

# The Economic Impact of Brexit: Evidence from Modelling Free Trade Agreements

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**Abstract** This paper assesses the economic implications of the United Kingdom (UK) leaving the European Union (EU). The basic data on trade in goods and services and investment between the two parties suggest that the cost of “Brexit” could be substantial. Trade between the UK and the EU-27 is large and of a similar order of magnitude as transatlantic trade (between the EU and the U.S.). The precise nature of the (hopefully free) trade agreement UK-EU-27 is still being negotiated. All available studies concur that a significant disruption of trade links will impose economic costs on both sides. However, the EU-27 would bear only a disproportionately small share of the total cost, not just because it is about five times larger than the UK in economic terms, but also for fundamental reasons such as greater market power of its enterprises. Other studies on different free trade arrangements confirm the general proposition that the smaller party has more to gain from eliminating trade barriers (and more to lose from imposing them). This implies that the EU will have a stronger negotiating position.

**Keywords** Brexit · European Union · Free trade agreements · Trade in goods and services · FDI

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## Introduction

On June 23, 2016, the UK voted narrowly (52:48) to leave the European Union (EU). The UK government then officially notified the EU on March 29, 2017, of its intention to leave, thus triggering Article 50 of the EU Treaty, which specifies that within two years the UK will cease to be a member. The date for Brexit is thus clear, but the nature of the economic relationship between the UK and the remaining EU-27 is still to be defined.

Principles of economics suggest that Brexit will have an economic cost for both sides as trade in both goods and services between the UK and EU-27 will no longer be (nearly) frictionless, as it is at present. The size of these economic costs is uncertain, but they are likely to be substantial since, at present, trade across the Channel is very large: €306 billion of exports of goods by the EU-27 to the UK, versus €184 billion of imports. In terms of percent shares of gross domestic product (GDP), the EU-27's exports to the UK amount to 2.5% of GDP, whereas the UK's exports to the EU-27 amount to 7.5% of its GDP. For comparison, transatlantic trade of goods is only about 20% larger than trade across the channel.<sup>1</sup>

For services, the amounts are also large: €94 billion of exports by the EU-27 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 as measured by the EU-27).

Foreign direct investments (FDI) flows and stocks are also very large on both sides. The EU-27'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 EU-27 totals a little less in value at €683 billion, but this is much bigger in relation to its GDP (26.6%). However, there are indications that a significant proportion, maybe more than one half, of this FDI represents financial operations whose purpose is to optimise tax liabilities of multinational corporations.

Leaving the EU will not only affect trade, but also the legal status of the large number of EU-27 citizens living in the UK (estimated at 3.35 million as of end 2016). 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 the remainder being workers and their dependent families, and students.

Another economic impact of Brexit is that the UK will no longer contribute to the EU budget, which would thus no longer count towards the €9 billion annual net contribution of the UK. This might be offset to some extent by a continuing contribution by the UK, if it were agreed upon by all parties, in order to secure a high degree of market access, or from tariff revenues if the relationship would be based just on World Trade Organization (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 approximately €20–40 billion.

The focus of this contribution will be on trade relations and how the expected costs of leaving the EU's internal market would be distributed across the two parties, which, in turn, should affect their negotiating positions. In principle there are two alternative extreme scenarios: (1) the UK would accede to the European Economic Area (EEA) as a non-member state like Norway, or (2) the UK would have no preferential trade

<sup>1</sup> In terms of data preparation and exposition, this paper heavily relies on Emerson et al. (2017).

relationship with the EU, which would imply that cross Channel trade would take place only under general WTO rules.

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, Theresa May, in her speech on 17 January 2017 (The Telegraph 2017), narrowed the focus considerably, favouring a Comprehensive Free Trade Agreement (CFTA).

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, and the WTO as the most pessimistic.

