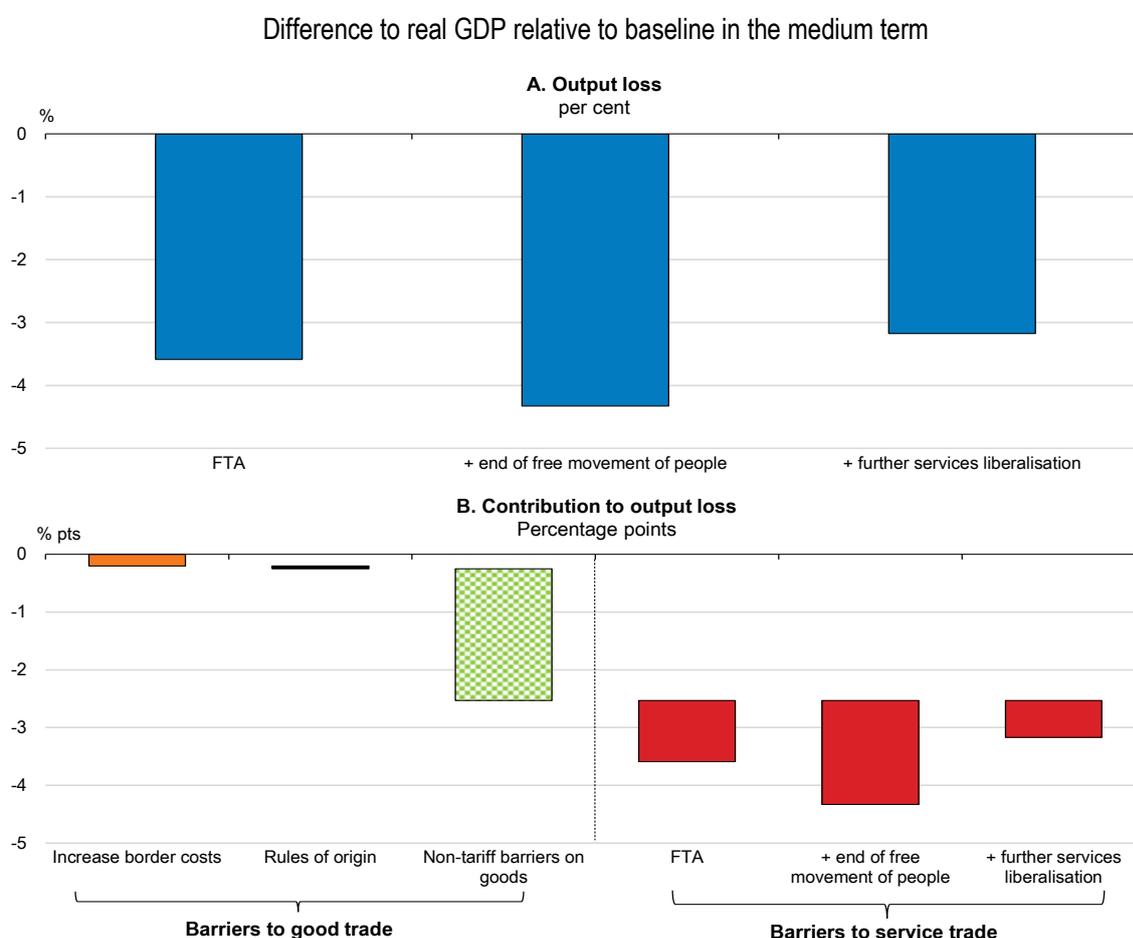
Output losses would be significant

The simulations suggest that moving to a FTA could lead to a fall by about 6.1% of UK exports and 7.8% of UK imports in the medium term, compared to a situation where the country would stay in the Single Market. UK goods exports will face higher compliance costs stemming from having to show compliance with EU regulations, border delays and rules-of-origin requirements.

The overall output loss would amount to 3.5% (Figure 5). This is considerably less than in a no-deal situation, but still significant especially as the simulation omits the productivity channel which is found to magnify the impact (Migration Advisory Committee, 2018; Boubtane, Dumont and Rault, 2014; Dhingra and Sampson, 2019). Those losses appear to be within the range of estimates reported in Kierzenkowski et al. (2016), HM Government (2018) and Dhingra and Sampson (2019). Looking at the factors that contribute the most to the output losses, about two-thirds of the cost would come from rising technical barriers and sanitary and phytosanitary measures on goods, as related regulations between the United Kingdom and the European Union diverge overtime. The remaining one-third stems from higher restrictions on services. Rules-of-origin and lower level of trade facilitation would have a small effect.

Ending free-movement of people for EU nationals is expected to bring additional costs to the services economy, with output losses reaching 4.3% in the medium term in the United Kingdom, some 0.7 percentage point higher than in the scenario without the end of free movement of people. Impacts on both trade and the domestic side would worsen. As indicated above, these estimates do not account for the impact on labour supply and likely underestimate the true impact. To give some order of magnitude, a 50% reduction of EU migration of those earning more than GBP 30 000, together with a 75% reduction of those earning less and a 25% increase in the number of non-EU migrants earning more than GBP 30 000 has been estimated to bring a GDP loss of about 1.4% to 1.8% in the long term (Levell et al., 2018). Those losses would be lower, amounting to 0.2-0.6% in a more liberal scenario, assuming reductions of a third and two-thirds for high and low-paid EU migrants respectively, and increases of 10% and 50% for low- and high-paid non-EU migrants (Bevington et al., 2019).

Figure 5. Higher non-tariff barriers and barriers to services trade under a free-trade agreement will lead to lower incomes than under EU membership



Note: FTA means that the UK enters into a no-quotas no-tariffs free trade agreement. “end of free movement of people” incorporates the regulatory costs of ending free entry of EU nationals into the UK labour market. “Further liberalisation” is a scenario where the United Kingdom takes measures to ease access to services markets. Those measures apply to all the UK trade partners.

Source: OECD METRO model.

