



DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT **A**
ECONOMIC AND SCIENTIFIC POLICY



An Assessment of the Economic Impact of Brexit on the EU27

Economic and Monetary Affairs

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**Internal Market and
Consumer Protection**

An Assessment of the Economic Impact of Brexit on the EU27

Study for the IMCO Committee



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STUDY

Abstract

This paper, managed by the Policy Department on Economic and Scientific Policies for the Committee on Internal Market and Consumer Protection, assesses the likely impact of Brexit on EU27, together with some scenarios for the terms of the UK's secession. For the EU 27, the losses are found to be virtually insignificant, and hardly noticed in the aggregate. By contrast, for the UK, the losses could be highly significant, over ten times greater as a share of GDP. Impacts on various Member States – in particular Ireland – and sectors in the EU27 could be more pronounced.

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EXECUTIVE SUMMARY

We were asked to assess the economic implications of Brexit for the EU27, in particular by:

1. laying out the basic data on trade in goods and services, investment, and the movement of people between the two parties, to which we add the EU budget;
2. characterising the key features of the various scenarios for the post-Brexit relationship between the UK and EU27;
3. providing estimates of the economic impact of some of the most significant possible scenarios.

Our conclusions are:

1. Trade between the UK and the EU27 is large and of a similar order of magnitude as transatlantic trade (between the EU and the US). Investment links between the UK and EU27 appear to be stronger, but the picture is heavily influenced by financial transactions whose main purpose might be tax optimisation.
2. The EEA option seems no longer relevant after the speech by Prime Minister May. However, there are still many variants possible of the free trade agreement which the UK is apparently seeking.
3. All available studies concur that a significant disruption of trade links will impose economic costs on both sides. However, the EU27 would bear only a disproportionately small share of the total cost.

The following summary contains somewhat more detail:

Basic data

The trade in both goods and services between the UK and EU27 is very substantial: €306 billion of exports of goods by the EU27 to the UK, versus €184 billion of imports, and thus a large surplus of account of goods alone (all data here and below for 2015). In terms of % shares of GDP, the EU27's exports to the UK amount to 2.5% of GDP, whereas the UK's exports to the EU27 amount to 7.5% of its GDP. Transatlantic trade of goods is only about 20 % larger than trade across the channel.

For services the amounts are also large: €94 billion of exports by the EU27 to the UK, versus €122 billion of imports, and thus a surplus in this case for the UK (although here the statistics are not so reliable, with big differences seen in the 'mirror data' for the same items collected by the EU27, which would cancel the UK's surplus).

For both goods and services the degrees of dependence in % of GDP on the UK market is much higher for the smaller EU member states that have close ties to the UK of historical character and/or geographic proximity (Ireland, Cyprus, Malta, Belgium, Netherlands).

Foreign direct investments (FDI) are very large on both sides. The EU27's stock of FDI in the UK is estimated at €985 billion, or 8.3% of its GDP, while the UK's investment in the EU27 total a little less in value at €683 billion but this is a much bigger in relations to its GDP (26.6%). However, there are indications that a significant proportion, maybe about one half, of this FDI represent financial operations whose purpose is to optimise tax liabilities of multinational corporations.

The number of EU27 citizens living in the UK at the end of 2016 is estimated at 3.35 million. The largest number are workers (2,002,000), compared to pensioners (223,000) and the unemployed (102,000). The number of UK citizens living in EU 27 countries is substantially

less: 1,217,000, of which 400,000 are pensioners, with remainder being workers and their dependent families, and students.

As regards the EU budget, the UK's withdrawal is likely to leave a 'hole' of about €9 billion annually, which might be offset to some extent by a continuing contribution by the UK if it were agreed to secure a high degree of market access, or from tariff revenues if the relationship would be based just on WTO membership terms. There is a question also of other 'legacy costs', which as of now however are neither defined nor quantified beyond speculative remarks in the range of the order of €20-40 billion.

Scenarios

We were invited to pay particular attention to two extreme scenarios:

- the UK would accede to the European Economic Area (EEA) as a non-member state like Norway, versus
- the UK would have no preferential trade relationship with the EU, with only their common membership of the World Trade Organization (WTO).

In between these two extremes there are quite a number of possibilities for free trade arrangements of varying depth, which are described below. However the UK Prime Minister in her speech of 17 January 2017 narrowed the focus considerably, favouring a 'Comprehensive Free Trade Agreement (CFTA). This wording resonates with the EU, since it has recently concluded two agreements in this category, namely:

- the Comprehensive Economic and Trade Agreement (CETA) with Canada, and
- the Deep and Comprehensive Free Trade Area (DCFTA) with Ukraine and other neighbouring countries.

These two cases have however two major differences that point to key issues on which the negotiators will soon have to take position:

- The CETA is entirely 'international' in content with no references to the EU acquis, whereas the DCFTA makes very extensive reference to EU single market acquis, with which Ukraine will become compliant. The UK has already decided to introduce on Day 1 of withdrawal a 'Great Repeal Act' that would transfer onto the UK statute book all relevant EU acquis. This would seem to point prima facie more towards the DCFTA than CETA model, and therefore a higher level of continued access to the single market, but this still poses the big question how the UK-EU27 agreement would handle future changes by the UK to this stock of EU acquis.
- Whereas the Canadian CETA is limited to trade policy issues, the DCFTA is part of a much wider Association Agreement, covering coordination over foreign and security policies, justice and home affairs, and possible participation in a wide range of EU agencies and programmes. While the UK Prime Minister rejects the idea of an Association Agreement, she does speak in favour of a Strategic Partnership, which could embrace the wider set of issues just mentioned, all of which are of definite interest to the UK.

It is clear that the default scenario, in the event that the negotiations fail to reach agreement within two years after the triggering of Article 50, is the WTO scenario. This means that the most plausible range of possible outcomes now consists of some kind of CFTA as the most optimistic, through to the WTO as the most pessimistic.

Economic impacts

There has been a considerable amount of quantitative modelling work done on various Brexit scenarios by both official institutions (UK Treasury, OECD) and independent economists. These all cover ranges of scenarios in the optimistic-pessimistic spectrum, including the spread between the EEA and WTO scenarios highlighted above. However as we have just noted, the plausible range of scenarios has been narrowed, excluding the EEA.

Nonetheless the modelling work has produced a cluster of relatively consistent results. The main story is one of economic losses by both parties, but disproportionately between them in money amounts in a ratio of around 1 to 2 or 3 for the UK and the EU27 respectively. In terms of percentages of GDP the losses for the EU27 would be about 10 to 15 times lower given the 1:5 ratio in the GDP of the UK relative that of the EU-27.

- For the EU 27 the losses are virtually insignificant, averaging between 0.11% and 0.52% of GDP for the optimistic versus pessimistic scenarios respectively. These amounts are modelled as the totals cumulating up to 2030, so the annual average losses would be of the order of 0.011% to 0.052 % of GDP.
- For the UK the losses average between 1.31% and 4.21 % of GDP for the optimistic and pessimistic scenarios respectively, or 0.13% to 0.41% of GDP annually. Among the different models it is also notable that the losses for the UK are higher than average in the case of two models (OECD and UK Treasury) that capture negative impacts on foreign direct investment (FDI), which is redirected in some degree away from the UK into the EU 27. In their pessimistic scenarios the losses cumulate to about 7.5% of GDP, or 0.75% annually, which are highly significant amounts macroeconomically. This FDI effect is not however reflected in models estimated for the EU27, and so implies that there might need to be some adjustment to the results reported above for the EU27.

The model builders would be the first to recognise that their researches cannot cover all the likely impacts of the Brexit. In particular the classic models assume 'normal' conditions' for assumed 'technical' adjustments to trade policies. By contrast the actual political context is subject to an unprecedented level of strategic uncertainty, both internally for the EU and internationally, which can only have a discouraging impact on investment in both the EU27 and UK (the UK Treasury and OECD models try to represent the uncertainty factor). In addition the UK Prime Minister has felt it necessary to draw attention to a more negative version of the WTO scenario assumed in the model calculations. This is the case in which the UK would engage in aggressively competitive reductions in tax and regulatory burdens to compensate for the losses that it would be suffering in the simple WTO scenario. This could be extended into considering how the EU27 might respond, with the possibility of measures to further restrict UK access to the EU27 market. Such a scenario with spiralling negative measures cannot be precisely anticipated and will hopefully be avoided, but its conceivable prospect does serve as a reminder that the relatively benign impacts modelled for the EU27 could turn out worse. However, we anticipate that in the end most of the additional economic cost of a ratcheting up of trade barriers would be borne by the UK.

1. INTRODUCTION

We have been asked to provide a briefing paper on several aspects of the possible economic impact of Brexit on the EU27, covering namely:

- the current level of trade in goods and services between the UK and EU27 as a share of GDP, and labour flows, distinguishing between member state and sectors;
- indication of the possible economic impact of at least two alternative scenarios:
 - European Economic Area (EEA)
 - World Trade Organisation (WTO)
- indication of the key characteristics of a wider range of different types of bilateral agreements that exist between the EU and third countries, including, including also customs unions, free trade agreements, association agreements, stabilisation and association agreements, partnership and cooperation agreements, etc.

We address all these points, in a somewhat different order, and give particular attention to the idea of a Comprehensive Free Trade Agreement (CFTA), since this is what Prime Minister Theresa May announced as the UK's objective in her speech of 17 January 2017.

2. BASIC FACTS: TRADE, INVESTMENT, LABOUR FLOWS AND BUDGETARY ISSUES

2.1. Trade in goods

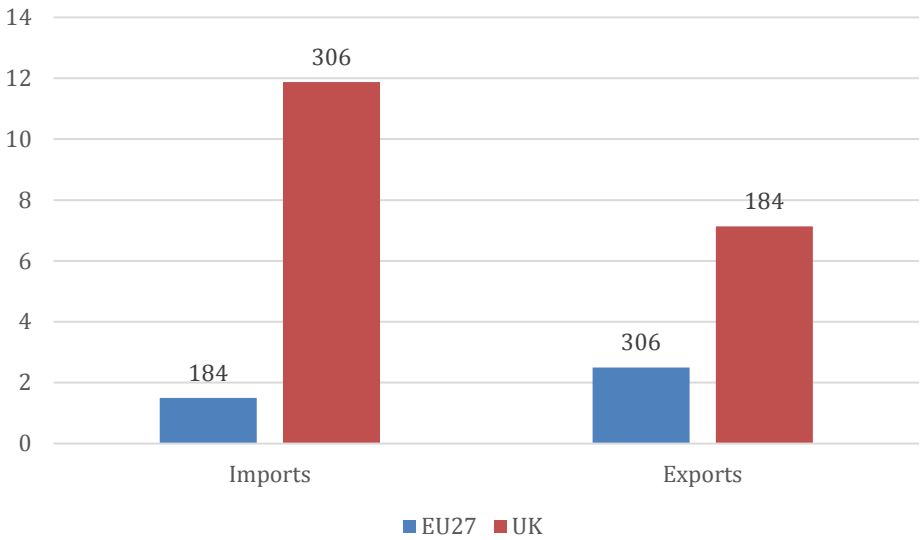
The volume or trade between the UK and EU27 is very substantial, with EU27 enjoying a large surplus. The EU27's exports to the UK totalled €306 billion, whereas it imports amounted to only a little above half as much, at €184 billion (all data in this section relate to 2015 unless otherwise stated).

Table 1: Total trade in goods between the UK and the EU27, 2015

	Imports (€bn)	% GDP	Exports(€bn)	% GDP	Trade (€bn)	% GDP
EU27	184	1.5	306	2.5	491	4
UK	306	11.9	184	7.1	491	19.1

For comparison we note that trade between the EU(28) and the US is of a similar order of magnitude. In 2015 the EU exported goods worth €371 billion to the US and imported about €250 billion, both values are only about 20 % larger than the corresponding values for trade across the Channel reported in table 1. From this point of view the impact of Brexit could be as important as the TTIP might have been (with the opposite sign of course).

Figure 1: Bilateral trade of goods, in % GDP (label: value in billion Euro)



By member state by far the largest exporter is Germany (€68 billion), the other major exporters being the Netherlands (€34 billion), France (€28 billion), Belgium (€23 billion), and Italy (€18 billion), Spain (€16 billion) and Ireland (€14 billion) – see Annex 1. All other member states export under €10 billion. The picture is roughly in line with the size of the EU27 economies, except for the UK's close neighbours the Netherlands, Belgium and Ireland, which are more than proportionately represented.

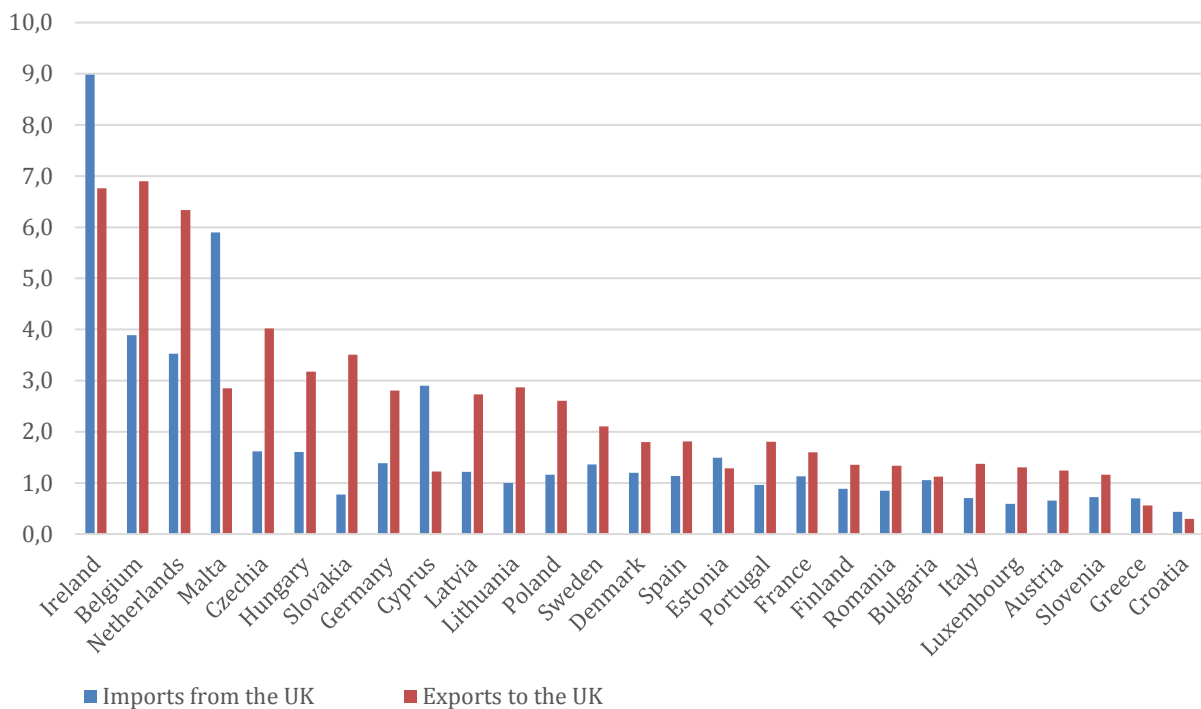
On the import side the picture is roughly the same, but scaled down: Thus Germany leads with (€34 billion), followed by France (€20 billion), the Netherlands (€19 billion), Ireland (€19 billion) and Belgium (€13 billion).

In terms of % shares of GDP, the EU27's exports to the UK amount to 2.5% of GDP, whereas the UK's exports to the EU27 amount to 7.5% of GDP. Looked at from the import side the proportions are even wider, reflecting the UK's large trade deficit with the EU: UK's imports from the EU amount to 11.9% of GDP, whereas the EU27's imports from the UK amount to only 1.5% of their GDP.