### Economic Impacts in Short

There has been a considerable amount of quantitative modelling work done on various Brexit scenarios by both official institutions (UK Treasury [Her Majesty's (HM) Treasury 2016]; Organization for Economic Cooperation and Development [OECD 2016a]) and independent economists (Ottaviano et al. 2016; Aichele and Felbermayr 2015; Booth et al. 2015). These all cover ranges of scenarios in the optimistic-pessimistic spectrum, including the spread between the European Economic Area (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 1:2 or 1:3 for the UK and the EU-27 respectively. In terms of percentages of GDP, the losses for the EU-27 would be about 10 to 15 times lower given the 1:5 ratio in the GDP of the UK relative to that of the EU-27 (Emerson et al. 2017).

For the EU-27, the losses are virtually insignificant, averaging between 0.08% and 0.44% 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 0.008% to 0.044% of GDP (Emerson et al. 2017).

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 (Emerson et al. 2017). 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 2016a; HM Treasury 2016) that capture negative impacts on FDI, which is redirected in some degree away from the UK into the EU-27. In their pessimistic scenarios (Aichele and Felbermayr 2015; OECD 2016a, b; Rojas-Romagosa 2016; Ottaviano et al. 2016) the losses cumulate to about 7.5% of GDP, or 0.75% annually, which are highly significant amounts in macroeconomic terms. This FDI effect is not, however, reflected in models estimated for the EU-27, and so implies that there might need to be some adjustment to the results reported above for the EU-27.

In the following, we provide a study on several aspects of the possible economic impacts of Brexit on the EU-27, covering (1) the current level of trade in goods and services between the UK and EU-27 as a share of GDP and labour flows, distinguishing between member state and sectors, (2) an indication of the possible

economic impact of at least two alternative scenarios, EEA or WTO, and 3 an indication of the key characteristics of a wider range of different types of bilateral agreements that exist between the EU and third world countries, including customs unions, free trade agreements, association agreements, stabilisation and association agreements, and partnership and cooperation agreements.

We do not go into the details in which the middle scenarios differ. These points mentioned in the previous paragraph are addressed in a somewhat different order. Particular attention is given to the idea of a CFTA, since this is what Prime Minister Theresa May announced as the UK's objective in her speech on 17 January 2017 (The Telegraph 2017).

## Basic Facts: Trade and Investment

### Trade in Goods

The volume of trade between the UK and EU-27 is substantial, with EU-27 enjoying a large surplus. The EU-27's exports to the UK totalled €306 billion, whereas imports amounted to only a little more than half as much at €184 billion (all data in this section relate to 2015 unless otherwise stated).

For comparison, we note that trade between the EU(28) and the U.S. is of a similar order of magnitude. In 2015 the EU exported goods worth €371 billion to the U.S. and imported about €250 billion, both values are 21 to 36% larger than the corresponding values for trade across the Channel reported in Table 1. From this point of view, the impact of Brexit should be of a similar order of magnitude as the Transatlantic Trade and Investment Partnership (TTIP) might have been (with the opposite sign, of course).

In terms of percent shares of GDP, the EU-27's exports to the UK amount to 2.5% of GDP, whereas the UK's exports to the EU-27 amount to 7.1% of GDP. Looked at from the import side, the proportions are even wider, reflecting the UK's large trade deficit with the EU. The UK's imports from the EU amount to 11.9% of GDP, whereas the EU-27's imports from the UK amount to only 1.5% of their GDP.

In regard to the sectoral breakdown of the trade flows, one finds that it is highly diversified, with the following leading sectors for exports from the EU-27 to the UK: machinery and transport equipment (€127 billion) road vehicles (€59 billion), followed by other manufactured goods (€70 billion), chemicals (€51 billion), food products (€32 billion), and mineral fuels (€11 billion). The UK has a deficit in most sectors, especially automotive and surplus, but mainly in mineral fuels and aircraft (and associated equipment).