Table 4. Impact on demand and supply components in the United Kingdom

Per cent, difference to baseline

		FTA	+end of free movement of people	+further service liberalisation
Real GDP		-3.53	-4.25	-3.15
Final Domestic Demand -		-4.12	-4.98	-3.51
	Private consumption	-2.86	-3.48	-2.37
	Government consumption	-7.94	-9.62	-6.87
	Investment	-4.46	-5.33	-3.96
Goods and services Import		-7.82	-9.32	-5.56
Goods and services Export		-6.10	-7.12	-4.48
Domestic production		-3.88	-4.65	-3.27
Intermediate use		-4.25	-5.08	-3.44

Source: OECD METRO model.

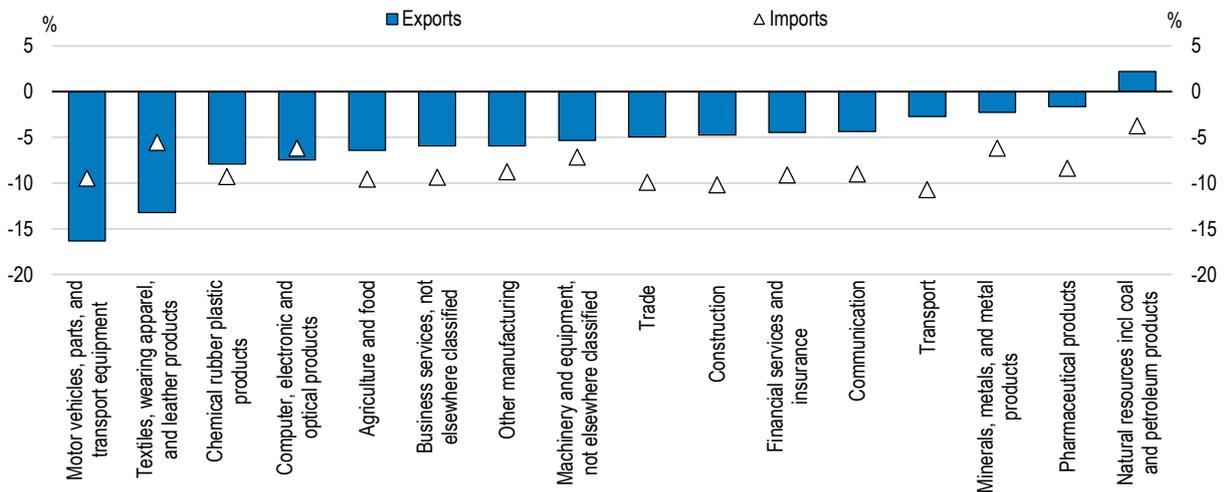
By contrast, services liberalisation would help to mitigate the trade losses from leaving the Single Market, on the trade side, but only to a limited extent. Reforming the price and speed of visa deliverance, together with changes to ease government procurement, screening or cross border data flows do not make up for the higher trade barriers with the European Union. Output losses would amount to 3.2% in the medium term. Even with these measures, all GDP components would continue to experience a marked decline compared to baseline.

The automobile and textile sectors would be the most affected

The impact of leaving the Single Market to enter an FTA would vary markedly across sectors, reflecting the different degrees of openness and other structural differences. In the UK goods sector, motor vehicles, part and transport equipment and to a lesser extent chemical would experience the largest falls in exports (Figure 6).

Figure 6. Export and import losses vary across sectors

Difference to baseline, exports and imports in the medium term



Note: Based on FTA.
Source: OECD METRO model.

Output losses in the services sectors would range from 2 to 7% in the medium term, with losses above 3% reported in key sectors, such as finances, business services, communications and construction (Table 5). The high integration of manufacturing in global value chains and the rise in compliance costs for goods, despite the comprehensive FTA agreement explain the larger fall experienced by some of the good sectors compared to the services sectors.

Large uncertainties surround results on the financial sector, as the extent of the impact will depend to a large extent on the outcomes of the negotiations on financial services and equivalence. Using different assumptions than those presented here, Dhingra and Simpson (2019) predict that financial intermediation will experience relatively greater losses.

Calculations using a standard Okun law also suggest that workers would be unevenly affected. In particular, unemployment is expected to rise by around 1 percentage point on average across sectors. The rise would be particularly marked in in the motor vehicle, part and transport equipment.

Leaving the Single Market is expected to have a differentiated impact in the four UK nations, reflecting their degree of openness, structure of trade and their job intensity (OECD, 2020). The North East and North Midland of England and Wales, which are specialised in manufacturing exports will be particularly affected by the expected fall in manufacturing trade in the move to a FTA. London and South England are the regions most exposed to a disruption in trade in services and have large employment shares in service sector industries such as financial intermediation. Those are also the regions which attract about half of the FDI projects and where jobs are concentrated (OECD, 2020c). The extent of the disruption in these regions will depend essentially on outcomes of the negotiations on financial services and equivalence. Thiessen et al. (2019) show that leaving the Single Market is likely to increase regional disparities.

Table 5. Output losses by sectors in the United Kingdom

Per cent, difference to baseline

	FTA	+end of free movement of people	+further service liberalisation
Agriculture and food	-2.82	-3.39	-1.60
Natural resources including coal and petro products	-0.29	-0.35	0.49
Textiles, wearing apparel, and leather products	-6.39	-6.58	-3.31
Other manufacturing	-3.18	-3.86	-1.20
Chemical rubber plastic products	-3.82	-3.94	-0.66
Pharmaceutical products	-1.65	-1.66	2.38
Minerals, metals, and metal products	-3.10	-3.27	0.48
Computer, electronic and optical products	-5.13	-5.07	0.17
Machinery and equipment not elsewhere classified	-3.98	-4.08	-0.29
Motor vehicles, parts, and transport equipment	-9.59	-9.74	-7.54
Utilities	-4.38	-5.28	-3.50
Construction	-4.26	-5.15	-3.87
Trade	-3.02	-3.64	-2.62
Transport	-2.44	-2.99	-3.46
Communication	-3.65	-4.61	-4.00
Financial services and insurance	-2.93	-4.01	-3.53
Business services not elsewhere classified	-3.96	-5.16	-5.48
Public Services	-6.93	-8.40	-6.17
Other services	-1.97	-2.50	-1.56

Source: OECD METRO model.