On the side of the EU27 many of the smaller member states are much more dependent on the UK market than the average (see Figure 2 and Annex 1). Whereas Germany exports 2.8% of its GDP to the UK, this is surpassed by Belgium (6.8% GDP), Ireland (6.9% GDP), and the Netherlands (6.3% of GDP). Most of the other member states are in or close to the 1.5-3.0% GDP range.

On the import side most member states are importing volumes amounting to around 1% of GDP, with Germany at 1.1% GDP, whereas Ireland, Malta, Cyprus, the Netherlands and Belgium are at much higher levels. This seems to be a story of geographic proximity, or historical connections, or in the Irish case both (with imports from the UK amounting to 9% of GDP).

Figure 2: Goods Imports and Exports of EU 27 with the UK, % GDP



A word of caution is needed in interpreting the very high figures for Belgium and the Netherlands. The ports of Zeebrugge and Antwerp in Belgium, and Rotterdam in the Netherlands, are big transit hubs for trade with the UK, inland continental Europe and big global trading nations such as China, Japan and Korea. Some of these 'Belgian' and 'Dutch' exports may have originated from elsewhere on the continent or the rest of the world, and some of their imports from the UK have been heading to other markets. In the case of the Netherlands data compiled by Statistics Netherlands suggest that transit exports account for 48% of all exports to 'Europe', thus nearly half the goods exports leaving the Netherlands bound for the rest of Europe are in fact re-exports (on the import side it is 38%)¹. It is likely

¹ Statistics Netherlands (2016), "Im-, export, transit trade; value weight", <http://cbs.overheidsdata.nl/82007ENG>.

that a similar pattern is observed vis-à-vis the UK. For Belgium data is scarcer but estimate with 2005 data show a transit export share of 28% in total exports².

As regards the sectoral breakdown of the trade flows, the aggregate data for the EU27's trade with the UK is given in Table 2. The sectoral distribution of this trade is highly diversified, with the following leading sectors for exports from the EU27 to the UK: machinery and transport equipment (€127 billion), of which road vehicles (€59 billion), followed other manufactured goods (€70 billion), chemicals (€51 billion), food products (€32 billion), and mineral fuels (€11 billion).

On the side of EU27 imports from the UK the structure is similar, which corresponds to the model of 'intra-sectoral' trade that emerged with the EU's internal market. This contrasts with the earlier predominance of 'inter-sectoral' trade paradigm, based on pronounced differences in comparative advantage, of which EU-Russian trade is still an example, with the EU importing commodities and exporting manufactures. The intra-sectoral trade paradigm sees each country importing and exporting to each other many of the same products. The value of this kind of trade is that it allows for big economies of scale to be achieved while still benefitting from the competition that is so crucial for assuring both quality and price competitiveness. It is these kinds of advantage that will be reduced if the UK leaves the single market and customs union, with much more important losses likely for the UK than the EU27, since the latter will see a proportionately lesser reduction in trade flows.

Table 2: Trade in goods between the UK and EU27, by product, 2015

	EU27 Imports (€bn)	Share in total	EU27 Exports (€bn)	Share in total
Animal and vegetable oils, fats and waxes	0.5	0%	1.0	0%
Beverages and tobacco	3.5	2%	5.7	2%
Chemicals and related products	33.4	18%	50.9	17%
Commodities and transactions not classified elsewhere	4.1	2%	2.6	1%
Crude materials, inedible, except fuels	2.9	2%	6.5	2%
Food and live animals	11.5	6%	32.2	11%
Machinery and transport equipment	62.4	34%	126.7	41%
Road Vehicles	19.3	10%	58.8	19%
Aircraft, associated equipment	8.8	5%	4.7	2%
Ship, boat, float. structures	0.4	0%	0.3	0%
Manufactured goods classified chiefly by material	19.0	10%	33.4	11%
Mineral fuels, lubricants and related materials	21.7	12%	10.6	3%
Natural Gas	3.0	1%	0.8	0%
Petroleum and petroleum products	17.7	6%	8.3	3%
Miscellaneous manufactured articles	25.2	14%	36.9	12%
All products	184.2	100%	306.4	100%

Source: UN Comtrade statistics

The full matrix of trade data broken down by country and sectoral products exists, but of course this becomes an excessively large mass of data to analyse. We restrict ourselves

² . Duprez, C. and L. Dresse (2013), "the Belgian economy in global value chains – An exploratory analysis", NBB, https://www.nbb.be/doc/ts/publications/economicreview/2013/ecorevii2013_h1.pdf.

therefore to presenting the sector-by-country data for the UK's top trading partners by volume and/or share of GDP on the EU27 side – see Annexes 3 and 4. This brings together Germany, Belgium, the Netherlands, Ireland and Malta.

German exports to the UK are concentrated in road vehicles, other manufactures and chemicals. Germany's imports are similarly concentrated in transport equipment and chemicals. Belgian and Dutch exports to the UK are also concentrated in machinery and transport equipment, and chemicals, although on the import side there are important volumes of oil and gas, reflecting the still significant while declining production of the North Sea.

Ireland and Malta tell different stories. Ireland is a notable exporter of food products to the UK, whereas its imports are highly diversified. Malta also has a diversified structure of imports for the UK, whereas its exports of goods are minimal.

2.2. Trade in services

The trade in services are also very substantial in volume, with €94 billion of exports from EU27 to the UK, and €122 in imports. When imports and exports of services are taken together their total of €306 billion is not all that much less than for the €394 billion total for goods. However the big difference here is that the UK has a significant surplus with EU27 on account of services (€28 billion), compared to its huge deficit on account of goods (€128 billion).

Table 3: Total trade in services between the UK and EU27, 2015

	Import (€bn)	% GDP	Export (€bn)	% GDP	Trade (€bn)	% GDP
EU27	122	1	94	0.8	216	1.8
UK	94	3.6	122	4.7	216	8.4

Source: Eurostat

Services is one area where Transatlantic trade is much more important the trade between the EU-27 and the UK. In 2015 EU exports of services were worth about €190 billion and imports worth almost €200 billion. The Transatlantic turnover in services trade was thus about 2 times larger than that across the Channel.

By *EU27 member state* the largest volume of service exports to the UK are from France (€18 billion), Spain (€15 billion) and Germany (€12 billion) – see Annex 4. All other EU27 member states fall under the €10 billion level of service exports to the UK. On the import side the picture is similar regarding Germany and France in leading positions, but here the next biggest importers are the Netherlands and Italy.

In terms of *share of GDP* the EU27's services exports average 0.8% of its GDP to the UK, whereas the UK exports 4.7% of its GDP to the EU27. For the smaller member states the picture is radically different, with services exports to the UK from Cyprus (7.5% GDP), Malta (5.4% GDP), Luxembourg (5.4% GDP), and Ireland (€2.6% GDP), dwarfing the GDP shares of other countries. On the import side the same countries are leading (Malta 10.3% GDP), Luxembourg (5.9% GDP), Ireland (5.0% GDP) – see Annex 4.

A big word of caution, however, is called for over these services data. Difficulties in the statistical recording of trade in services are known to be substantial. In particular 'mirror statistics' show big divergences. 'Mirror statistics' are where each side of a bilateral trade relationship is in principle measuring the same thing (e.g. UK exports to Belgium should equal Belgian imports from the UK). The actual 'mirror statistics' for UK-EU27 trade in services

show indeed big differences – see Annex 5. Thus the Belgian services deficit with the UK is recorded to be €1.8 billion according to UK data, whereas the Belgian data suggest the deficit to be only €0.1 billion. The biggest divergence is in the case of Ireland, where according to UK data the UK has a large surplus of €6.1 billion, whereas according to Irish data it is Ireland that enjoys an even bigger surplus of €11.5 billion. Unfortunately the official statisticians, be it from Eurostat or national agencies, do not seem able to throw much light on these differences, no doubt because various service flows are so difficult to record.

Sectoral data also exist in the aggregate for UK services trade with the EU27, but not the full matrix by country and sector. EU27 exports to the EU are concentrated in transport and travel (together €41 billion, of which tourism would be the main item), followed by business services including ICT and other (together €26 billion). For EU27 imports from the UK the leading sector is financial services (€25 billion), followed by business services including ICT and other (together €32 billion) and transport and travel (together €30 billion).

Table 4: Service trade between the UK and EU27, by sector, 2015

	EU27 imports from the UK (€bn)	% of GDP	EU27 exports to the UK (€bn)	% of GDP	Trade (€bn)	% of GDP
Transport	14.8	0.1%	12.9	0.1%	27.6	0.2%
Travel	15.0	0.1%	27.7	0.2%	42.7	0.4%
Construction	0.9	0.0%	2.2	0.0%	3.1	0.0%
Insurance and pension services	3.0	0.0%	0.7	0.0%	3.7	0.0%
Financial services	25.1	0.2%	4.5	0.0%	29.6	0.2%
Charges for the use of intellectual property	5.2	0.0%	2.5	0.0%	7.7	0.1%
Telecommunications, computer, and information services	9.3	0.1%	6.7	0.1%	16.0	0.1%
Other business services	22.7	0.2%	18.9	0.2%	41.7	0.3%
Personal, cultural, and recreational services	0.9	0.0%	0.4	0.0%	1.2	0.0%
Government goods and services	0.7	0.0%	2.2	0.0%	2.8	0.0%
Other	3.3	0.0%	1.0	0.0%	4.3	0.0%
Services	100.8	0.8%	79.6	0.7%	180.4	1.5%

Source: Eurostat.

In terms of the balance of trade in services the main items are the UK's surplus on account of financial services (€20 billion), its deficit on account of travel and transport (largely tourism, €11 billion), whereas the substantial trade in business services is more nearly balanced.

As mentioned the detailed sector-by-country data is not available. However some of the primary explanations are obvious enough. The high ranking of service exports from Luxembourg and Cyprus reflect large financial service components, whereas for Cyprus and Malta tourism is big. On the side of services imports by EU27 countries from the UK, the top rank of Luxembourg is surely in financial services.

2.3. Foreign direct investment

Data is available on both stocks and flow of foreign direct investment (FDI) of the UK and the EU27. These data are relatively complete for the *worldwide* flows and stocks of FDI (Table 5 and Annex 5). However the bilateral data as between the UK and individual member states have some gaps, and contain some apparent distortions (Table 6 and Annex 6).

The *worldwide* stocks of FDI are massive in both directions, with the EU27 having a stock of €7,033 billion of outward investments, while receiving €5,692 billion of inward investments. The UK has a stock of €1,386 outward investments and about the same amount of inward investments, at €1,314 billion.

UK investments in the EU 27 of €683 billion looks reasonably proportioned in relation to the worldwide total of €5,692 billion investments in the EU27. However in the statistics for EU27 investment in the UK the data seems implausible, with €985 billion of inward investments from the EU27 accounting for a very large share (75%) of the total worldwide investment in the UK of €1,314 billion. The source of this implausibility seems to be the huge reported amount of Dutch investments in the UK of €454 billion, which is related to the important amount of nominal investments in the Netherlands (see Annex 6), which in reality are only intermediate investments in transit from other sources.

Table 5: Foreign direct investment of UK and EU27 worldwide, total flows and stock, 2015

	Flow				Stock			
	Inward		Outward		Inward		Outward	
	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP
EU27	360	3%	494	4%	5,692	47%	7,033	58%
UK	36	1.4%	-55	-2%	1,314	51%	1,386	54%

Source: Eurostat.

Table 6: Foreign direct investment: bilateral between the UK and EU27, total flows and stock, 2015

	Flow				Stock			
	Inward		Outward		Inward		Outward	
	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP
EU27	3.7	0.0%	-73	-0.6%	683	5.6%	985	8.1%
UK	-73	-2.8%	3.7	0.1%	985	38.2%	683	26.5%

Source: Eurostat.

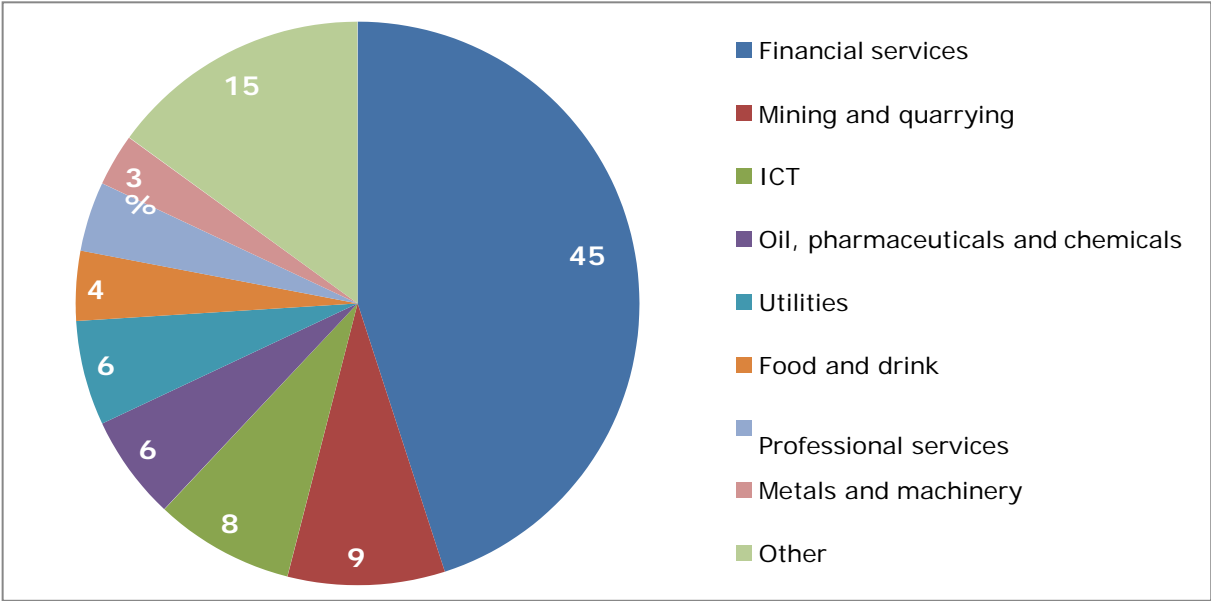
The major EU27 exporters of capital measured in stocks of FDI to all worldwide destinations are Germany (€1,634 billion), France (€1,184 billion), the Netherlands (€948 billion – but note the above comment), Spain (€426 billion), Italy (€421 billion) and Belgium (€414 billion) – see Annex 5. The same set of countries are the leading importers of capital, although on a somewhat smaller scale.

The flows of FDI from EU27 to worldwide destinations in 2015 follows the same pattern as for the stocks on of course a much smaller (€494 billion), whereas for the UK the amount was negative, with €55 billion of disinvestment.

As regards the sectoral breakdown of the stocks of direct investment in the UK by the EU27 (see Figure 3), there is a massive predominance of the financial services accounting for 45% of the total, whereas the remainder is a very diversified set of industries. The data on financial services requires however a specific interpretation, since it consists largely of the build-up of financial balance sheet assets, matched by liabilities. This is very different to investment in

factories, infrastructures and other physical assets in the case of the other sectors. Among the small EU27 member states with concentrations of interests in financial services the GDP share accounted for by these stocks of investment are of stratospheric proportions for Malta (1,637% of GDP), Cyprus (707% GDP), and Luxembourg (361% GDP).

Figure 3: Inward foreign direct investment stock in the UK from EU27, by sector



Source: ESRI, ‘Scoping the Possible Economic Implications of Brexit on Ireland’, 2015.

Statistics on FDI stocks and flows have to be analysed with caution since they contain many inaccuracies and internal contradictions.

The first limitation is showcased by the mismatch of bilateral/multilateral FDI data and their corresponding ‘mirror statistics’. The figures for FDI stocks are reported to be substantially different depending on whether one uses the recipient’s or the investor’s data. For example from the Irish (data) perspective the UK is a large net (FDI) investor in Ireland whereas the UK (data) view suggest it is only a small net investor (one-tenth of the Irish statistics). For Italy the net position vis-à-vis the UK even switches from a substantial net recipient to a net investor position, depending on which country’s statistics one uses. S for the services data, official statistical offices have not been able to clear up these apparent contradictions.