**Table 1** Total trade in goods between the UK and the EU-27, 2015

	Imports (€bn)	Imports (% GDP)	Exports(€bn)	Exports (% GDP)	Trade (€bn)	Trade (% GDP)
EU-27	184	1.5	306	2.5	491	4
UK	306	11.9	184	7.1	491	19.1

Source: Eurostat (2017)

## Trade in Services

Trade in services is also very substantial in volume, with €94 billion of exports from EU-27 to the UK, and €122 in imports (Table 2). When imports and exports of services are taken together their total of €216 billion is not all that much less than for the €490 billion total for goods. However, the big difference here is that the UK has a significant surplus with EU-27 on account of services (€28 billion), compared to its huge deficit on account of goods (€122 billion).

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

A big word of caution, however, is called for with respect to the 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 occur when 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-EU-27 trade in services show large differences (Emerson et al. 2017, Annex 5). For example, 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. According to UK data, the UK has a large surplus of €6.1 billion, but according to Irish data it is Ireland that enjoys the surplus in the amount of €11.5 billion. Unfortunately, the official statisticians, whether from Eurostat or national agencies, are unable to cast 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 EU-27 but not the full matrix by country and sector. We do not provide this detail as the data would be highly unreliable for the reasons given above (Belke et al. 2017).

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

## Foreign Direct Investment

Data are available on both stocks and flows of foreign direct investment (FDI) for the UK and the EU-27. These data are relatively complete for the worldwide flows and stocks of FDI (Table 3) (Emerson et al. 2017, Annex 6). However, the UK and

**Table 2** Total trade in services between the UK and EU-27, 2015

	Import (€bn)	% GDP	Export (€bn)	% GDP	Trade (€bn)	% GDP
EU-27	122	1	94	0.8	216	1.8
UK	94	3.6	122	4.7	216	8.4

Source: Eurostat (2017)

**Table 3** Foreign direct investment of UK and EU-27 worldwide, total flows and stocks, 2015

	Flow				Stock			
	Inward		Outward		Inward		Outward	
	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP
EU-27	360	3%	494	4%	5692	47%	7033	58%
UK	36	1.4%	-55	-2%	1314	51%	1386	54%

Source: Eurostat (2017)

individual member states' bilateral data have some gaps and contain some apparent distortions (Table 4) (Emerson et al. 2017, Annex 7).

The worldwide stocks of FDI are massive in both directions, with the EU-27 having a stock of €7033 billion of outward investments, while receiving €5692 billion of inward investments. The UK has a stock of €1386 outward investments and about the same amount of inward investments, at €1314 billion.

UK investments in the EU-27 of €683 billion look reasonably proportioned in relation to the worldwide total of €5692 billion investments in the EU-27. However, the data for EU-27 investment in the UK seems implausible, with €985 billion of inward investments from the EU-27 accounting for a very large share (75%) of the total worldwide investment in the UK of €1314 billion. The source of this implausibility seems to be the huge reported amount of Dutch investments in the UK of €454 billion, in comparison to the UK's nominal investments in the Netherlands (Emerson et al. 2017, Annex 7). In reality, these are only intermediate investments in transit from other sources.

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 and multilateral FDI data with the corresponding "mirror statistics". The figures for FDI stocks differ substantially 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 suggests it is only a small net investor (one-tenth of the Irish statistics). For Italy, the net position *vis-à-vis* the UK switches from a substantial net recipient position to a net investor position, depending on which country's statistics one uses. For the services data, official statistics offices have not been able to clear up these apparent contradictions.

**Table 4** Foreign direct investment: bilateral between the UK and EU-27, total flows and stocks, 2015

	Flow				Stock			
	Inward		Outward		Inward		Outward	
	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP	bn Euro	% GDP
EU-27	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 (2017)

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 also account for around 60% of the overall total inward and outward stocks of the EU-27 (Eurostat 2017). According to the OECD (2016a), on average for 2011–2015, 70% and 95% of all FDI inflows to the Netherlands and Luxembourg, respectively, were via SPEs. This type of financial FDI is less likely to take the form of productive investment. A reduction financial FDI may have different implications for economic growth, 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 in financial FDI given the role of the city of London as a financial hub. FDI stocks from and to the EU-27, excluding the Netherlands and Luxembourg, might thus be a more reliable indication of the real links from direct investment than the overall figures for the UK that include these two countries. The limited 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.