Effect on the European Union

Output losses in the European Union would be less than that in the United Kingdom

The European Union will experience losses as a result of the United Kingdom leaving the Single Market though not as pronounced as the output loss in the United Kingdom. This is not surprising given the existing asymmetry between the two trade partners, with the United Kingdom trading more with the European Union than each individual EU country does with the United Kingdom. The analysis shows that even with an FTA in place, regulatory divergence and increased border measures between the two regions would result in a GDP decline of 0.4% in the European Union (Table 6).

This is within the range of what other Brexit studies have found (Annex Table A.1). Mayer et al. (2017), using a gravity estimation, found that under a Regional Trade Agreement (RTA) between the United

Kingdom and the European Union, output losses in the European Union would be on average between 0.2 and 0.4%. A similar FTA scenario by the IMF found a GDP decline of 0.8% for the European Union in the long run (IMF, 2018). The Netherlands Bureau for Economic Analysis (CPB) found that GDP losses in the European Union would amount to 0.6% under a differed FTA option (Rojas-Romagosa, 2016).

Ending the free movement of people between the European Union and the United Kingdom is expected to deepen output loss by 0.1 percentage point. However, multilateral services liberalisation by the United Kingdom could slightly mitigate the negative effects of restricting bilateral services trade between the United Kingdom and the European Union (Table 6).

Table 6. Impact on demand and supply components in the European Union

Per cent, difference to baseline

	FTA	+ end of free movement of people	+ further services liberalisation
Real GDP	-0.41	-0.53	-0.49
Final domestic demand	-0.54	-0.70	-0.64
Private consumption	-0.32	-0.41	-0.38
Government consumption	-1.10	-1.40	-1.30
Investment	-0.59	-0.75	-0.69
Goods and services import	-0.90	-1.22	-1.15
Goods and services export	-0.58	-0.79	-0.76
Domestic production	-0.46	-0.60	-0.56
Intermediate use	-0.49	-0.66	-0.63

Note: Goods and services trade includes Intra EU27 trade.

Source: OECD METRO model.

The effects of leaving the Single Market on individual EU members vary widely

Though losses for the European Union as a whole are considerably less than those for the United Kingdom, the extent to which individual member states may be impacted vary markedly (Figure 7). Losses depend on a number of factors including current bilateral trade relationships with the United Kingdom, a country's sectoral specialisation, and the degree to which European financial centres are seen as viable substitutes for London (IMF, 2018). Real GDP declines among EU member states are estimated to range from -0.1 to -2.0 % under the assumption of an FTA between the United Kingdom and the European Union. Not surprisingly, EU member states with strong trade relations, particularly in economically important sectors, with the United Kingdom experience larger declines in output and trade. Ireland, Luxembourg and Denmark, medium to small open economies, are the top three countries most affected once the United Kingdom leaves the Single Market. These findings are similar to other Brexit studies. Mayer (2017) found GDP losses under a regional trade agreement assumption to range from 0.1 to 2.6% with Ireland, Luxembourg and Malta topping their list. IMF (2018) estimates Ireland to be the most negatively impacted even under an FTA with a GDP loss of 2.5 % in the long run, followed by the Netherlands and Belgium (- 0.5 and -0.7% respectively).

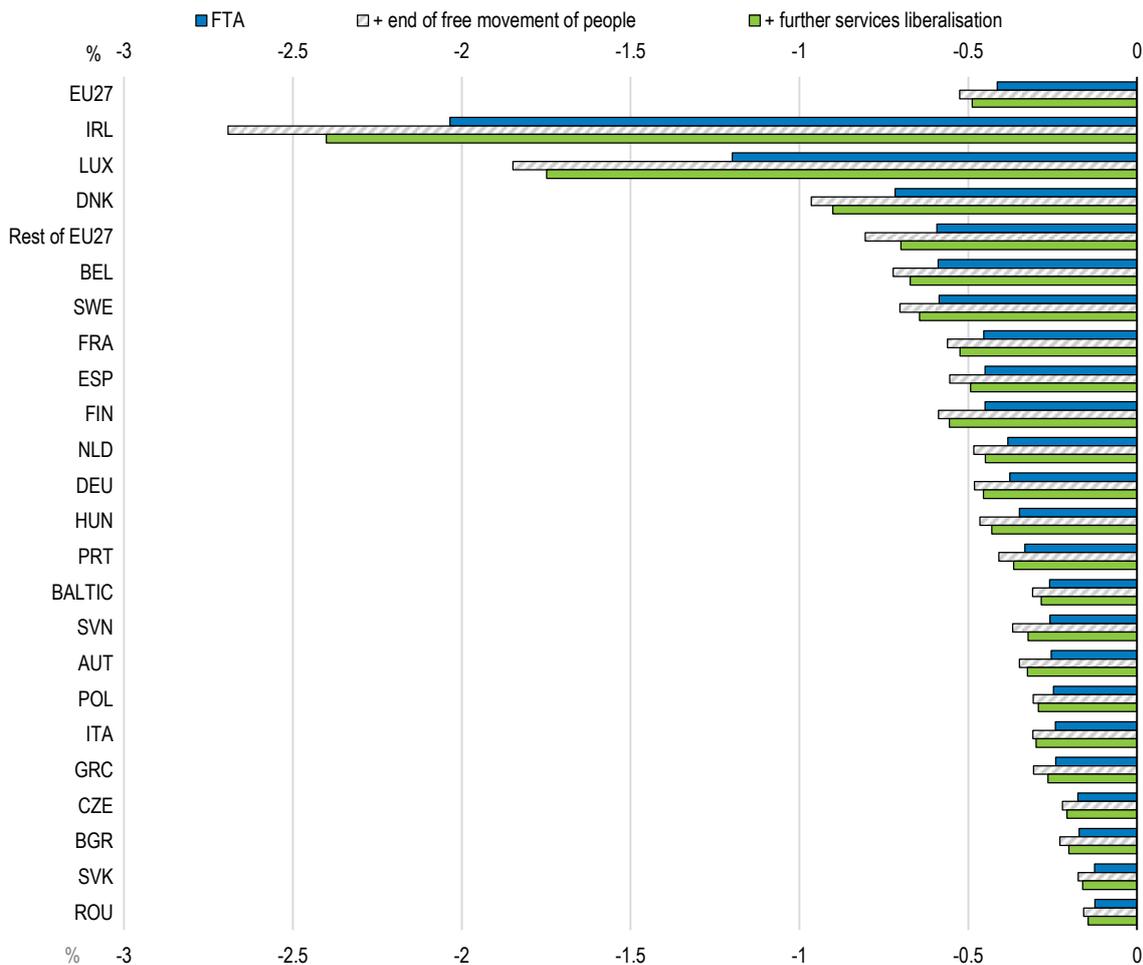
The Irish and the United Kingdom economies are deeply integrated across several dimensions including trade and the labour market (Arriola et al., 2018). Production processes in many industries are increasingly fragmented across national borders and a common labour market was established between the two countries even before EU membership (Bergin et al., 2019) As such, Brexit has a large effect on the Irish economy, more than other EU member state. Even with a UK-EU FTA, Irish GDP would decline 2.0% in the medium term, where much of the decline is due to divergence in regulations. Increasing restrictions on the movement of people between the United Kingdom and the European Union deepens the GDP loss by an additional 0.7 percentage point. Ireland's Economic and Social Research Institute (ESRI) estimated