The second limitation stems from ‘hollow’ FDI via special purpose entities or vehicles (SPEs), for example for taxation or other regulatory reasons. The share of SPE-driven FDI is particularly large in Luxembourg and the Netherlands. These two countries are also those who account for around 60% of the overall total inward and outward stocks of the EU27 (Eurostat, 2016). According to the OECD, on average for 2011-2015, 70% and 95% of all FDI inflows to the Netherlands and Luxembourg, respectively, were via SPEs³. This type of ‘financial’ FDI is less likely to take the form of productive investment. A reduction in ‘financial’ FDI may have different implications for economic growth, in particularly sustainable growth. A detailed breakdown for the UK into traditional and ‘financial’ FDI is not available, but it can be assumed that the UK is also heavily engaged financial FDI given the role of the City of London as a financial hub. FDI stocks from and to the EU 27 outside the Netherlands and Luxembourg might thus be a more reliable indication of the real links from direct investment than the overall figures for UK that include the Netherlands and Luxembourg. The limited

³ OECD, ‘Most recent FDI statistics for OECD and G20 countries’, 2016

bilateral data available (which excludes Luxembourg) suggests that financial FDI accounts for about one half of UK investment in the EU 27 and at least about one third of EU-27 FDI in the UK.

2.4. Movement of people

Data on the movement of people are less detailed (and usually less up to date) than for trade and investment.

The number of EU27 citizens living in the UK at the end of 2016 is estimated at 3.35 million (based on ONS population statistics for 2015⁴ and net migration statistics for 2016⁵) – see Figure 4. The largest number are workers (2,002,000), compared to pensioners (223,000) and the unemployed (102,000). The large ‘other’ category (656,000) presumably includes students. Data is not available on the sectoral composition of employment of the workers, but it is widely appreciated that this is very dispersed across the economy, with substantial numbers in agriculture, retailing, construction, nursing and medicine, home care, financial services and other diverse business services.

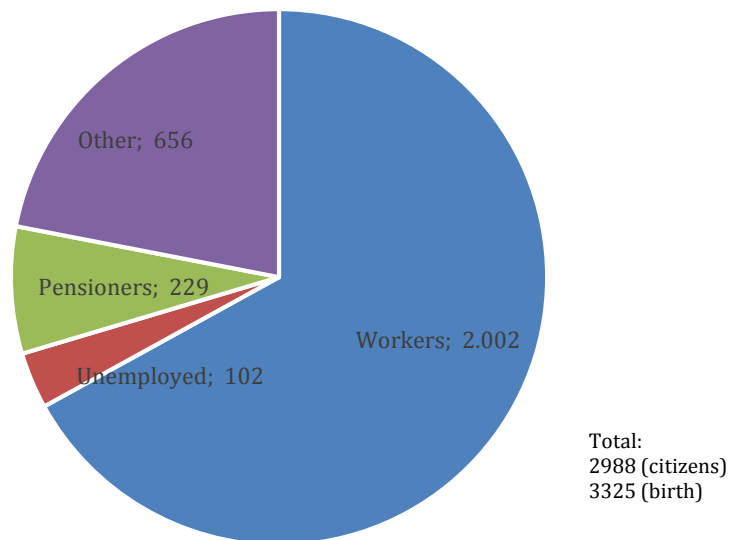
The flow of new migrants from the EU27 to the UK in 2014 was 263,600, while the return of EU27 migrants out the UK was 89,300 (full data is not available yet for later years). It will be of exceptional political importance to observe whether there is now to be a spontaneous drop in net migration from the EU27 to the UK. Data so far available up to the first half of 2016 showed no reduction in the flow. However as a result of the referendum campaign the atmosphere surrounding immigrants for the EU has become unsettled to say the least, with disturbing manifestations of xenophobic tendencies in parts of society. In addition the depreciation of the pound has cut incomes in the UK relative to the continent. These factors may result in a reduction or even reversal of net migration, but hard data in this regard are not yet available.

The stock of UK citizens living in EU 27 countries is substantially less, namely 1,217,000 according to OECD data⁶. UK data records around 400,000 of its citizens as pensioners living in the EU 27 countries, thus twice as many as vice versa. Implicitly that leaves around 800,000 as workers with their dependent families and students.

⁴ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/datasets/populationoftheunitedkingdombycountryofbirthandnationalityunderlyingdatasheets>.

⁵ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/migrationstatisticsquarterlyreport/dec2016>.

⁶ UN, “Trend in international migration stock 2015”.

Figure 4: EU27 citizens living in the UK, 2015

Detail of the composition of UK citizens living in the EU 27 by country and by occupation are not easily accessible. However we have looked at three major cases: Germany, Spain and Ireland. In Germany the majority might be expected to be workers, whereas in Spain the majority might be pensioners. Actually the figures do not confirm this stereotypical view, since in Germany there are 40,000 pensioners out of 103,000 UK born residents (38%), in Spain there are 100,000 pensioners among 309,000 UK citizens (32%), and in Ireland there are 103,000 pensioners out of 255,000 residents (40%)⁷.

2.5. EU budget contributions

The key language in Prime Minister May's speech of 17 January here is "... because we will no longer be members of the single market, we will not be required to contribute huge sums to the EU market".

With the UK's withdrawal, the EU is likely to face a €9 billion 'hole' in its annual budget, being the estimated amount of the UK's net contributions at the present time (the precise amounts vary from year to year)⁸. If the EU demands a contribution as a condition for a CFTA, one reference amount would be the contribution that Norway makes, scaled up for the size of the UK economy. This gives about €3.5 billion, which might be considered the outer limit or beyond for the UK, since it will not be a member of the single market like Norway in the European Economic Area.

If on the other hand there is no CFTA, and the UK has simply a WTO-based relationship with the EU, then the EU budget would receive additional tariff revenues, estimated at roughly €4.5 billion⁹. Interestingly this amount is not so different from the 'Norway-based' calculation above. So in both cases the EU would recuperate around a third to half of its loss of UK contributions.

This so far has concerned only regular current budget matters. But there also emerges the issue of 'legacy costs' of the divorce. There has been considerable public mention of this, including from the European Commission, with figures in the range of €20-40 billion sometimes cited. However, there has been no definition so far of what such costs would

⁷ <https://www.gov.uk/government/organisations/department-for-work-pensions/about/statistics>.

⁸ Jorge Nunez Ferrer, 'The Impact of Brexit on the EU Budget – a Non-Catastrophic Event', CEPS Policy Brief No 347, September 2016.

⁹ Ibid.

consist of, beyond for example remarks about commitments made before the UK's withdrawal which will be paid only after its withdrawal, and about pension liabilities for retired EU staff¹⁰. There has been so far no listing of the EU's assets and liabilities, including contingent liabilities such as loan guarantees, nor explanation of the legal basis for this or that claim that the EU might make.

¹⁰ The most detailed material so far published is: Financial Times, *'UK faces Brexit divorce bill of up to €20 billion'*, 12 October 2016.

3. KEY CHARACTERISTICS OF DIFFERENT TYPES OF BILATERAL AGREEMENTS

The terms of reference for this study mentions a wide range of scenarios, with two polar scenarios in the range of soft and hard Brexits, between (1) membership of the European Economic Area (EEA), and (2) membership only of the World Trade Organisation (WTO) with no preferential trading relationship with the EU. We review these therefore first.

In between there are a number of variants under the broad heading (3) of preferential arrangements, including free trade areas (FTAs), which can be more or less deep and comprehensive, and which can be with or without inclusion in the customs union (CU).

However Prime Minister May's important speech of 17 January 2017 narrows the field considerably, with a declared preference for a 'Comprehensive free Trade Agreement (CFTA)'. There have so far been two instances of 'CFTAs', with Canada (CETA) and Ukraine and others (DCFTA), so these are treated in some detail below.

3.1. European Economic Area (EEA)

In economic terms this would be close, but not identical, to the status quo for a full member state that is not a eurozone member, with full inclusion in the single market for all four freedoms, and compliance with all 'EEA-relevant' regulatory legislation by the EU. But it excludes membership of the EU's custom union, as well as agricultural and fisheries policies.

In the EEA all new or amended EU legislation has automatically to be taken on board by the non-EU EEA states.

Dispute settlement is by a special EFTA Court, which however cannot deviate from the rulings of the European Court of Justice.

Budget contributions are made, which are substantial, but significantly less than for EU member states (see section 1.5 above).

On the free movement of persons it may be noted that Liechtenstein was allowed to retain a quota regime for immigrants including from the EU, but this is unlikely to be considered a relevant precedent for the UK.

There is the theoretical option to add a scenario in which the EEA would be combined with membership of the EU's customs union (**1.1 EEA + customs Union**). In economic terms this would be a model very close to the status quo. The present EEA non-EU member states do not want this, because they value their freedom to make their own trade deals with the rest of the world. The UK clearly excludes this scenario, so it is not further pursued here.

3.2. World Trade organisation (WTO)

The UK is and will remain a WTO member state. The terms of the UK's revised membership will have to be determined. One possibility is that the UK would opt unilaterally to continue with the EU's common external tariff as its bound m.f.n. tariff schedule, which would facilitate an early agreement with WTO member states¹¹. The EU's average m.f.n. tariff is estimated to about 3.8% when weighted by the product structure of the UK's current exports to the EU27¹². However this average covers a wide range from zero to very high rates up to 50%, as for example for:

¹¹ m.f.n. stands for 'most favoured nation' and means in practice the schedule of fixed tariff rates applied to other WTO member, except in the case of specific preferential arrangements such as free trade areas with zero tariffs for 'substantially all' products (FTA).

¹² See Annex 9 for details of EU m.f.n. tariffs.

- Mineral fuels and pharmaceuticals zero%
- Machinery 2%
- Iron & steel, copper, wood 2%
- Aircraft 3%
- Vehicles 9%
- Clothes 12%
- Footwear 10%
- Processed foods 20-35%
- Cereals and meat 45-50%

The UK might opt for a more liberal m.f.n. schedule, for example for agricultural products, but is highly unlikely to be able to negotiate compensating concessions from other WTO members, because that would mean their changing their own m.f.n. schedules for all WTO members.

For services the WTO has a special regime, the General Agreement on Trade in Services (GATS). The liberalisation of services under the GATS is subject to a hugely complex set of 'reservations', whereby the member states can continue with restrictions on market access for specified services. Since the EU's own competence in the field of services is incomplete, this has had the result that at the WTO the 'reservations' by the EU and its member states are a hybrid of EU-level reservations and bilateral member state reservations. The UK could continue with its own bilateral reservations, and could further decide whether or not to continue to apply the EU-reservations bilaterally. The UK might well choose to be more liberal here than under the status quo, adopting fewer of the EU's reservations of itself bilaterally. However the UK's service providers would face many more reservations limiting their access to the EU market, compared to the still incompletely liberalised single market regime.

The Prime Minister's speech included at the end the widely noted phrase *'no deal would be better than a bad deal'*, followed by the remarks that if the simple WTO default solution resulted from the failure to make a better agreement, the UK could take steps to protect its competitive position, notably through tax policies and other regulatory policies. To this any independent economist would add a further possible depreciation of the pound, which the Prime Minister understandably did not want to encourage through public statements.

This leads into a second WTO scenario in which there might be some combination of a big reduction of corporation tax, a lighter regulatory regime than the EU *acquis* across the board and especially for financial markets, plus depreciation of the pound. This may be labelled **'2.1 WTO + aggressive, non-cooperative competition'**. The Prime Minister is evidently seeking to strengthen the UK's bargaining position, but it is already debated whether she is bluffing or not, and whether it would help get a better deal or not, or lead to an escalation of non-cooperative actions on both sides.

On the tax front, the UK already has a low corporation tax of 20%, and has also announced even before the referendum plans to reduce it further and substantially so (Ireland's rate of 12.5% is eyed). As regards regulatory competition, financial markets have much experience of this, ever since London won the international Eurobond market first from New York and then from Paris starting in the 1960s. On these accounts the threat is not an empty one. The Prime Minister also made more radical general remarks about going for an 'alternative economic model', which is viewed in the UK debate with much more scepticism. There is no appetite for reducing the tax base to the point of making the funding of vital public services such as the national health service even more difficult, and the Prime Minister has as regards

social and labour market policies stressed not undermining these, even pledging to strengthen workers' rights in some respects in the name of a fairer society.

3.3. Various preferential models

Given the very comprehensive and complex content of the many trade, cooperation and partnership agreements that the EU has concluded over the years, there are quite a few conceivable variants to consider. However these can for practical purposes be reduced to a manageable number of scenarios, and assessed in terms of their proximity to the two polar cases of EEA and WTO.

3.3.1. Simple Free Trade Agreement (FTA)

As the simplest model one can look at EFTA's own FTAs with third countries. These typically involve suppression of tariffs, but otherwise defer to WTO rules and principles on matters of non-tariff barriers, intellectual property rights and services. There is no freedom of movement of people in the simple FTA. But the UK says it wants something more than a simple tariff-cutting FTA, namely a 'Comprehensive' agreement (see further below).

3.3.2. Customs union (Turkey)

A next variant could be to add membership of the customs union to a simple FTA. This has features in common with the current regime with Turkey.

However the UK does not want to stay in the customs union because it wants freedom to negotiate its own trade deals with third countries. In the short to medium run it would mean that the EU's many free or preferential trade agreements in the rest of the world would cease to apply to the UK. The UK's trade relationships with these countries would therefore fall back on WTO m.f.n. conditions, until and unless it was able to renegotiate such agreements bilaterally.

For the UK exclusion from the EU's customs union will mean the introduction of rules of origin paperwork and procedures, which are estimated to be of some tariff-equivalent significance (3-5%).

3.3.3. Swiss model

Following its 1992 referendum that rejected accession to the EEA, Switzerland and the EU entered into a long and complex process of negotiating many sector-specific agreements, which had the effect of reconstituting much of the content of the EEA agreement. These were negotiated over many years and were grouped into successive packages. However the EU has become highly critical of the Swiss model on grounds of its complexity and 'cherry-picking' aspect. The EU has explicitly stated that it would like to see the Swiss relationship changed in favour of a single comprehensive agreement¹³.

The selectivity and perceived flexibility of the Swiss model are reasons why it has been discussed as a model in the UK. But it is clear the EU would exclude it, and the Prime Minister did not mention it in her speech of 17 January.

¹³ Council of the EU, Council Conclusions on a Homogenous Single Market and EU Relations with Non-EU Western European Countries, 16 December 2014. Extract, para. 44: "A precondition for further developing a bilateral approach remains the establishment of a common institutional framework for existing and future agreements through which Switzerland participates in the EU's internal market, in order to ensure homogeneity and legal certainty in the internal market. The Council welcomes the opening of negotiations on such a framework in May 2014, expects further efforts in order to progress with these negotiations and reiterates that without such a framework no further agreements on Swiss participation in the internal market will be concluded."

Switzerland and the free movement of persons

A second and more relevant aspect of the Swiss experience concerns the free movement of people. Switzerland agreed in 1999 to the free movement of people, subject however to a 'safeguard clause', which provided that: *"In the event of serious economic or social difficulties, the Joint Committee shall meet, at the request of either Contracting Party, to examine appropriate measures to remedy the situation. ... The scope and duration of such measures shall not exceed that which is strictly necessary to remedy the situation. Preference shall be given to measures that least disrupt the working of this Agreement."* This clause has never been activated, and so there is no experience with how it might have been applied. However it is worth bearing in mind, since the Prime Minister said nothing in her speech of 17 January over how the UK may reassert control over immigration from the EU.