that the Irish GDP would decline by 2.6% in the long term under in a “Deal” scenario which did not include restrictions on migration (Bergin et al., 2019).

EU members with fewer trade links to the United Kingdom are somewhat insulated from the effect of Brexit. For example, Eastern European countries like Bulgaria, Romania, and Slovak Republic are less reliant on British trade. Imports from the United Kingdom make up less than 3% of total imports in each of these three countries. Exports to the United Kingdom account for less than 4% of their respective exports. The smaller trade exposure to the United Kingdom translate to a GDP loss of 0.1%.

Figure 7. Output losses of European Union

Difference to baseline, real GDP in the medium term



Note: Baltic countries refer to Estonia, Latvia and Lithuania. EU27 refers to 27 European Union member countries. Rest of EU27 refers to Croatia, Cyprus and Malta.
Source: OECD METRO model.

The decline in trade in the European Union differs across sectors

Once the United Kingdom exits the Single Market, the two regions are no longer bound to maintain the same rules and standards. Regulatory divergence would add additional costs to both British and European Union exporters, not only in meeting different requirements to trade goods and services in the other region,

but also verifying compliance. As a result, real exports and imports would fall in the European Union (-0.6% and -0.9% respectively under the FTA scenario).

The decline in trade is not uniform among sectors (Figure 8, panel A). European Union member states would import less professional services such as financial services and insurance, communication, and other business services mainly due to regulatory divergence in the services sector between the United Kingdom and the European Union. Imports of financial services by EU 27 members would decline by 3.5% with a FTA in place. Business service imports would decline by almost 2%. Ending the free movement of labour further deepens the decline in services trade. Imports of financial services and insurance decrease by an additional 2.3 percentage points for a total decline of -5.8%. Imports of business services fall an additional 1.3 percentage points.

While the manufacturing sectors experience smaller declines relative to the services sectors, manufacturing imports account for almost 60% of the total imports by EU members, of which 5% is sourced from the United Kingdom. The average decrease in imports of manufacturing goods is about 1%, which amounts to a real decline of USD 2.7 trillion of manufacturing imports by EU countries under the FTA scenario.

The decline in exports from EU members is expected to be widespread. As with imports, the financial services and insurance sector has the strongest decline in all three scenarios. Much of the decrease in exports of this sector (46%) is accounted for by the decline in Luxembourg, although a handful of countries would experience small gains in exports including the Netherlands, Austria and the Czech Republic. The effect on the financial sector, however, is uncertain as negotiations between the European Union and the United Kingdom are still ongoing and the finance sector is likely to have a specific chapter in any agreement between the two regions.

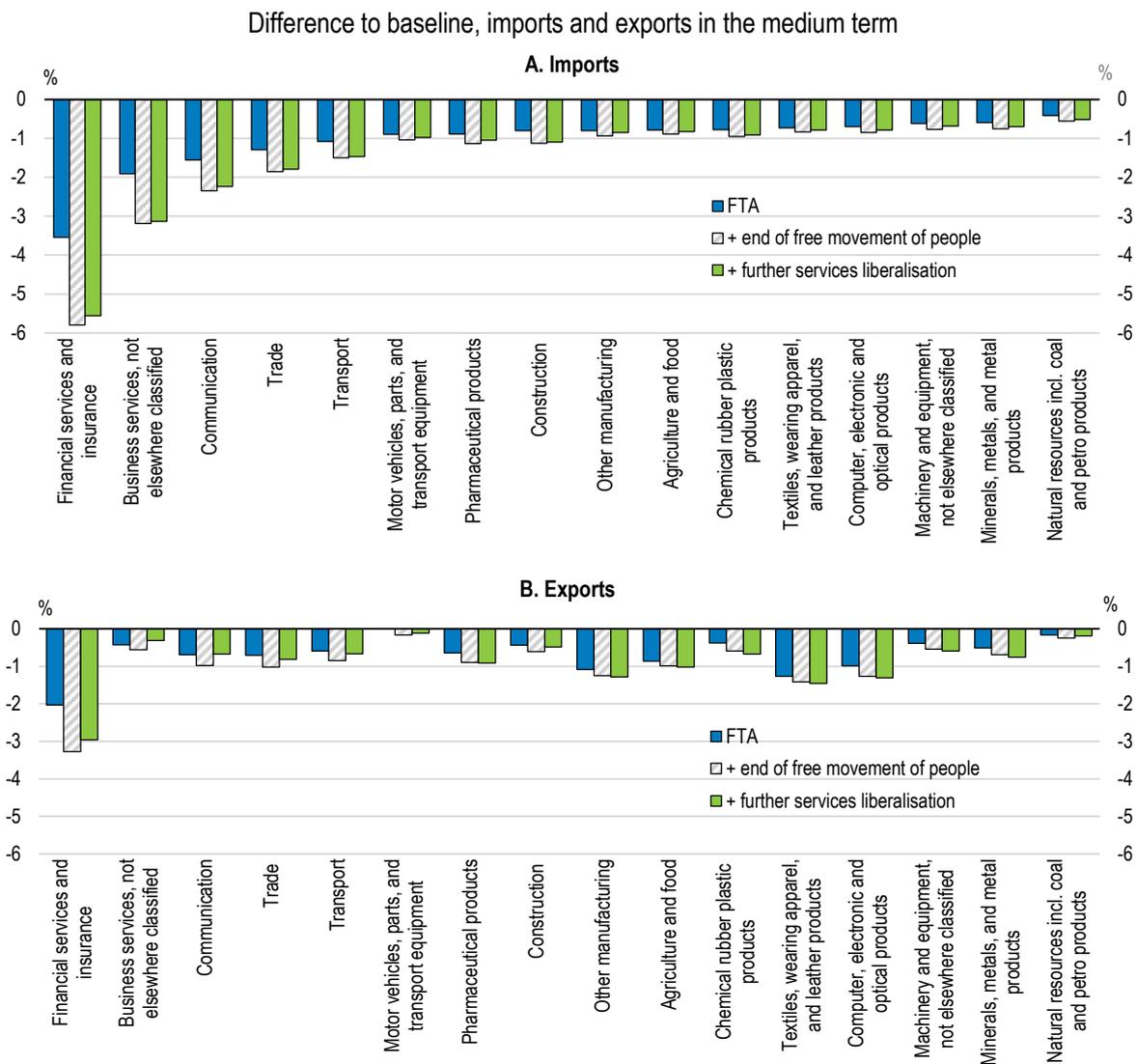
The decrease in manufacturing exports is deeper than the decline in imports, notably for the textiles and wearing apparel sector, other manufacturing and computer and electronics. Under the FTA scenario, gross exports in these sectors would decrease 1.3%, 1.1%, and 1% respectively. The decline in domestic value added in EU27 exports of these sectors would range from USD 1.4 billion (textiles) to USD 68.7 billion (other manufacturing). Most of the loss in gross exports is due to regulatory divergence related to technical barriers, but divergence of services regulation contributes about 0.2 percentage point to the decline. Exports of motor vehicles and parts would be less affected by Brexit than other sectors. Under the FTA scenario EU27 gross exports of this sector increase by 0.01% while the European value added content of car exports from the region increases by 0.5%. The increase in export demand follows a rise in production in most EU27 countries as well as an increase in intermediate import demand for cars and car parts from Turkey, Switzerland and Eastern Europe.