In February 2014, it was in any case overtaken politically by a referendum that was passed by a narrow majority of 50.3% 'Against Mass Immigration', effectively requiring the government to establish within three years a system of quantitative limits to immigration from all sources, including the EU. As the deadline approached the Swiss parliament's lower house adopted on 21 September 2016 a new law favouring the recruitment of local residents for new vacancies, including already established EU residents. The new law appears to be a soft measure aimed at ending the confrontation with the EU, but will presumably not be considered a relevant model by the UK.

3.3.4. Comprehensive Economic and Trade Agreement (CETA)

This new agreement with Canada is a model of a Comprehensive FTA with an advanced industrial economy outside Europe (see Annex 8 for its table of contents). It is a more recent and developed model than for example that with Korea, and seems considered now as a basis for modernising a number of other older FTAs such as with Mexico.

CETA provides for basic tariff-free FTA conditions. For services the CETA goes considerably beyond WTO-GATS provisions (mobility of workers, mutual recognition of professionals, removal of some restrictions in financial and maritime transport services, public procurement). It is also quite radical in opening public procurement markets.

In the field of technical standards and regulations the key language in Article 4.4 is: *"The Parties undertake to cooperate to the extent possible, to ensure that their technical regulations are compatible with one another"*, with provisions for recognition of equivalence where one party judges that its standard is equivalent to that of the other party. But this is not automatic, and has to be agreed product by product. There is agreement on conformity assessment, such that a competent body in the EU can test EU products for export to the Canadian market according to Canadian rules and vice versa.

For sanitary and phytosanitary regulations (SPS), Article 5.6 provides that *"The importing Party shall accept the SPS measure of the exporting Party as equivalent to its own if the exporting Party objectively demonstrates to the importing Party that its measure achieves the importing Party's appropriate level of SPS protection"*.

The main point of comparison with the other models cited is that the CETA goes substantially beyond a simple FTA, but avoids any commitments by Canada to approximate EU legislation (or vice versa), and leaves much of the furthering of market access to future processes of negotiation. CETA is therefore less deep, legally binding and certain than the DCFTA (see further below). Mutual recognition in the area of technical regulations is possible, but not automatic.

Although much discussed in the UK debate, it was not mentioned by the Prime Minister in her 17 January speech for good reason: the UK will retain all EU market law on Day 1 of

withdrawal, and surely continue compliance with much such law to assure good access to the EU market.

3.3.5. Deep and Comprehensive Free Trade Area (DCFTA)

The new Association Agreements that came into force in 2016 with Ukraine, Georgia and Moldova are characterised by their comprehensive political and economic content, and inclusion of DCFTAs, which could lead to a high degree of inclusion in the single market for three of the four freedoms (free movement of goods, service and capital, but not people)¹⁴. The exclusion of free movement of people is because of concern in the EU over the prospect of large flows of immigrants. The EU's doctrine that all four freedoms are an indivisible package is thus applied to the EU itself and the EEA, but not between the EU and other close neighbours, or FTAs with the rest of the world.

These Agreements set out in legally precise terms the entire agenda for defining the relationship with the EU, sector by sector, for virtually all EU competences. The structure of chapters is more or less the same as that used in many of the EU's other association or partnership agreements with third countries, but the key issue is how far these chapters entail legally binding provisions and compliance with the EU *acquis*. The DCFTAs entail a high degree of compliance with EU *acquis*, and thus are a category apart from the most advanced agreements with non-European countries such as the CETA with Canada. The DCFTA is asymmetric in privileging EU law, whereas the CETA is strictly symmetric with reference to each party's laws. As a result the DCFTA, when fully implemented after transitional arrangements (that would in any case be irrelevant in the UK context), can assure a very high degree of access to the EU single market, close to the EEA case at least for trade in goods, but not for the movement of people or services. The coverage of EU law is very extensive (see Annex A), but not quite as complete as for the EEA. For some service sectors the DCFTA offers the possibility of 'full internal market treatment', conditional on full compliance with the EU *acquis*, notably for financial services and telecommunications. The dispute settlement mechanisms lean on WTO practice, with less total reliance on the European Court of Justice than in the EEA case.

There is no general contribution to the EU budget by the partner state, except for participation in specific agencies and programmes. On the contrary the EU is making substantial grant and loan aid to its DCFTA partners, whereas for the UK the EU is expected to request a general budget contribution as condition for preferential market access.

The Association Agreement also includes several other chapters that would be of great importance for the UK, including participation in the Horizon 2020 programme for scientific research, the Erasmus+ programme for cooperation in higher education, the European Defence Agency, Europol, etc. (see Annex 10).

3.3.6. Stabilisation and Association Agreement (SAA)

These are agreements between the EU and the non-member Balkan states that have 'membership perspectives', including Bosnia, Serbia, Albania, and Macedonia. They provide for a gradual move to tariff-free trade, alongside much attention given to the much needed improvement in the rule of law. Compared to the DCFTA, while the SAA model is also extensive in its listing of topics, the legal precision and level of binding commitment in the internal market area is much less. For example the Serbian SAA seeks to "promote the use of EU technical standards and regulations", which is a weak formulation of uncertain

¹⁴ For an explanation of these complex agreements see Michael Emerson and Veronika Movchan, *Deepening EU-Ukraine Relations – What, why and how?* CEPS and Rowman and Littlefield International, 2016 (www.ceps.eu/publications/deepening-eu-ukrainian-relations-what-why-and-how).

operational meaning. Chapters such as for public procurement and intellectual property rights are dealt with by reference to WTO or other international standards. Several key service sector chapters, such as for financial services and telecommunications, are dealt with only at the level of vague endeavours to “cooperate”.

The SAA model is also not politically relevant for the UK because it is intended to be a stepping-stone towards full membership.

3.3.7. Partnership and Cooperation Agreements (PCA)

The EU has many PCAs, especially with states of the former USSR, including Russia. These have extensive agendas for cooperation, but no legally binding preferential or free trade provisions. They rely on WTO m.f.n. tariff schedules. While many of these agreements are now two decades old, or have been replaced by the three DCFTAs, there is an ongoing effort to revise and update them. For example the EU has made in 2015 a new ‘Enhanced Partnership and Cooperation Agreement’ with Kazakhstan in this category. It has the same comprehensive list of topics as in many other of the EU’s recent agreements including the DCFTA, but these are almost all limited to ‘best endeavours to cooperate’, with no binding commitments beyond references to WTO rules. This means that the economic impact of this category of agreement may be limited to a soft improvement of the mutual business climate, possible encouraging direct investment, but they are otherwise in economic terms little more than the WTO model.

Therefore the PCA model is not interesting for the UK.

3.3.8. Strategic Partnerships

The EU has ‘strategic partnerships’ with countries of the world deemed to be most important for economic and/or political reasons, including the US, Canada, Mexico, China, Japan, Korea, India, Brazil, and South Africa. The main feature is the holding of regular annual or twice-yearly summit meetings to discuss global as well as bilateral issues. Some are combined with FTAs (Canada, Mexico, Korea), with some FTAs are currently under negotiation (US, Japan, Brazil), but others are without preferential trade arrangements in the foreseeable future (China). The EU has had an informal strategic partnership with Russia, with twice-yearly summit meetings, but these are suspended given the sanctions policy triggered by the Ukraine crisis.

The term ‘strategic partnership’ is to be compared with the ‘association agreement’ as representing the political framing of the relationship with the EU. The strategic partnership has connotations of top-level global affairs, whereas the association agreement is shared with the EU’s smaller neighbours. For this reason it is not surprising that the UK Prime Minister says she is looking for a ‘strategic partnership’ in discussing the UK’s possible future relationship with the EU, which she seems to want to combine with a CFTA, to which we now turn.

3.3.9. Strategic partnership with CFTA

In economic terms this would seem to mean a deal with characteristics somewhere between the Canadian CETA and the Ukraine DCFTA. It would include basic tariff-free trade as starting point. The Prime Minister also wants ‘maximum access’ to the single market, without being ‘member’ of it. The UK will in any case start on Day 1 of withdrawal with full compliance with EU single market law for goods and services, which under the ‘Great Repeal Act’ would have been transplanted wholesale into UK domestic law. This would be more along the lines of the DCFTA without any transitional delays, than with the Canadian CETA which has no references to EU law. To this extent the CFTA could be not far from the EEA for goods, although less close for services, and excluding the free movement of people.

However the UK wants to keep its options open as regards future changes to the EU *acquis* transplanted into UK law. But this raises a major issue for negotiation with the EU, since its conception of a CFTA will surely be that of a legally water-tight and binding agreement. This would be incompatible with having an open option for the UK side to change this EU-derived law, unless there were a provision requiring agreement between the two parties for such changes. Such a provision for changing the detail of the agreement exists in the Ukraine DCFTA, since the lists of EU laws contained in the annexes to the main text can be changed by agreement of the two parties.

Another possibility would be for a system according to which the UK starts by being fully compliant with EU *acquis*, but where subsequently it might depart from this, and so would lose preferential access for the goods or services in question. For example the UK might become less than fully compliant with the EU's government procurement directive, and so would lose market access in that sector. On the other hand it might remain fully part of the European system of technical standards for industrial products, which are set in any case by pan-European technical organisations of which the UK will remain a full member.

The retention by the UK of freedom to make even selective changes to the EU-derived market law would be a major problem for the EU side to the extent that it views its single market law as a legally homogenous whole. This is indeed legal doctrine within the EU. In this case the alternative approach would be to go for something closer to the Canadian CETA, which ignores EU law.

These are important issues which seem (at least from public speeches) not yet to have been thought through on the UK side, and to which the EU side has not yet had to respond.

For the purposes of rough assessment of the economic implications of the UK's possible CFTA with the EU, one can say that the outcome might be in the range between the Canadian CETA at a lower level of market access on the one hand, and on the other hand at the higher end there would be (a theoretical version of) a fully implemented Ukrainian DCFTA. Or, one can compare these hypothetical outcomes with the EEA-WTO comparison, where EEA stands for a very high level of market access, while the WTO stands for no preferential market access. In this range the DCFTA might be quite close to the EEA, whereas the CETA would be less close.

Table 7: Summary of scenarios or models for the EU's agreements with other countries

Scenario	Assessment
1. EEA	Close to the status quo, too close for UK
1. 1 EEA+customs union	Theoretical case, very close to status quo, too close for UK
2. WTO	Considerable lessening of market access, default regime for UK
2.1 + aggressive competition	With non-cooperative tax and regulatory competition
3. Preferential models	
3.1 Simple FTA	Possible, but UK wants a more ambitious 'Comprehensive FTA'
3.2 Customs union (with FTA)	More than simple FTA, but UK does not want customs union
3.3 Swiss model	Selective and flexible in the past, but not available for the UK
3.4 CETA (Canada)	Comprehensive, beyond simple FTA; no EU <i>acquis</i> content
3.5 DCFTA (Ukraine)	Deep and Comprehensive, with much EU <i>acquis</i> content
3.6 SAA (Balkans)	Weaker than DCFTA, for accession candidates, not for UK
3.7 PCA (Kazakhstan)	Little more than WTO, not for UK
3.8 Strategic Partnership	Summit level global diplomacy
3.9 <i>Idem</i> with CFTA	= UK objective (i.e. a Comprehensive FTA, somewhere between CETA & DCFTA?)

3.4. The EU's response

The only political statements so far have been that there will be no negotiations before Article 50 has been triggered, and that the four freedoms for goods, services, capital and labour are an indivisible package. The EU also would want there to be a single comprehensive agreement, ruling out a replay of the Swiss model of successive packages of sectoral agreements. One interpretation of the 'indivisible package' position would mean that any significant derogation from the freedom of movement of people would mean no access to the single market, and only a 'Simple FTA'; a harsher interpretation would be to exclude any FTA. Some public statements, such as by President Hollande, are suggesting that the UK would have to 'pay' for market access, allowing maybe for a solution consisting of a CFTA with a significant budgetary contribution. Indeed this may become the final trade-off, with many possible graduations of both market access and monetary amounts. This assumes a no doubt difficult but still constructive negotiation process. We turn to the hypothesis of an aggressively competitive process with a spiralling of reciprocal restrictive measures at the end of this paper.

4. ECONOMIC IMPACTS: QUANTITATIVE ESTIMATES AND QUALITATIVE ASSESSMENTS

4.1. Model-based simulations

There have been a number of model-based attempts to simulate the impact of Brexit, of which several estimate the impacts on both the UK and the EU27. Of these three are from official sources (OECD, UK Treasury, Netherlands Central Planning Bureau), and three from independent academic institutions or think tanks (London School of Economics, IFO in Munich, Open Europe in London). Broadly speaking this cluster of studies represents the 'state of the art' in trade policy modelling, with both new and traditional methodologies – see Table 8 and from Figure 5 to Figure 9 for the summary of results, and Annexes 12-14 for explanation of the methodologies and more detailed results. Annex 15 provides a brief note on what one might learn from the studies on TTIP and the literature on the benefits of EU membership.

While these model simulations cannot capture all the likely economic effects of the Brexit, as explained further below, they do provide a cluster of findings that are close to a consensus view on the relative size of the impacts. Given that the UK trade with the EU27 is a much bigger fraction of the UK's GDP than that of the EU27, it is hardly surprising that the economic impacts are much higher for the UK.

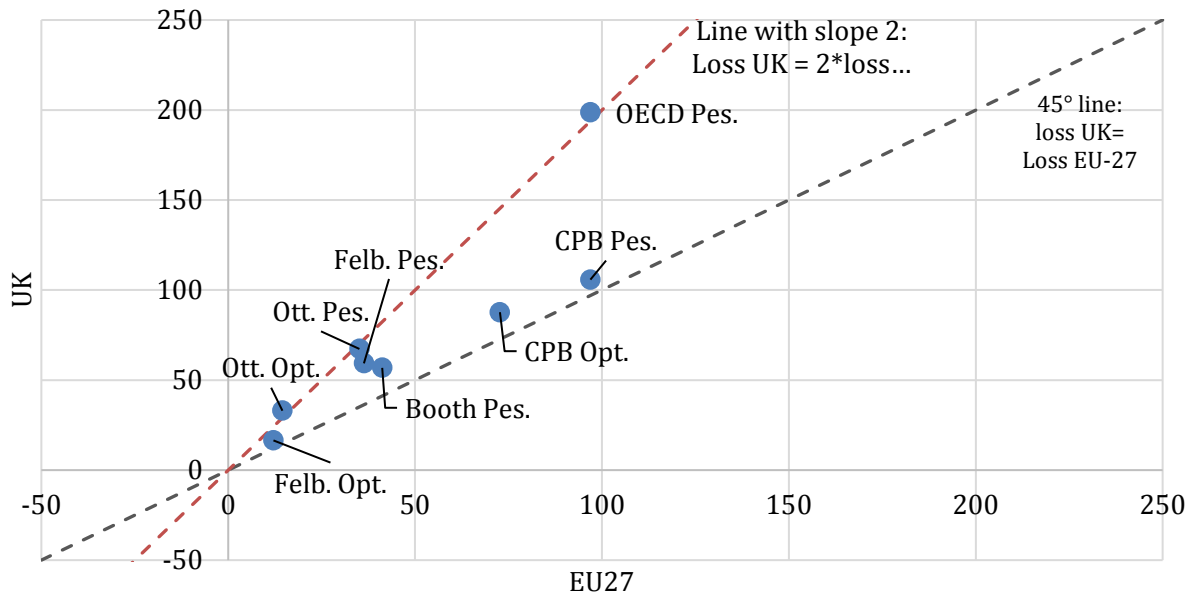
The hypotheses for these studies are quite similar, in that they all simulate a range of scenarios that we call either 'optimistic', meaning a small increase in trade barriers between the two parties, or 'pessimistic', meaning a much larger increase in trade barriers. Some also have a 'central' scenario between the two polar cases. The optimistic scenario in several cases assumes that the UK would enjoy a regime close to that as member of the European Economic Area like Norway. But Prime Minister May's recent speech shows this scenario already to be excessively optimistic. The pessimistic scenario usually assumes that the trading relationship between the UK and the EU27 is reduced to the terms of their WTO membership, with tariffs introduced at m.f.n. rates. This is widely called the 'hard Brexit'.