The United Kingdom is an important source of imported intermediate inputs for EU member states including professional services, notably finance and insurance but also communication and other business services (Annex Table A.4.). For some countries the United Kingdom is also an important source of imported manufacturing goods used as inputs into production. British cars and parts account for a large share of intermediate imports of this sector into Belgium (12%), Sweden (10%), and Germany (8%). The United Kingdom is also a key source of intermediate inputs of pharmaceuticals for some EU countries including the Netherlands, Spain, Ireland, and Portugal. After the United Kingdom exits the Single Market, the increase in cost related to importing British intermediate goods and services would be reflected in higher production costs in most EU sectors (Annex Table A.3.).

The United Kingdom is also an important export market for many sectors. Trade to the United Kingdom accounts for 11% of total exports between the 27 EU Members and the United Kingdom and 7% of EU27 exports to all trade partners. The UK market is also important in terms of EU's activity in global value chains. Five percent of EU27 domestic value added that is exported outside of the Single Market is used in British exports. European motor vehicles and parts and the metal products sectors are particularly linked

to global value chains via the UK market where over 10% of the exported EU value added in these sectors are used in products and services exported from the United Kingdom.

Figure 8. Total import and export changes of European Union



Note: Includes Intra-EU27, which is 27 European Union countries.
 Source: OECD METRO model.

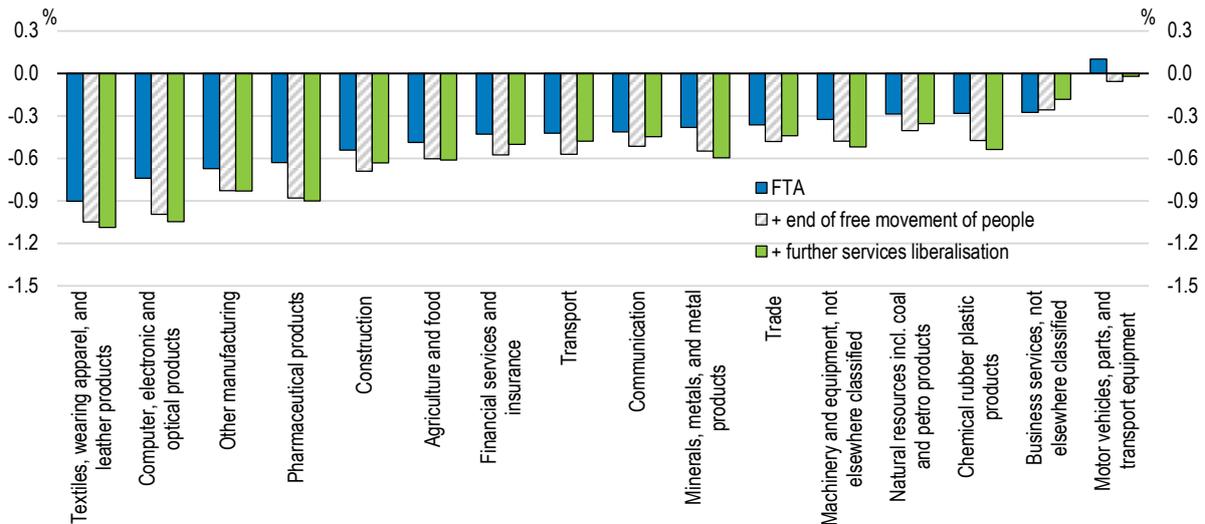
EU27 production declines marginally across almost all sectors relative to the baseline

Production in the European Union would decline marginally in almost all sectors in all three scenarios compared to a situation where the United Kingdom would stay in the Single Market (Figure 9). The decrease stems from reduced demand for EU exports in the UK market as well as an increase in production costs. With overall output declining in the United Kingdom in the various scenarios, there is less demand for goods and services both imported and domestic. Moreover the increase in the cost of imported intermediate inputs from the United Kingdom into the EU27 would increase the price of intermediate goods and services used in production.