We will concentrate in most of this section on the impact of Brexit on GDP, which is also the focus of most models. Some of the models also report the impact on trade flows. For instance, Lawless and Morgenroth (2016) estimate a fall of the EU27's exports to the UK of 30% and for UK's exports to the EU27 of 22% taking into account only the introduction of WTO m.f.n. tariffs. However, given the differences in the size of trade flows this translates into a decline of only 2% of total (worldwide) EU27 exports. The impact of Brexit on Ireland and Belgium is of course estimated to be the much larger, with these two countries facing a reduction in total exports equal to 4% and 3.1%. For the UK, the impact of Brexit on total exports is considerably larger, 9.8%. Roja-Romagosa (2016) arrive at broadly similar results. They predict, that the fall in EU27 exports to the UK would amount to 3% in the WTO scenario and of 1.7% in the FTA scenario. For the UK, instead, total exports would decrease by 21.8% and 12.5% in the WTO and FTA scenarios respectively.

We now turn to the impacts on GDP. Table 8 provides an overview. For the EU27 on average there are losses of 0.11 to 0.52% of GDP for the optimistic and pessimistic scenarios respectively. These results cumulate over the whole decade until 2030, which means that if the impacts were spread evenly over these years, the annual average impact would be of the order of 0.01 to 0.05% of GDP: i.e. the impacts would be insignificant and hardly noticeable at the macro-economic level for the whole EU27 economy. This does not exclude that individual sectors, or some small member states would be more significantly affected, on which we comment further below.

The results for the UK are much larger, where the losses average 1.31 to 4.21% of GDP for the optimistic and pessimist scenarios respectively. Since the ratio of the UK economy to the EU27 is about 1:5 a disproportionate result in terms of a % of GDP was to be expected. If the absolute loss were of the same size for both sides one would have expected that the loss as a % of GDP should be 'only' five times higher for the UK. But as a % of GDP the average loss for the UK is about ten times higher, or more.

Figure 5: Absolute losses for UK and EU27 GDP (in € Billion)



Note: GDP figures are sourced from OECD stat. For the UK, the amount is converted from Pound to Euro using the annual average exchange rate for 2015. The blues spots represent the different model-based estimates, with indication of authors.

Source: Authors' own elaboration

Why is the loss distributed so asymmetrically? Economic theory predicts only that both sides will lose from creating new trade barriers. However, general economic principles also suggest that larger economies lose less from the imposition of a tariff because of the greater market power of its enterprises. Suppose that two trading partners both impose a tariff of 5% on each other's exports. The more powerful party will be more able to maintain the price of its exports, with the importer paying the extra costs. However the weaker party is forced to cut its export price to try and keep its market, and so bears the cost himself. There is thus a fundamental reason why trade agreements between large and small countries tend to be asymmetric, and why the losses from Brexit are likely to be borne primarily by the UK (despite the fact that the UK is a net importer of goods from the EU).

The OECD and UK Treasury models represent a deeper set of impacts from FDI, which go beyond investment and trade volumes. FDI is found, in various empirical studies taken into account in the two models, to have a favourable impact on R & D expenditures and thence on innovation and competitiveness, as also on general management quality.¹⁵

¹⁵ It is notable also that two of the studies, by the OECD and the UK Treasury, give significantly higher losses for the UK, which may be explained by the more extensive range of economic impacts that they take into account, notably negative impacts on FDI. In the pessimistic scenarios the losses for the UK, according to these two studies, mount up to around 7.5% of GDP which would be highly significant macroeconomically, meaning a reduction of GDP growth over a decade of around 0.75% annually.

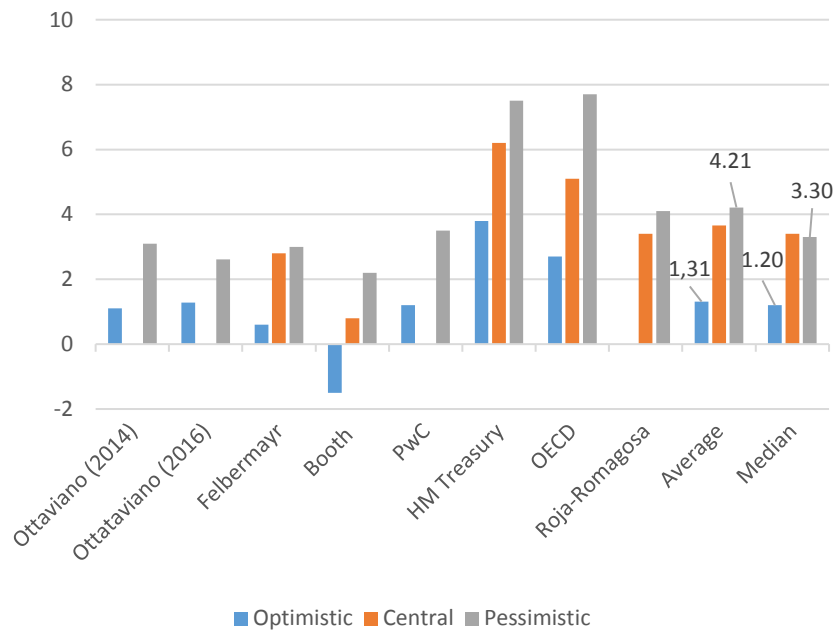
Table 8: Summary of model-based simulations of Brexit scenarios for the EU27 and UK, long term impact by 2030 (% GDP and absolute loss in 2015 euros)

	EU27		UK	
	(%)	(€ Bil)	(%)	(€ Bil)
Ottaviano/LSE				
Optimistic: UK similar to EEA/Switzerland	-0.12	-14.5	-1.28	-33.0
Pessimistic: UK as WTO third country	-0.29	-35.1	-2.61	-67.3
Aichele/Felbermayr/IFO				
Optimistic: UK similar to EEA/Switzerland	-0.1	-12.1	-0.64	-16.5
Pessimistic: UK as WTO third country	-0.3	-36.3	-2.3	-59.3
OECD				
Optimistic: trade, FDI, migration, small declines	-		-2.7	-69.7
Central: <i>idem</i> medium declines	-		-5.1	-131.6
Pessimistic: <i>idem</i> large declines	-0.8*	-96.9	-7.7	-198.7
Roja-Romagosa/Cental Planning Bureau, NL				
Optimistic: FTA after 10 years with half NTBs between EU and WTO	-0.6	-72.7	-3.4	-87.7
Pessimistic: UK as WTO third country	-0.8	-96.9	-4.1	-105.8
Booth/Open Europe				
Optimistic: UK unilateral FTA with all world, plus ambitious deregulation agenda			+1.5	38.7
Pessimistic: UK as WTO third country	-0.34	-41.2	-2.2	-56.8
UK Treasury				
Optimistic: UK similar to EEA	-		-3.8	-98.0
Central: UK in customs union as Turkey, or Canadian CETA	-		-6.2	-160.0
Pessimistic UK as WTO third country	-		-7.5	-193.5
Average				
Optimistic	-0.11	-13.3	-1.31	-33.8
Pessimistic	-0.52	-63.0	-4.21	-108.6

Note: OECD* estimation for the EU is computed only for a medium-term scenario (2023); Aichele/Felbermayr (2016) uses GDP per capita; GDP figures are sourced from OECD stat. For the UK, the amount is converted from Pound to Euro using the annual average exchange rate for 2015.

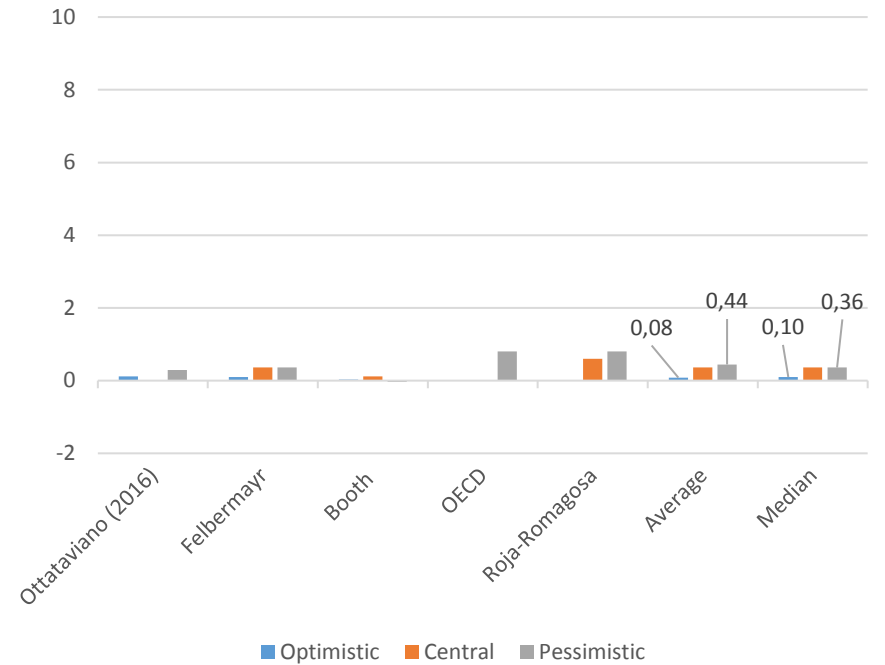
Source: see Annex 12 for a short explanation of the methodologies, and Annexes 13 and 14 for some more details on the models cited.

Figure 6 : Change in UK's GDP (2030) by type of exit scenario (%)



Notes: All changes are reported with an opposite sign, i.e. positive values express a reduction of GDP; Felbermayr (2016) uses GDP per capita.

Figure 7: Change in EU27's GDP (2030) by type of exit scenario (%)



Notes: All changes are reported with an opposite sign, i.e. positive values express a reduction of GDP; OECD estimation for the EU is computed only for a nearer term scenario (2023); Felbermayr (2016) uses GDP per capita.

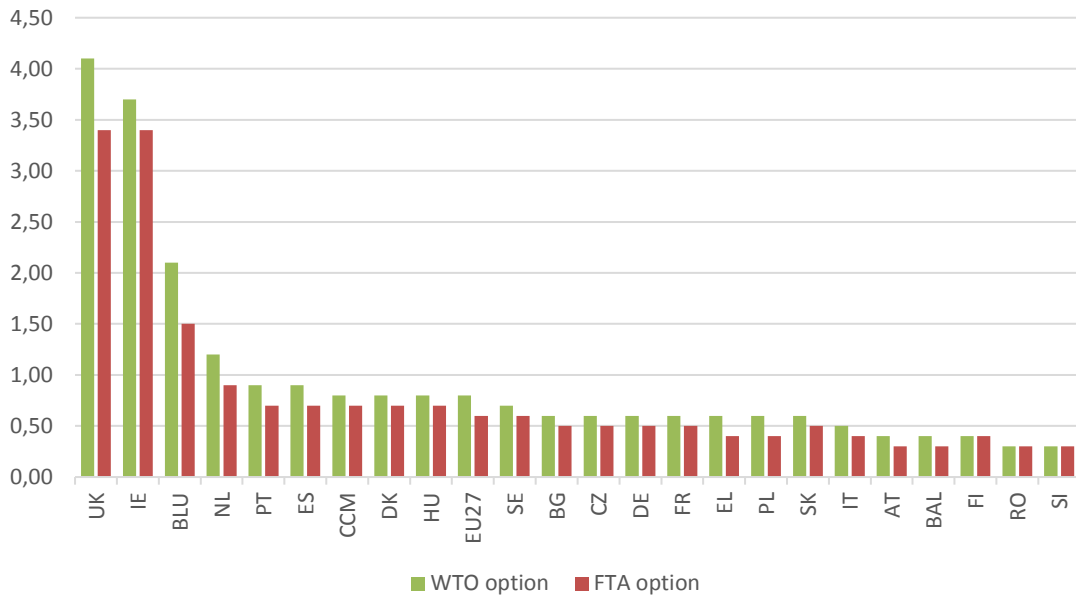
One outlier among the model results is that of Booth/Open Europe, which however adopts a radically different 'optimistic' scenario, namely the ultra-liberal formula whereby the UK would adopt free trade unilaterally both with the EU and the whole of the rest of the world, without negotiating counterpart concessions from anyone. The world has seen three such cases: Singapore, Hong Kong and Georgia. But these are all small countries, with very high concentrations in Singapore and Hong Kong of financial and other services, somewhat similar actually to the place of London as regional and global service centres. However in the British case, beyond the 10 million people in cosmopolitan London, there are another 50 million people with different interests. This is a clue why the scenario does not attract political support in the UK, even if the simulation postulates that it would be beneficial. It is interesting to note that the EU27 would also benefit from the implausible scenario.

Regarding the results for the EU27 two of the studies (Roja-Romogosa and Felbermayr) give a complete breakdown for each of the 27, as shown in Figure 8 and Figure 9. The aggregate result for the EU27 is also roughly reflected as one would expect in the results are for the large member states (Germany, France, Spain, Italy).

However for several small member states, and in particular those with close historic ties with the UK, the results are more damaging. The most striking result is that Ireland suffers the same magnitude of losses as does the UK. This is plausibly explained by the fact that Ireland relates to the UK in the same way that the UK relates to the EU27 aggregate; i.e. Ireland's greater trade dependency on the UK is greater than vice versa, in roughly the same proportions that the UK has a greater trade dependency on the EU27 than vice versa.

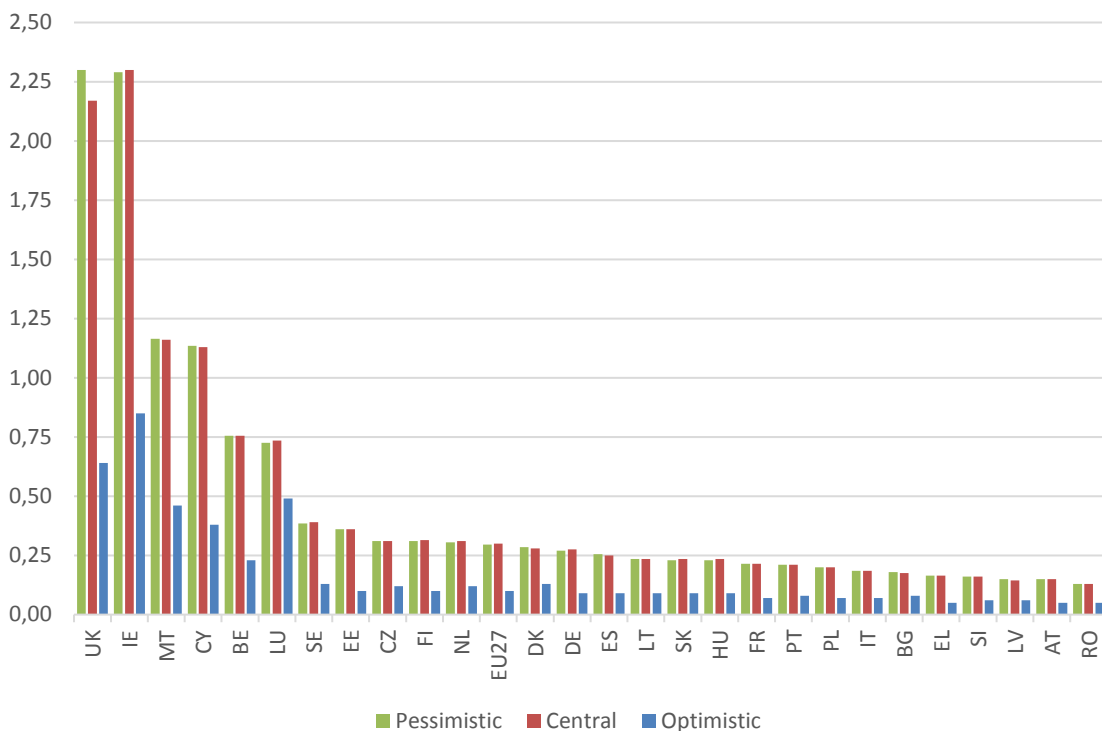
Malta and Cyprus are also among the most exposed Member States, as shown in the estimates of Felbermayr for GDP per capita (Figure 9), as also in Roja-Romogosa to a somewhat lesser degree (in Figure 8), where under the acronym CCM aggregates Croatia, Cyprus and Malta together). A similar picture emerges for Belgium and the Netherlands, although there may be some upward bias in the results to the extent that there is a lot of trade between the UK and the EU27 that transits through the important seaports of Belgium and the Netherlands without much value being added. The high results for Cyprus, Malta and Luxembourg may rely a lot on an assumed reduction in trade in financial services with the UK, which are of huge proportions relative to GDP in these three economies. The least affected countries are the Baltic states, Finland and Romania.