Production in the textile industries, computers and, pharmaceuticals sectors would decline by 0.9%, 0.7%, and 0.6% respectively under the FTA scenario. Restricting bilateral services trade between the United Kingdom and the European Union would deepen the losses in all manufacturing sectors as services are an important input into manufacturing industries. The services sector would also experience decreases in production ranging from 0.3% (Business services) to 1% (Public services) in the medium term under the FTA scenario.

Figure 9. Production changes of European Union

Difference to baseline, production by sector in the medium term



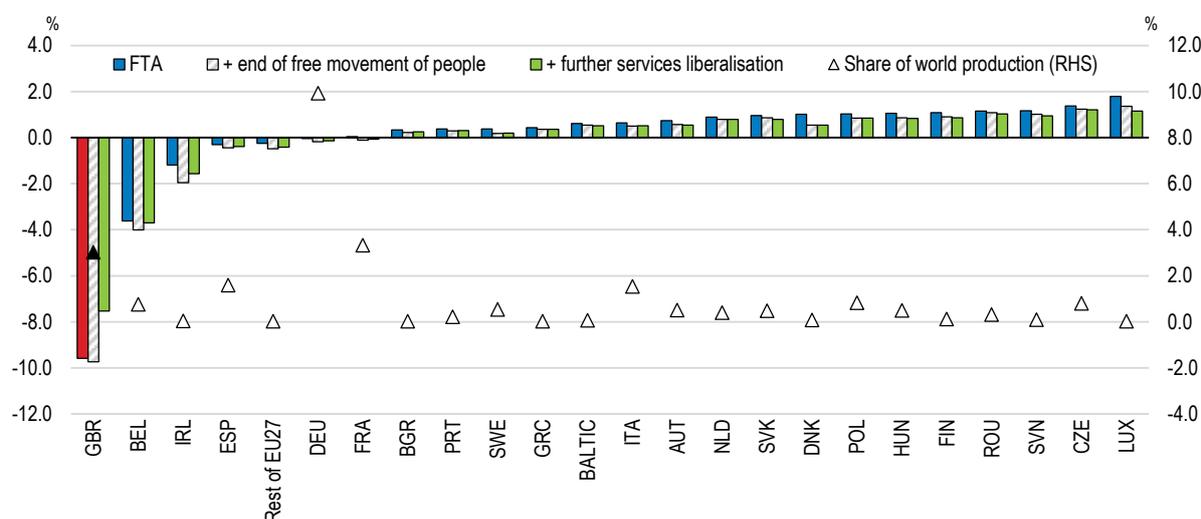
Note: Data refer to 27 European Union countries.
 Source: OECD METRO model.

Production would increase in a few sectors in certain countries. Production of pharmaceuticals in Ireland would increase by 1% in all three scenarios. While total EU27 production of the financial sector would decline by 0.4% under the FTA scenario, there were small increase in production (less than 1%) in Slovak Republic, Romania, Czech Republic and Belgium.

Moreover, under the FTA scenario, the production of motor vehicles and car parts increase slightly by 0.1%. While car production in western European countries like Belgium, Spain, and Germany would decline even under a Free Trade Agreement (4%, 0.3%, 0.04% respectively), car production in other regions, with less trade exposure to the United Kingdom would fare better under Brexit (Figure 10). Eastern European Countries such as the Czech Republic and Poland, would increase production of motor vehicles and parts by about 1%. The extent to which European automakers gain from a UK exit from the Single Market depends on if countries maintain their preference for existing trade partners. Smith et al, (2019) showed that if countries are more sensitive to price changes, trade that was once met by the United Kingdom could be diverted towards non-European countries, such as China, India, the United States, and Canada, rather than European partners.

Figure 10. Car production changes of European countries

Difference to baseline, car production by sector in the medium term



Note: Data refer to the sector "Motor vehicles, parts, and transport equipment". Baltic countries refer to Estonia, Latvia and Lithuania. Rest of EU27 refers to Croatia, Cyprus and Malta.
Source: OECD METRO model.

Conclusion

The paper examines the trade impact for the United Kingdom and EU countries of leaving the Single Market to join a FTA, under different assumptions. Output losses in the United Kingdom would range between 3.2 to 4.3%. More than a number, which is necessarily surrounded by a lot of uncertainties, the paper helps to highlight the relative importance of the different factors that are going to rise trade costs. It shows that costs would come essentially from rising technical barriers and sanitary and phytosanitary measures on goods and rising trade costs on services. Rules of origin and border transition costs would have a small effect.

Output losses in the European Union (0.4-0.5%) are expected to be less pronounced than in the United Kingdom in the medium term, but would vary markedly across individual countries. Ireland would experience the largest losses, while countries with loose trade links with the United Kingdom would barely be affected. Losses would also vary across sectors.

Estimates reported in this work are likely to be conservative, as they omit factors that are likely to play a key role but whose impact was too uncertain to be captured with the METRO model. This includes the extent to which FDI flows are going to be redirected toward other directions, as well as the labour-supply implications of international migration and the productivity impacts. Despite those caveats, the analysis underlines the large heterogeneity of impact across sectors and countries, implying that targeted policy should aim at easing the adjustments costs from the leaving the Single Market.

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Annex A.

This annex provides additional statistical tables from the OECD METRO Model.

Table A.1. Results comparison, BREXIT under a Free Trade Agreement

	Model Type	Time horizon	Percent Change in GDP	
			United Kingdom	European Union
This paper	CGE	Medium-run	-3.5	-0.4
Rojas-Romagosa, (2016)	CGE	Long-run	-3.4	-0.9
Mayer et al. (2017)	Gravity	na	-2.4	-0.4
IMF (2018)	CGE	Long-run	-2.5	-0.8

Source: Author's compilation.