Figure 8: Losses in GDP (2030) by Member States and type of Brexit scenario (%)



Source: Roja-Romagosa (2016). BLU (Belgium and Luxembourg); CCM (Croatia, Cyprus and Malta); BAL (Baltic countries).

Figure 9: Losses in GDP per capita (2030) by Member States and type of Brexit scenario (%)



Source: Felbermayr (2016)

At the sectoral and enterprise level there will also be some impacts that would be much sharper than the average, especially for the pessimistic scenarios in which WTO m.f.n. tariffs are introduced. For example the automobile sector is one of huge trade and supply chain

interdependence between the UK and the EU27, and where the EU's WTO m.f.n. tariff rate is a high 10%. In addition the UK's exit from the customs union would mean a further increase in non-tariff costs to trade of the order of 3%, which would discourage complex cross-channel supply chains. At unchanged exchange rates this could lead to a considerable loss of demand on the continent for Minis, Range Rovers, Nissans and Toyotas 'made in the UK'. However the pound has already depreciated relative to the euro by an average of about 10 % since the 23 June referendum, which could leave competitiveness levels maybe more or less unchanged. Reinforcing the importance of this sectoral example, Nissan made a well-publicised but non-transparent deal with Prime Minister May to avoid new trade barriers.

4.2. Beyond the models

The model-builders themselves would be the first to say that their quantitative methodologies cannot capture all the likely or possible impacts of an unprecedented event such as Brexit.

The challenge then is to speculate what kinds of impact might be both important and ignored by the models. In this limited study we can only provide a sketch of some issues that are likely to become important.

First, Brexit means in any case a huge politico-economic shock to the EU system. It is not an orthodox, or just technical trade policy adjustment, which is what most of the models implicitly assume. As is obvious from public debate Brexit is shaking the EU system at its foundations. Public debate exercises a huge range of possible consequences, between at the most pessimistic end a further 'falling apart' of the EU edifice, to a middle scenario of the EU pulling themselves together sufficiently to avoid this bigger disaster, through to the optimistic scenario in which the EU seizes the occasion to strengthen itself as an economic and/or political structure. The surge of support for populist parties in much of Europe, with the Brexit being seen by some of these political movements as pointing the way for the future, adds to concerns on the pessimistic side.

Further amplifying the stakes is the arrival of President Trump who engages in concrete acts of protectionism, has asked who will be next in quitting the EU, and looks forward to an excellent relationship with Putin. All together this amounts to a situation of unprecedented strategic uncertainty, which economic actors note. The likely impact of this uncertainty factor could be at least deferral of investments decisions in Europe as a whole, thus amplifying the negative model-calculated impacts for as long as the uncertainty remains. While this uncertainty factor will hit both the UK and EU27, there is one element of vulnerability that is greater on the EU27 side, namely the potential financial instabilities in the euro system.

A second question is how far there are zero-sum impacts to be taken into account (i.e. losses for some that translate into gains for others), beyond the model simulations that are suggesting just different degrees of losses for all. The prime candidate in this regard is the impact on the distribution of foreign direct investment (FDI) in Europe by multinational corporations that are strategically aiming in their investment decisions at the EU's single market. Up until now the UK has been outstandingly successful in winning a more than proportionate share of such FDI, thanks to its business-friendly regulatory and legal-cultural environment, coupled to advantages of the English language. As Japanese investors have been saying with great clarity, their large investment stake in the UK has been driven by the unquestioned assumption that the UK was a permanent member of the EU. This assumption has now been shattered. If the overall volume of Europe-oriented FDI remains relatively stable, there could be a re-distribution of FDI to the disadvantage of the UK, and to the advantage of the most agile and well-prepared of the EU27 member states. However, it is also possible that inwards FDI from the rest of world into Europe diminishes as the EU27 market also shrinks somewhat in size with Brexit.

There is already considerable anecdotal evidence to that Brexit is affecting FDI, with leading automotive companies saying that they tend now to put their investment plans for the UK at least 'on hold' for the time being. The UK Prime Minister had to make apparently strong (but non-transparent) promises very fast in October 2016 to Nissan for it to be persuaded to go ahead with plans to expand production in the UK. In financial markets various banks are already planning relocation of parts of their staff to the EU27, especially to France, Germany, Ireland and Luxembourg.

Especially interesting is the case of Ireland, which according to the models stands to be hurt most by the Brexit, but is also well positioned by virtue of its friendly business climate and English language to gain market share in European FDI¹⁶. A detailed study by ESRI in Dublin is very cautious in assessing this prospect, but it would only take a small redistribution of European FDI to Ireland to make a big difference to its economy.

A further zero-sum impact concerns the EU budget. As indicated above, the EU budget will suffer a 'hole' of about 9 billion, which may be partly offset whether by the UK being induced to make some budgetary contribution as a condition of advantageous market access, or in the case of the 'WTO only' scenario increased tariff revenues on imports for the UK. There is a further debate emerging on other 'legacy' or 'divorce' costs relating to the EU's liabilities and assets.

A third question is to consider what may happen to relative competitiveness, even if both sides introduce comparable tariffs towards each other. Already there has been a 10% depreciation of the pound against the euro, which will help the UK maintain market share, but with losses of real incomes as inflation begins to rise. But there is also a scenario in which the UK matches a 'hard Brexit' outcome to its negotiations with a decision to engage in aggressive and non-cooperative tax and regulatory policies in order to compensate for the losses that it risks suffering, and notably in relation to the impact on FDI discussed above. This unfortunate scenario has to be considered because the Prime Minister herself has opened it up in her speech of 17 January. Through aggressive reduction in corporation tax in particular the UK could seek to offset the unfavourable impact on FDI, coupled possibly to further devaluation of the pound against the euro, which would offset the introduction of tariffs. The UK's corporation tax is already a relatively low 20%, and it is planned to reduce it to 17% in the next few years, and even further beyond.

If such a scenario developed, what would be the reaction of the EU27? Clearly the pressures for protectionist measures against the UK would build up, thus leading into the nightmare scenario of spiralling protectionist and counter-protectionist measures, with political as well as economic consequences. The results of this would for sure be negative for all, adding to the model-based negatives.

How do these various considerations affect the overall picture of the model results? The strategic uncertainty factors, together with the risk of the last 'nightmare scenario', mean that the outcomes could risk being worse for both parties. The arguments concerning FDI on the other hand would tend to increase the costs for the UK and alleviate them for the EU27, while the challenge for the UK of getting fast FTAs with the rest of the world look like hurting their terms of trade.

The popular press in the UK and speeches by Brexit-advocating politicians are keen to use various scraps of short-term evidence (lower savings to finance consumer spending over the last Christmas season) to dismiss the findings of the various studies such as reported above, which show very much more costly results for the UK than for the EU27. Such views seem ill-advised. On the one hand the costs of Brexit are in any case only expected to accumulate over the medium-term future, and the short-run factors may soon evaporate.

¹⁶ Source: Barrett, Alan, et al. "Scoping the possible economic implications of Brexit on Ireland." *ESRI Research series* 48 (2015).

5. CONCLUSIONS

This study has focussed on the impact of Brexit on the EU27.

Our main finding is that the available studies largely agree that Brexit will inflict losses on both sides. All studies agree that the losses will be considerably larger for the UK than for the EU27. Only in very pessimistic scenarios would the losses for the EU27 reach a significant size.

We find that the trade linkages between the EU27 and the UK are of a similar (but somewhat smaller) order of magnitude as trade between the EU and the US. This would suggest that the negative impact of Brexit on the EU27 might be of a comparable size to the positive impact that TTIP might have had. We have not pursued this analogy any further (Annex 15 provides some pointers, though).

It is very difficult to determine which of the several different scenarios discussed above are still politically feasible after Prime Minister May ruled out the EEA. However, the available evidence suggests that the additional losses that would result from a bad or uncooperative outcome would be borne mostly by the UK.

REFERENCES

- Aichele, Rahel, and Gabriel Felbermayr. "Costs and benefits of a United Kingdom exit from the European Union." Guetersloh: Bertelsmann Stiftung (2015).
- Barrett, Alan, et al. "Scoping the possible economic implications of Brexit on Ireland." ESRI Research series 48 (2015).
- Booth, Stephen, et al. "What if...? The consequences, challenges and opportunities facing Britain outside EU." Open Europe Report 3 (2015): 15.
- Breuss, Fritz. "Austria and Switzerland—Experiences with and without EU Membership." *Austrian Economic Quarterly* 1.2006 (2006): 13-39.
- Busch, Berthold, and Jürgen Matthes. "Brexit—the economic impact." A Meta-Analysis, IW-Report 10 (2016).
- Campos, Nauro F., Fabrizio Coricelli, and Luigi Moretti. "Economic growth and political integration: estimating the benefits from membership in the European Union using the synthetic counterfactuals method." (2014).
- Kierzenkowski, Rafal, et al. "The economic consequences of Brexit: a taxing decision." *OECD Economic Policy Papers* 16 (2016): 1.
- Lawless, Martina, and Edgar Morgenroth. "The Product and Sector Level impact of a hard Brexit across the EU". ESRI, WP No 550. (2016).
- Ottaviano, Gianmarco IP, et al. "The Costs and Benefits of Leaving the EU: Trade Effects." Centre for Economic Performance Technical Report (2016).
- Ottaviano, Gianmarco IP, et al. "The costs and benefits of leaving the EU." (2014).
- PwC. "Leaving the EU: Implications for the UK economy". March (2016).
- Rojas-Romagos, Hugo. "Trade effects of Brexit for the Netherlands". CPB background document, June (2016).
- Straathof, Bas, et al. *The Internal Market and the Dutch economy: Implications for trade and economic growth*. No. 168. CPB Netherlands Bureau for Economic Policy Analysis, 2008.
- Treasury, H. M. "HM Treasury analysis: the long-term economic impact of EU membership and the alternatives." Parliament by the Chancellor of the Exchequer by command of Her Majesty, April (2016).

ANNEXES

Annex 1: EU27 exports/imports with UK for all goods, by country, ranked by share of GDP, 2015

	EU27 imports from the UK (€bn)	% GDP	EU27 exports to the UK (€bn)	% GDP	Trade	% GDP
Ireland	23	9.0	17	6.8	40	15.7
Belgium	16	3.9	28	6.9	44	10.8
Netherlands	24	3.5	43	6.3	67	9.9
Malta	1	5.9	0	2.9	1	8.7
Czech Rep.	3	1.6	7	4.0	9	5.6
Hungary	2	1.6	3	3.2	5	4.8
Slovakia	1	0.8	3	3.5	3	4.3
Germany	42	1.4	85	2.8	127	4.2
Cyprus	1	2.9	0	1.2	1	4.1
Latvia	0	1.2	1	2.7	1	3.9
Lithuania	0	1.0	1	2.9	1	3.9
Poland	5	1.2	11	2.6	16	3.8
Sweden	6	1.4	9	2.1	15	3.5
Denmark	3	1.2	5	1.8	8	3.0
Spain	12	1.1	19	1.8	32	2.9
Estonia	0	1.5	0	1.3	1	2.8
Portugal	2	1.0	3	1.8	5	2.8
France	25	1.1	35	1.6	59	2.7
Finland	2	0.9	3	1.4	5	2.2
Romania	1	0.8	2	1.3	3	2.2
Bulgaria	0	1.1	1	1.1	1	2.2
Italy	12	0.7	23	1.4	34	2.1
Luxembourg	0	0.6	1	1.3	1	1.9
Austria	2	0.7	4	1.2	6	1.9
Slovenia	0	0.7	0	1.2	1	1.9
Greece	1	0.7	1	0.6	2	1.3
Croatia	0	0.4	0	0.3	0	0.7
EU27	184	1.5	306	2.5	491	4.0

Source: Eurostat.

Annex 2: Imports from the UK by product for selected EU countries, 2015

	Belgium		Ireland		Netherlands		Malta		Germany	
	€bn	% GDP	€bn	% GDP	€bn	% GDP	€bn	% GDP	€bn	% GDP
Food and live animals	0.5	0.1	3.9	1.5	1.3	0.2	0.1	0.7	1.1	0.0
Beverages and tobacco	0.1	0.0	0.5	0.2	0.3	0.0	0.0	0.1	0.3	0.0
Crude materials, inedible, except fuels	0.2	0.1	0.3	0.1	0.2	0.0	0.0	0.0	0.5	0.0
Mineral fuels, lubricants and related materials	3.4	0.8	2.5	1.0	7.9	1.2	0.0	0.0	3.8	0.1
Natural Gas	1.5	0.4	1.3	0.5	7.3	1.1	0.0	0.0	3.8	0.1
Petroleum and petroleum products	1.7	0.4	1.0	0.4	0.4	0.1	0.0	0.0	0.0	0.0
Animal and vegetable oils, fats and waxes	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.0
Chemicals and related products	3.0	0.7	3.1	1.2	4.9	0.7	0.1	0.8	8.2	0.3
Organic chemicals	0.7	0.2	0.1	0.0	1.2	0.2	0.0	0.0	0.8	0.0
Medicinal pharma products	0.8	0.2	0.9	0.4	2.4	0.3	0.0	0.4	3.9	0.1
Essential oils, perfume etc.	0.5	0.1	1.1	0.4	0.3	0.0	0.0	0.2	0.8	0.0
Manufactured goods classified chiefly by material	1.7	0.4	2.7	1.1	1.4	0.2	0.1	0.8	4.5	0.1
Machinery and transport equipment	5.1	1.3	5.3	2.1	4.7	0.7	0.2	2.3	17.7	0.6
Road Vehicles	3.5	0.9	1.2	0.5	1.5	0.2	0.0	0.6	3.8	0.1
Aircraft, associated equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.8	0.2
Ship, boat, float. structures	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8	0.0	0.0
Miscellaneous manufactured articles	1.3	0.3	4.2	1.7	2.4	0.4	0.1	1.0	5.3	0.2
Commodities and transactions not classified elsewhere in the SITC	0.6	0.1	0.3	0.1	0.5	0.1	0.0	0.1	0.5	0.0
All Commodities	16.0	3.9	23.0	9.0	23.8	3.5	0.5	5.9	42.0	1.4

Source: UN Comtrade statistics.

Annex 3: Exports to the UK by product for selected countries, 2015

	Belgium		Ireland		Netherlands		Malta		Germany	
	€bn	% GDP	€bn	% GDP	€bn	% GDP	€bn	% GDP	€bn	% GDP
Food and live animals	2.7	0.7	5.6	2.2	5.7	0.8	0.0	0.1	4.5	0.1
Beverages and tobacco	0.4	0.1	0.4	0.2	0.5	0.1	0.0	0.0	0.5	0.0
Crude materials, inedible, except fuels	0.3	0.1	0.5	0.2	1.5	0.2	0.0	0.0	0.9	0.0
Mineral fuels, lubricants and related materials	1.8	0.4	0.5	0.2	2.7	0.4	0.0	0.0	0.4	0.0
Natural Gas	1.8	0.4	0.3	0.1	1.5	0.2	0.0	0.0	0.3	0.0
Petroleum and petroleum products	0.1	0.0	0.0	0.0	0.7	0.1	0.0	0.0	0.0	0.0
Animal and vegetable oils, fats and waxes	0.1	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.1	0.0
Chemicals and related products	8.3	2.0	4.3	1.7	10.0	1.5	0.1	1.5	13.4	0.4
Organic chemicals	0.8	0.2	0.8	0.3	1.6	0.2	0.0	0.0	1.2	0.0
Medicinal pharma products	4.3	1.1	2.3	0.9	5.1	0.8	0.1	1.5	6.3	0.2
Essential oils, perfume etc.	0.4	0.1	0.7	0.3	0.5	0.1	0.0	0.0	1.2	0.0
Manufactured goods classified chiefly by material	3.5	0.9	0.9	0.4	2.8	0.4	0.0	0.1	9.2	0.3
Machinery and transport equipment	10.9	2.7	3.5	1.4	14.5	2.1	0.1	0.9	47.4	1.6
Road Vehicles	8.1	2.0	0.2	0.1	2.0	0.3	0.1	0.6	27.6	0.9
Aircraft, associated equipment	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	1.6	0.1
Ship, boat, float. structures	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Miscellaneous manufactured articles	3.2	0.8	1.5	0.6	4.7	0.7	0.0	0.2	8.1	0.3
Commodities and transactions not classified elsewhere in the SITC	0.1	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.6	0.0
All Commodities	31.4	7.7	17	6.8	42	6.3	0.3	2.9	85	2.8

Source: Comtrade.

Annex 4: Service trade between the UK and EU 27, by country, ranked by share of GDP, 2015

	Imports (€bn)	% GDP	Exports (€bn)	% GDP	Trade (€bn)	% GDP
Malta	0.9	10.3	0.5	5.8	1.5	16.0
Cyprus	0.7	4.2	1.3	7.5	2.1	11.6
Luxembourg	3.0	5.9	2.8	5.4	5.8	11.3
Ireland	12.8	5.0	6.7	2.6	19.5	7.6
Netherlands	17.2	2.5	7.2	1.1	24.4	3.6
Portugal	1.6	0.9	3.5	1.9	5.1	2.9
Greece	1.7	1.0	3.2	1.8	4.9	2.8
Bulgaria	0.6	1.4	0.5	1.0	1.1	2.4
Sweden	5.7	1.3	4.5	1.0	10.2	2.3
Denmark	4.3	1.6	1.5	0.6	5.9	2.2
Spain	7.9	0.7	14.7	1.4	22.5	2.1
Belgium	4.9	1.2	3.2	0.8	8.1	2.0
Croatia	0.3	0.6	0.6	1.3	0.8	1.8
Lithuania	0.4	0.9	0.3	0.8	0.6	1.7
France	19.5	0.9	17.8	0.8	37.3	1.7
Hungary	0.7	0.6	0.8	0.7	1.4	1.3
Finland	1.9	0.9	0.7	0.4	2.6	1.2
Poland	2.7	0.6	2.5	0.6	5.2	1.2
Czech Rep.	1.2	0.7	0.8	0.5	2.0	1.2
Slovakia	0.6	0.7	0.3	0.4	0.9	1.1
Italy	11.3	0.7	6.4	0.4	17.8	1.1
Latvia	0.1	0.4	0.2	0.7	0.3	1.1
Germany	19.7	0.6	11.6	0.4	31.3	1.0
Romania	1.0	0.6	0.6	0.4	1.6	1.0
Estonia	0.1	0.7	0.0	0.2	0.2	0.9
Austria	1.5	0.4	1.3	0.4	2.8	0.8
Slovenia	0.1	0.3	0.1	0.3	0.2	0.6
EU27	122.5	1.0	93.6	0.8	216.1	1.8

Source: Eurostat.

Annex 5: Bilateral service trade between the UK and EU 27 with 'Mirror' data, in bn Euro

	Service trade balance	
	UK data	Mirror data
Belgium	-1.8	-0.1
Bulgaria	-0.2	0.3
Czech Rep.	-0.5	0.3
Denmark	-2.8	-0.7
Germany	-8.0	1.4
Estonia	-0.1	0.0
Ireland	-6.1	11.5
Greece	1.5	2.7
Spain	6.8	6.9
France	-1.7	2.9
Croatia	0.3	0.3
Italy	-4.9	-0.2
Cyprus	0.6	1.1
Latvia	0.1	0.3
Lithuania	-0.1	0.0
Luxembourg	-0.3	2.0
Hungary	0.1	0.2
Malta	-0.4	0.6
Netherlands	-9.9	0.2
Austria	-0.2	0.2
Poland	-0.3	0.2
Portugal	1.8	2.2
Romania	-0.3	0.0
Slovenia	0.0	0.0
Slovakia	-0.3	0.0
Finland	-1.1	-0.2
Sweden	-1.1	-0.1

Note: 'Mirror' data are here reporting, for example, Belgian data for their bilateral service trade balance with the UK showing a deficit of €-0.1 bn, while UK data reports a deficit of €1.8 bn for the same. Positive numbers indicate a surplus balances with the UK for the countries in question.

Source: Eurostat.

Annex 6: Foreign direct investment of the UK and EU27, worldwide flows and stocks by country, 2015

	Flow				Stock			
	Inward		Outward		Inward		Outward	
	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP
Austria	3	1%	11	3%	149	44%	188	55%
Belgium	28	7%	35	8%	422	103%	414	101%
Bulgari	2	4%	0	0%	38	84%	3	6%
Croatia	0	0%	0	0%	24	54%	5	11%
Cyprus	4	23%	9	50%	125	707%	120	680%
Czech R.	1	1%	2	1%	102	61%	17	10%
Denmark	3	1%	12	4%	91	34%	172	65%
Estonia	0	1%	0	1%	17	84%	5	27%
Finland	7	4%	-9	-5%	83	40%	85	41%
France	39	2%	32	1%	696	32%	1184	54%
German	29	1%	85	3%	1011	33%	1634	54%
Greece	0	0%	0	0%	16	9%	24	14%
Hungary	1	1%	1	1%	83	76%	35	32%
Ireland	91	35%	92	36%	393	153%	715	280%
Italy	18	1%	25	2%	302	18%	421	26%
Latvia	1	2%	0	0%	13	54%	1	5%
Lith.	1	2%	0	0%	13	35%	2	5%
Luxem.	22	43%	35	69%	185	361%	153	298%
Malta	9	98%	0	-2%	147	1677%	61	697%
Netherl.	65	10%	102	15%	637	94%	968	143%
Poland	7	2%	3	1%	192	45%	25	6%
Portugal	5	3%	7	4%	103	57%	57	32%
Romani.	3	2%	0	0%	62	39%	1	0%
Slovak Rep.	1	1%	0	0%	43	55%	2	3%
Slovenia	1	2%	0	0%	11	28%	5	13%
Spain	8	1%	31	3%	481	45%	426	40%
Sweden	11	3%	21	5%	254	57%	312	70%
EU27	360	3%	494	4%	5692	47%	7033	58%
UK	36	1%	-55	-2%	1314	51%	1386	54%

Source: Eurostat.

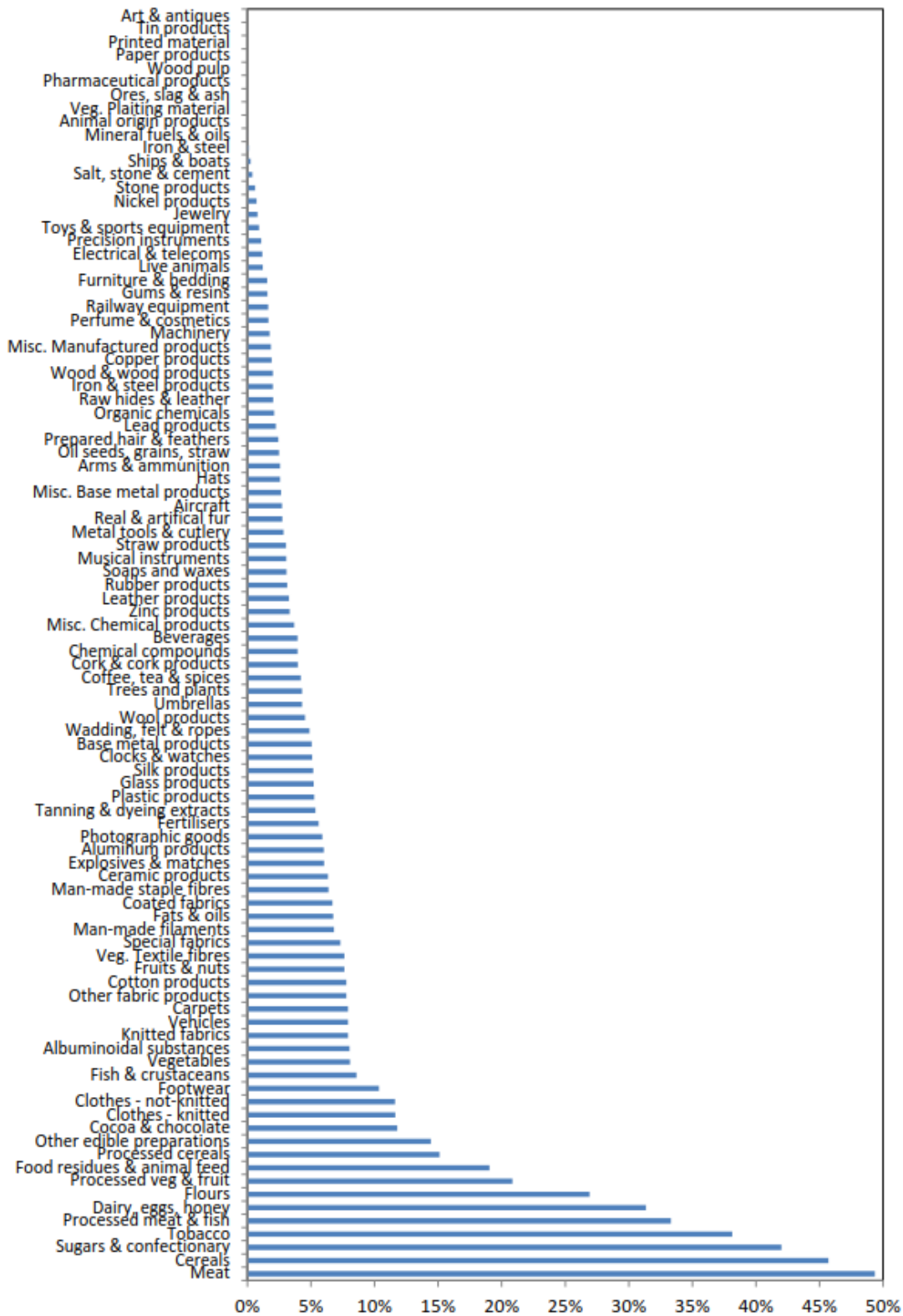
Annex 7: Foreign direct investment *between the UK and EU27, flows and stocks by country, 2015*

	Flow				Stock			
	Outward		Inward		Outward		Inward	
	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP
Belgium	12.7	3.7%	4.7	1.4%	32.0	9.4%	-0.8	-0.2%
Bulgaria	0.0	0.0%	0.0	0.0%	0.1	0.0%	2.3	0.6%
Czech Rep.	0.0	0.0%	0.3	0.7%	0.3	0.6%	4.0	8.8%
Denmark	0.7	1.6%	-0.7	-1.6%	18.7	42.7%	7.7	17.6%
Germany	2.2	12.2%	3.0	17.2%	146.1	828.3%	62.5	354.3%
Estonia	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.3	0.2%
Ireland	0.5	0.2%	-4.1	-1.6%	89.0	33.5%	37.0	13.9%
Greece	-0.4	-1.9%	0.1	0.3%	-1.2	-6.1%	0.1	0.5%
Spain	8.8	4.2%	1.6	0.8%	76.1	36.4%	66.1	31.6%
France	9.5	0.4%	5.9	0.3%	121.4	5.6%	65.9	3.0%
Croatia	0.0	0.0%	0.6	0.0%	0.0	0.0%	0.5	0.0%
Italy	-0.3	-0.2%	3.5	2.0%	22.7	12.9%	36.2	20.6%
Cyprus	n.a.	n.a.	n.a.	n.a.	2.7	2.5%	3.9	3.6%
Latvia	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.5	0.2%
Lithuania	0.0	0.0%	0.2	0.0%	0.1	0.0%	0.4	0.0%
Luxemb.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Hungary	0.2	0.6%	1.0	2.8%	0.5	1.4%	7.2	19.2%
Malta	0.0	-0.1%	0.1	0.2%	0.1	0.2%	0.7	1.4%
Netherla.	-106.1	-1206.9%	-18.0	-205.0%	454.3	5169.7%	334.9	3810.4%
Austria	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Poland	0.1	0.0%	2.5	0.6%	1.0	0.2%	9.1	2.1%
Portugal	0.1	0.0%	0.6	0.4%	1.5	0.8%	7.7	4.3%
Romania	n.a.	n.a.	0.2	0.1%	0.0	0.0%	1.3	0.8%
Slovenia	0.0	0.0%	0.1	0.1%	0.0	0.0%	0.3	0.4%
Slovakia	n.a.	n.a.	0.0	0.0%	n.a.	n.a.	0.4	1.1%
Finland	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sweden	-1.2	-0.3%	2.2	0.5%	20.2	4.5%	35.5	7.9%
EU27*	-73.1	-0.6%	3.7	0.0%	985.6	8.1%	683.9	5.6%
UK	3.7	0.1%	-73.1	-2.8%	683.9	26.5%	985.6	38.2%

Note: EU27 only includes those country where data is available. Figures for the entire EU27 will be significantly larger since e.g. Luxembourg is missing.

Source: Eurostat.

Annex 8: WTO implied tariffs on UK exports to EU27, by product



Source: Lawless, Martina, and Edgar Morgenroth. "The Product and Sector Level impact of a hard Brexit across the EU". ESRI, WP No 550. (2016).

Annex 9: EU-Canada Comprehensive Economic and Trade Agreement (CETA)

Table of Contents

- Market access for goods, tariff elimination
- Rules of origin
- Trade remedies
- Technical barriers to trade (TBT)
- Sanitary and phytosanitary measures (SPS)
- Customs and trade facilitation
- Competition policy, subsidies, state enterprises, monopolies
- Government procurement
- Intellectual property
- Investment
- Services
 - Financial services
 - International maritime transport services
 - Telecommunications
 - Electronic commerce
- Mutual recognition of professional qualifications
- Labour
- Environment
- Science, technology
- Dispute settlement

N.B. The above is a simplified version of the official text.

Annex 10: EU's Association Agreements, including Deep and Comprehensive Free Trade Areas (DCFTAs) with Ukraine, Georgia and Moldova

Table of contents

Chapters on political, foreign policy matters, rule of law, etc.

Political dialogue

Foreign and security policy

Justice, freedom and security

 Rule of law and human rights

 Migration, asylum and border management

 Movement of persons

 Fight against crime, money laundering, illicit drugs

Chapters of the DCFTA (selected)

Market access for goods (elimination of almost all tariffs)

Trade remedies (e.g. anti-dumping duties)

Customs procedures (including rules of origin)

Technical standards for industrial goods

Food safety regulations

Services (notably financial services, transport, electronic communications, etc.)