Table A.2. Importance of UK EU27 trade relations, at base

Per cent

	Share of global European Exports		Size of European Exports (USD billion)
	UK exports to EU27	EU27 exports to UK	
Agriculture & food	3.44	8.40	557.4
Natural resources	9.39	4.64	225.7
Textiles, wearing apparel, & leather	3.57	6.41	256.8
Other manufacturing	2.92	6.82	377.5
Chemical rubber plastic products	4.64	5.61	701.2
Pharmaceutical products	3.94	7.35	320.8
Minerals, metals, & metal products	2.93	4.77	609.3
Computer, electronic & optical products	4.82	6.90	401.5
Machinery & equipment not elsewhere classified	2.55	4.73	836.0
Motor vehicles, parts, & transport equipment.	3.94	8.25	924.7
Utilities	0.91	5.41	40.4
Construction	1.68	1.94	55.3
Trade	3.23	3.77	197.8
Transport	1.84	3.56	579.9
Communication	8.78	6.00	138.0
Financial services & insurance	12.64	4.49	234.3
Business services not elsewhere classified	9.19	4.67	449.7
Public Services	2.61	6.83	79.0
Other services	4.70	6.02	115.7
Total	4.36	5.89	7,101.1

Note: European trade includes exports by the United Kingdom and EU27 to all partners and includes Intra-EU27 trade.

Source: OECD METRO Model, reference year 2014.

Table A.3. Change in the cost of production across EU27, weighted average

Per cent

	FTA	+ end of free movement of people	+ further liberalisation of services
Agriculture and food	-0.01	-0.01	-0.01
Natural resources incl coal and petro products	-0.06	-0.10	-0.08
Textiles, wearing apparel, and leather products	0.07	0.08	0.06
Other manufacturing	0.05	0.06	0.05
Chemical rubber plastic prods	0.06	0.07	0.06
Pharmaceutical products	0.01	0.06	0.05
Minerals, metals, and metal products	0.01	0.01	0.00
Computer, electronic and optical products	0.10	0.13	0.10
Machinery and equipment not elsewhere classified	0.06	0.06	0.05
Motor vehicles, parts, and transport equipment	0.21	0.21	0.19
Utilities	-0.03	-0.03	-0.03
Construction	0.00	0.00	0.00
Trade	-0.01	0.01	0.02
Transport	-0.06	-0.06	-0.05
Communication	0.00	0.06	0.06
Financial services and insurance	0.08	0.23	0.23
Business services not elsewhere classified	0.01	0.07	0.06
Public Services	-0.01	0.00	-0.01
Other services	-0.04	-0.01	0.00

Note: Weighted by production quantity at the base.

Source: OECD METRO Model.

Table A.4. Share of total imported intermediate goods and services that comes from the United Kingdom

Per cent

	Agriculture & food	Natural resources	Textiles, wearing apparel, & leather	Other manufacturing	Chemical rubber plastic prods	Pharmaceutical products	Minerals, metals, & metal products	Computer, electronic & optical prod.	Machinery & equipment nec	Motor vehicles, parts, & transport equip.	Utilities	Construction	Trade	Transport	Communication	Financial services & insurance	Business services nec	Public Services	Other services
Austria	0.4	0.3	1.6	1.0	2.5	1.7	1.4	1.4	1.0	3.0	0.5	1.1	2.4	3.9	8.8	10.3	7.6	2.6	8.6
Belgium	2.1	5.4	3.0	3.8	6.4	1.6	3.3	7.6	4.3	12.4	0.6	1.9	2.9	2.8	10.7	9.8	10.6	2.2	7.7
Czech Republic	1.1	0.2	5.1	1.5	3.1	5.8	1.5	4.1	2.4	1.4	0.1	0.4	2.9	4.8	7.0	14.7	8.6	1.7	4.2
Denmark	3.2	4.0	5.7	2.0	6.7	5.2	3.8	7.0	4.4	5.5	0.7	2.6	2.9	4.7	11.1	15.8	16.4	2.0	11.8
Finland	1.8	0.8	4.4	2.6	4.1	7.6	3.0	2.2	3.5	6.9	0.5	0.6	2.9	4.7	10.1	7.7	11.2	3.8	5.7
France	5.7	1.8	2.2	3.6	5.8	5.4	4.4	4.5	3.8	6.1	1.7	3.6	3.0	5.3	13.4	10.5	13.6	1.4	8.3
Germany	1.7	4.6	2.9	1.9	5.8	4.9	4.3	3.5	2.5	7.8	0.8	2.2	2.9	2.9	9.4	18.5	10.8	1.0	11.0
Greece	0.6	0.6	1.9	1.2	1.8	10.0	2.8	7.5	3.4	2.9	0.1	0.8	2.7	1.7	15.1	11.3	12.1	1.1	5.9
Hungary	1.7	0.1	3.0	0.9	2.1	4.2	1.0	2.4	1.3	2.4	0.1	0.8	2.5	2.8	8.7	15.4	8.9	1.4	14.6
Ireland	55.0	51.3	63.6	41.2	32.9	11.9	47.6	33.8	30.5	37.8	19.2	2.0	2.3	9.5	19.5	16.2	11.6	11.8	13.7
Italy	1.3	0.4	2.7	1.5	3.2	5.8	2.5	3.6	3.6	6.7	0.4	1.0	2.4	4.6	11.5	7.2	11.1	1.9	11.4
Luxembourg	0.2	0.2	2.8	2.8	4.5	0.8	1.0	3.9	1.0	1.7	0.7	2.2	3.1	3.3	11.2	21.8	9.3	2.7	12.2
Netherlands	2.8	6.2	8.9	3.4	8.6	22.9	4.2	3.0	3.5	6.5	0.4	2.9	2.6	5.3	13.3	10.3	13.4	3.1	4.5
Poland	1.2	0.3	5.2	1.7	4.3	7.0	1.5	4.6	2.0	3.2	0.9	0.9	4.3	4.4	8.7	16.5	9.3	1.7	8.2
Portugal	2.5	1.4	3.5	1.8	2.1	9.2	5.2	5.0	2.8	2.4	0.5	0.7	2.4	5.2	9.9	13.6	8.3	1.5	8.6
Slovakia	0.5	0.5	1.3	1.3	2.0	1.3	1.4	0.9	0.8	0.8	0.1	0.5	1.5	2.1	5.2	17.5	3.7	1.1	8.5
Slovenia	0.2	0.1	1.2	0.9	1.6	2.9	1.3	3.8	1.2	2.7	0.1	0.7	2.1	2.1	10.2	15.2	7.4	1.2	6.4
Spain	2.7	1.2	2.8	2.0	4.6	10.8	5.7	5.8	3.2	5.3	1.6	0.9	3.5	9.6	10.3	17.2	10.8	0.6	9.8
Sweden	3.2	5.7	4.7	3.0	8.1	12.1	6.8	6.0	3.9	10.0	1.1	3.4	3.8	3.4	10.2	6.7	10.7	2.0	8.2
Bulgaria	0.4	0.1	2.3	0.9	2.5	4.6	1.6	8.6	1.9	2.8	0.3	0.6	4.5	5.3	7.1	15.6	7.8	2.4	8.1
Romania	0.6	0.1	8.7	1.5	1.8	5.6	1.2	2.6	2.2	5.3	1.0	1.6	5.7	4.4	9.3	13.7	8.7	2.0	14.5
Baltic countries	0.9	0.1	5.2	1.0	2.1	1.4	1.1	4.2	2.3	2.9	0.4	0.4	4.8	3.6	8.4	10.2	7.8	2.8	6.1
Rest of EU	4.4	1.7	2.1	5.9	2.3	3.8	2.0	4.1	4.5	5.0	0.2	0.9	3.9	5.4	10.6	14.9	12.5	4.4	10.3