Payments and capital movements

Public procurement

Intellectual property rights (IPRs)

Competition policy

Trade-related energy

Chapters of Economic and Sectoral Cooperation

Macroeconomic cooperation

Taxation

Energy cooperation (excluding trade-related)

Environment

Agriculture

Fisheries and maritime policy

Company law

Consumer protection

Information society

Employment and social policy

Public health

Agencies and programmes

Space

Cross-border cooperation

Chapters on legal and institutional provisions

Dispute settlement

Institutional provisions

N.B. The above is a somewhat simplified and edited list of chapters.

Annex 11: Agencies of the EU open to participation by non-member states

European Agency for Safety and Health at Work (EU-OSHA)

European Fisheries Control Agency (EFCA)

European Monitoring Centre for Drugs and Drug Addiction (EMCDDA)

European Union Institute for Security Studies (EUISS)

European Centre for Disease Prevention and Control (ECDC)

European Aviation Safety Agency (EASA)

European Defence Agency (EDA)

European Foundation for the Improvement of Living and Working Conditions (EUROFOUND)

European Union's Judicial Cooperation Unit (EUROJUST)

European Agency for the Management of Operational Cooperation at the External Borders (FRONTEX)

European Environment Agency (EEA)

European Asylum Support Office (EASO)

European Chemicals Agency (ECHA)

European Police College (CEPOL)

European Maritime Safety Agency (EMSA)

European Food Safety Authority (EFSA)

European Institute for Gender Equality (EIGE)

European Police Office (EUROPOL)

European GNSS Agency (GSA)

European Network and Information Security Agency (ENISA)

Annex 12: Programmes of the EU open to non-member states

Competitiveness of Enterprises and SMEs (COSME)

Asylum, Migration and Integration Fund

Copernicus, European Earth Observation Programme

Erasmus+

Creative Europe, Programme for the cultural and creative sectors

Customs 2020

European Maritime and Fisheries Fund

European Statistical Programme

European Territorial Cooperation Health for Growth

Fiscalis 2020

Galileo and EGNOS Programmes Global satellite navigation system

Horizon 2020

Hercule III, Anti-fraud

Internal Security Fund

Life Programme,

Environment and climate change

Pericles 2020, Programme for the protection of the euro against counterfeiting

SESAR JU, Air Traffic Management modernisation

European Union Civil Protection Mechanism

Annex 13: Model methodologies for simulating the economic impact of Brexit

The standard theoretical and applied model is the **Computable General Equilibrium (CGE) model**, in which for trade policy simulations trade openness is supposed to increase with the reduction of tariffs, or tariff-equivalent estimates for non-tariff barriers (and vice versa). These changes in openness have complex ripple effects throughout the economy, affecting trade and production structures through the changes in relative competitiveness. The standard model calculates new equilibrium situations, i.e. the aggregate result accumulated over the number of years required for all the impacts to work through (thus 2030 is frequently quoted time horizon in the cited studies). However, in CGE modelling, results heavily depend on the assumptions made, the structure of the model, and data used. Finally, beside the high complexity characterizing this model, CGE are 'comparative static' models, meaning that results derive from a comparison of the economy equilibrium today with the one achieved when the economic shock is absorbed. Hence, dynamic impacts on productivity and economic growth effects are not covered. Booth (Open Europe) and Roja-Romagosa (CPB) base their estimation on CGE model.

Gravity models assume that bilateral trade flows are increasing in relation to the size of the trade partner's economy and decreasing in relation to its geographic distance. In other words, the bigger and closer countries are, the larger their bilateral trade would be. Gravity models are thus used to assess how trade flows would be with or without free trade. However, in contrast to CGE models, gravity models cannot estimate the economic impact on other economic factors such as employment and welfare. Finally, gravity models have been found to underestimate the impact of FTAs on trade flows for two main reasons: 1) some FTAs specificities could have a negative impact on trade and, if not accounted for, results are biased, and 2) the causation of the relationship between FTAs and trade volumes is complicated by endogeneity or circular causation, in the sense that an increase in trade rise the likelihood of an FTAs, while at the same time, FTAs foster trade.

New Quantitative Trade Models (NQTM) are based on both gravity equations and basic assumptions of CGE models. The advantage of NQTM over CGE models is a much simpler construction of the model itself, requiring fewer and more straightforward equations than CGE models. This allows for a better understanding of the effect of each parameter taken into consideration. Trade elasticities calculated using gravity equations represent the second element characterizing NQTM. These models are able to estimate how changes in trade costs affect both trade flows and economic welfare. Finally, additional parameters can be included in estimation, such as multiple sectors and countries, or trade in intermediate products. Yet, as CGE models, NQTM models are static models meaning that results strongly depend on assumptions made and are unable to catch dynamic effects. Both Ottaviano (LSE) and Aichele, Felbermyr (IFO) applies NQTM in their estimation.

The National Institute Global Econometric Model (NiGEM) is a global macroeconomic model (with more than 40 countries) constructed upon a 'New-Keynesian' framework. In the NiGEM, economic agents are assumed to be forward-looking. They further allow for nominal rigidities that slow down adjustment processes arising from external shocks. Finally, NiGEM estimation are based on historical data, which differentiate it from normal Dynamic Stochastic General Equilibrium (DSGE) models. Through the use of real-world data, NiGEM can be used to carry out both policy analysis and forecasting.

Each country included in NiGEM is defined by a country-specific model composed by 1) a production function, where external shocks impact domestic productivity, 2) a demand function, where a trade shock plays a role in defining the capital stock in the long-term, 3) exports and imports, 4) personal income and 5) financial markets. Countries then interact between each other through different channels such as international trade, financial markets and international stock of assets. An essential balancing factor in countries' interaction is competitiveness, as changes in domestic prices are reflected in trade prices as well, making possible for net trade to adjust for shifts in domestic demand.

In a nutshell, the combination of macroeconomic approach and use of historical-data makes the NiGEM a solid theoretical model, which is suitable for forecasting both static and dynamic effects. The NiGEM has been used by both the UK Treasury and OECD, and both studies provide the highest estimates in terms of UK GDP reduction. This is because they were able to account for the effect on UK productivity of factors such as FDI, trade openness and net migration.

Annex 14: Model simulations of economic impact of Brexit on the UK

	Agreement scenarios (e.g. EEA, WTO)		Type of model (ex-ante/ex-post; trade/macro-economics)		Total Long term Impact on GDP (by 2030)	Breakdown by type of impact
	Optimistic	Pessimistic	Type	Main assumptions		
Ottaviano et al. (2016) LSE	Norway/Switzerland Tariffs stay at zero + NTBs equal to ¼ of those faced by US exporters. Intra-EU barriers fall 20% in 10 years, but UK would not enjoy.	WTO MFN Tariffs + NTB equal to 2/3rds of those faced by US exporters. Intra-EU barriers fall 40% in 10 years, but UK would not enjoy.	NQTM using gravity model. Ex-ante trade model.	Perfect competition and trade in intermediaries. YES dynamic effects with empirical estimation	-1.28% to -2.61% (Reduction pr growth -6.3% to -9.5%)	Trade effects: -1.37% to -2.92% Fiscal Benefit: +0.09% to +0.31%
Roja-Romagosa (2016), NL Central Planning Bureau	FTA after 10 years , Tariffs will return to zero, NTBs half-way of WTO option	WTO MFN Tariffs + increase of NTBs	CGE	Dynamic effect between trade volumes and productivity	-3.4% to -4.1% productivity link: -5.9% to -8.7%	Member States and Dutch economic sector
Aichele/Felbermayr (2015) IFO	Soft (Norway/Switz.): Trade Agreement with the EU where Tariffs stay at zero + NTBs + new trading costs due to withdraw from the EU.	Deep cut: No trade agreement. Tariffs as for US exporters + higher NTBs Isolation UK: UK withdraw also from existing FTAs with third countries.	NQTM using gravity model. Ex-ante trade model.	Perfect competition and trade in intermediates. No dynamic effects.	GDP per capita Soft: -0.64%; (with NTMs) Deep cut: -1.5 to -2.8% (with NTMs); Isolation: -1.6% to -3% (with NTMs)	Fiscal Benefit: +0.5%

Booth et al. (2015) Open Europe	FTA2: FTA1 + UK chooses a unilateral free trade approach with RoW (+0.75%). The UK also pursues a deregulation agenda (+0.7%). Best case: FTA2+ extremely ambitious deregulation agenda	WTO: MFN Tariffs + new TBs. FTAs with 3 rd countries remain in place. FTA1: Internal Market access for goods + moderate increase TBs for services and FDI. Some fiscal contribution to EU budget.	CGE ex-ante trade model	Perfect competition and multi-sectoral and multi-county analysis. Accounts for investment and capital accumulation, but not for dynamic growth effects (e.g. FDI spillovers). Focus on merchandise goods, while trade in services and GVC are not considered.	-2.2% (WTO)/-0.8% (FTA1)/+0.64% (FTA2)/ +1.5% (Best case)	WTO: Tariffs - 0.95% / Border Costs -1.2% / NTBs (good+services +FDIs) -0.61%/ EU budget +0.53%
UK Treasury (2016)	EEA FTA (e.g. Switzerland/Turkey/Canada)	WTO	Gravity model approach, + macroeconomic & NiGEM modeling for productivity and FDI impacts	Dynamic effect of FDI and productivity are considered. Welfare effects are included. Takes into account also of next stage of the Single Market	-3.8% (EEA) -6.2% (FTA) -7.5% (WTO) With next stage: -5.8% (EEA) -8.2% (FTA) -9.5% (WTO)	
OECD (2016)	Optimistic: Trade -10%; inward FDI -10%; net migr -56thous; Business R&D -0.11% of GDP; regulation index -0.4; mgmt. quality -5% Central: Trade op. -15%; inward FDI -30%; net migr -84thous; Business R&D -0.29% of GDP; Regulation -0.2; mgmt. quality -10%	Pessimistic: Trade op. -20%; inward FDI -45%; net migr -116thous; Business R&D -0.48% of GDP; ETCR index (i.e. regulation) 0; decline mgmt. quality -20%	NiGEM macroeconomic modelling	Dynamic effect of FDI and productivity are considered	Optimistic - 2.7%; Central - 5.1%; Pessimistic - 7.7%	

Annex 15: Model simulations of economic impact of Brexit on EU27

	Agreement scenarios (e.g. EEA, WTO)		Type of model (ex-ante/ex-post; trade/macro-economics)		Total Long term Impact on GDP (by 2030)	Breakdown by type of impact
	Optimistic	Pessimistic	Type	Main assumptions		
Ottaviano et al. (2016) LSE	Norway/Switzerland Tariffs stay at zero + NTBs equal to ¼ of those faced by US exporters. Intra-EU barriers fall 20% in 10 years, but UK would not enjoy.	WTO MFN Tariffs + NTB equal to 2/3 of those faced by US exporters. Intra-EU barriers fall 40% in 10 years, but UK would not enjoy.	NQTM using gravity model. Ex-ante trade model.	Perfect competition and trade in intermediaries.	-0.12% to -0.29%	
Roja-Romagosa (2016), NL Central Planning Bureau	FTA after 10 years , Tariffs will return to zero, NTBs half-way of WTO option	WTO MFN Tariffs + increase of NTBs	CGE	Dynamic effect between trade volumes and productivity	-0.6% to -0.8% productivity -1.1% to -1.5%	Member States and Dutch economic sector
Aichele/Felbermayr (2015) IFO	Soft (Norway/Switz.): Trade Agreement with the EU where Tariffs stay at zero + NTBs + new trading costs due to withdraw from the EU.	Deep cut: No trade agreement. Tariffs equal to those applied to US exporters + higher NTBs Isolation UK: UK withdraw also from existing FTAs with third countries.	NQTM using gravity model. Ex-ante trade model.	Perfect competition and trade in intermediaries. No dynamic effects.	GDP per capita Soft: -0.1% (with NTMs); Deep cut: -0.24 to -0.36% (with NTMs); Isolation: -0.23% to -0.36% (with NTMs)	Member States

Booth et al. (2015) Open Europe	<p>FTA2: FTA1 + UK chooses a unilateral free trade approach with RoW (+0.75%). The UK also pursue a deregulation agenda (+0.7%).</p> <p>Best case: FTA2+ extremely ambitious deregulation agenda</p>	<p>WTO: MFN Tariffs + new TBs. FTAs with 3rd countries remain in place. Fiscal contribution to the EU is safe.</p> <p>FTA1: Internal Market access for goods + moderate increase TBs for services and FDI. Only part of fiscal contribution to the EU is safe.</p>	CGE ex-ante trade model	Perfect competition and multi-sectoral and multi-county analysis. Account for investment and capital accumulation, but not for dynamic growth effects (e.g. FDI spillovers). Focus on merchandise goods, while trade in services and GVC are not considered.	Relative to baseline -0.34% (WTO)/-- 0.12% (FTA1)/ 0.03% (FTA2)	
OECD (2016)	Financial mkts shocks similar magnitude financial crisis 2011-12; depreciation of the pound; reduction trade openness; reduction net migration		NiGEM macroeconomic modelling	Dynamic effect of FDI and productivity are considered	(Results for 2023) -0.8%	

Annex 16: Going beyond the models: lessons from other approaches

Transatlantic Trade and Investment Partnership (TTIP)

Another way to estimate the costs of Brexit for the EU27 is to use the studies done in preparation of TTIP, which would have involved the opposite of Brexit, namely an elimination of WTO m.f.n. tariffs and a reduction of non-tariff barriers (NTBs).

The comparison between Brexit and TTIP is more interesting than appears at first sight. The US economy is of course several times larger than that of the UK, but trans-Atlantic trade is of a similar order of magnitude to trans-Channel trade. Trans-Atlantic goods trade was in 2015 only about 20 % larger than the trade in goods between the UK and the EU27. The impact of Brexit might thus be comparable to that of TTIP with the sign reversed. Trade in services is, however, twice as large across the Atlantic than across the Channel.

Studies of scenarios for the TTIP came to the conclusion that the elimination of tariffs alone would not lead to large gains. The Commission's own website puts it succinctly:

"Given the low average tariffs (under 3%), the key to unlocking this potential lies in the tackling of non-tariff barriers. These consist mainly of customs procedures and behind the border regulatory restrictions." See <http://ec.europa.eu/trade/policy/countries-and-regions/countries/united-states/>

The widely accepted result from the economic impact studies which used a similar approach (and models) to those surveyed here for Brexit, was that TTIP would increase EU GDP by about 0.5 % of GDP, with 0.1 % of GDP due to the elimination of tariffs between the EU and the US, and 0.4 % of GDP due to the lowering (typically halving) of NTBs.

http://trade.ec.europa.eu/doclib/docs/2013/september/tradoc_151787.pdf

Lessons from the literature on the benefits of EU membership

Another way to estimate the cost of Brexit is to consider that the cost of Brexit should be the mirror of the benefit of EU membership. There is a substantial literature which shows significant gains from EU and single market membership. If one were to accept that conclusions of this literature, one would conclude models surveyed here might understate the cost of Brexit.

One of the first studies to incorporate the many effects of a Single Market, was done by the CPB (Straathof et al, 2008), which used a blended CGE/macro-econometric model [Worldscan] to arrive at benefits of EU membership of 10 % of GDP or more. A novel attempt was undertaken by Campos, Coricelli and Moretti (2014) based on a synthetic counterfactual for the EU countries which joined in 1973 or later: they come to an average gain of 12 % of GDP (except for Greece), with more for the UK. Because the WTO has become more comprehensive in scope and a little 'deeper' too, in the meantime, the implied costs of exiting might be today a little less high.

But in any event, the large negative effects in the models used on BREXIT are a priori consistent with this new literature on the EU benefits being quite large, and should not be dismissed too swiftly. Another variant of the counterfactual approach is Breuss 2006, comparing Switzerland and Austria given their respective choices for market integration in Europe, which also arrives at large benefits for Austria.

NOTES

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