Note: Includes intra-EU trade.

Source: OECD METRO Model.

Table A.5. Share of total exports by sector destined for the United Kingdom at the base
Per cent

	Agriculture & food	Natural resources	Textiles, wearing apparel, & leather	Other manufacturing	Chemical rubber plastic prods	Pharmaceutical products	Minerals, metals, & metal products	Computer, electronic & optical prod.	Machinery & equipment nec	Motor vehicles, parts, & transport equip.	Utilities	Construction	Trade	Transport	Communication	Financial services & insurance	Business services nec	Public Services	Other services
Austria	2.7	0.5	2.2	4.2	2.7	1.5	2.6	4.3	2.9	5.4	1.9	1.2	3.2	2.7	4.6	2.4	3.2	4.3	4.8
Belgium	10.1	3.1	13.3	8.2	7.6	12.4	5.8	9.5	8.9	22.8	4.3	3.3	2.1	1.5	7.3	5.9	5.6	7.7	5.3
Czech Republic	3.8	0.3	4.8	3.7	3.2	3.0	3.2	8.4	4.8	5.1	0.8	0.7	5.3	2.4	4.9	4.5	3.8	5.0	5.4
Denmark	9.4	24.4	6.9	6.0	4.2	5.0	5.0	5.1	7.9	4.5	1.9	1.1	1.5	2.6	5.4	3.2	4.2	3.4	4.7
Finland	1.7	13.3	1.7	8.7	4.4	1.2	4.2	2.0	2.7	2.1	2.8	0.6	0.7	4.1	5.0	3.5	4.4	5.5	4.5
France	9.3	3.1	7.9	10.0	7.5	6.5	5.9	6.6	6.2	7.2	14.0	2.6	5.5	4.3	8.3	7.4	5.1	7.6	8.2
Germany	7.3	2.3	5.4	6.9	6.2	10.6	6.7	7.0	4.7	10.4	0.7	1.6	2.3	2.9	7.3	7.0	6.0	6.7	4.7
Greece	6.1	0.9	6.0	6.1	4.4	12.8	4.4	6.2	6.0	1.0	6.5	1.7	7.9	4.4	9.2	6.0	6.6	8.1	8.4
Hungary	3.3	0.6	2.3	2.4	3.3	3.2	3.1	6.0	3.7	3.2	1.8	0.6	2.5	3.9	6.2	6.3	5.1	4.5	4.1
Ireland	40.2	24.1	37.9	10.7	7.9	6.5	40.1	17.4	17.9	30.0	17.2	6.8	2.3	16.7	8.0	4.8	6.4	17.1	9.2
Italy	8.8	0.9	5.8	6.1	5.0	5.9	4.2	4.2	4.7	7.3	4.0	1.2	4.0	3.9	6.5	5.2	6.0	5.3	6.1
Luxembourg	1.9	5.1	6.1	2.7	4.8	0.4	5.1	4.2	8.0	4.5	2.4	1.4	2.5	2.6	8.4	7.6	8.8	3.0	4.9
Netherlands	9.9	6.3	10.9	8.9	8.1	9.4	5.9	12.3	6.1	6.4	20.6	4.8	4.2	2.7	7.0	4.5	5.8	6.4	8.2
Poland	6.9	4.6	2.7	6.6	5.4	5.1	5.8	10.3	6.1	6.5	1.1	1.4	4.6	2.0	6.3	6.5	5.3	5.5	5.1
Portugal	6.2	0.8	7.8	6.4	4.3	11.5	4.8	10.8	4.6	9.3	3.6	1.8	8.1	7.4	8.7	7.7	5.4	10.0	10.6
Slovakia	2.8	0.1	0.9	4.1	1.9	4.9	2.1	7.0	2.1	5.3	0.9	1.4	2.8	1.9	5.8	4.0	5.6	5.6	4.4
Slovenia	1.6	0.0	0.8	2.5	2.0	1.2	2.0	3.3	1.8	1.4	0.4	0.6	3.1	1.9	5.4	4.5	3.8	4.2	4.0
Spain	8.2	1.6	5.5	5.9	4.3	7.1	6.8	5.6	5.5	12.5	4.1	3.4	10.4	9.5	8.6	10.9	6.7	14.7	10.4
Sweden	6.2	19.3	9.0	10.4	3.7	6.9	5.6	4.0	4.2	6.4	1.0	0.9	1.7	2.1	6.0	3.4	4.9	5.0	5.6
Bulgaria	1.6	0.3	4.0	3.0	3.0	3.0	1.7	4.4	1.7	4.6	1.3	1.2	6.4	4.8	6.9	7.5	7.9	7.0	6.3
Romania	2.2	0.1	8.2	3.1	2.8	8.9	1.6	4.7	3.8	4.3	0.5	1.6	3.4	3.9	7.2	5.1	4.7	5.1	4.1
Baltic countries	2.2	11.8	4.5	9.6	4.4	2.7	3.5	3.2	2.0	1.1	1.8	0.9	3.6	2.1	4.9	7.8	4.9	6.1	4.8

Note: Includes Intra-EU27.

Source: OECD METRO Model.