## Economic Impacts: Quantitative Estimates

### 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 EU-27. Of these, three are from official sources (OECD 2016a; the UK Treasury [HM Treasury 2016] and the Netherlands Central Planning Bureau (CPB) [Rojas-Romagosa 2016]), and three from independent academic institutions or think tanks (London School of Economics [Ottaviano et al. 2016]; IFO in Munich [Aichele and Felbermayr 2015], Open Europe in London [Booth et al. 2015]). Broadly speaking, this cluster of studies represents the state-of-the-art in trade policy modelling, with both new and traditional methodologies (for full details, Emerson et al. 2017).

While these model simulations cannot capture all the likely economic effects of Brexit, 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 EU-27 is a much bigger fraction of the UK's GDP than that of the EU-27, 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 situation close to that as a member of the European Economic Area like Norway. The pessimistic scenario usually assumes that the trading relationship between the UK and the EU-27 is reduced to the terms of their WTO membership, with tariffs introduced at most favoured nations (MFN) rates. This is widely called the “hard Brexit”.



In most of this section we will concentrate 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 in the EU-27's exports to the UK of 30% and in the UK's exports to the EU-27 of 22%, taking into account only the introduction of WTO MFN tariffs. However, given the differences in the size of trade flows, this translates into a decline of only 2% of total (worldwide) EU-27 exports. The impact of Brexit on some individual member states, like Ireland and Belgium, is of course estimated to be 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%. Rojas-Romagosa (2016) arrive at broadly similar results. They predict that the fall in EU-27 exports to the UK would amount to 3% in the WTO scenario and 1.7% in the FTA scenario. For the UK, total exports would decrease by 21.8% and 12.5% in the WTO and FTA scenarios, respectively.

For the EU-27, on average, there are losses of 0.08 to 0.44% 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 0.04% of GDP (i.e., the impacts would be insignificant and hardly noticeable at the macroeconomic level for the whole EU-27 economy). This does not exclude that individual sectors, or some small member states, would be more significantly affected, on which we comment on below.

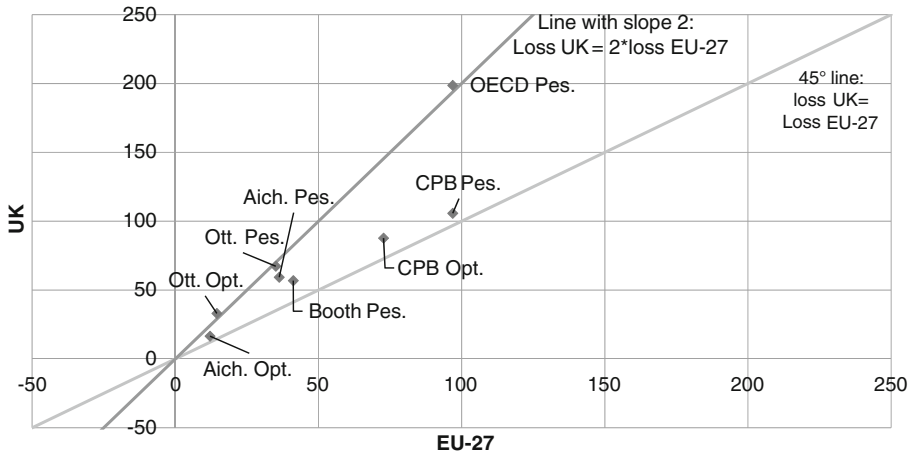
The results for the UK are much larger, where the losses average 1.31 to 4.21% of GDP for the optimistic and pessimist scenarios, respectively. Since the ratio of the UK economy to the EU-27 is about 1:5, a disproportionate result in terms of a percent of GDP was to be expected. If the absolute loss were of the same size for both sides, one would have expected that the loss as a percent of GDP should be only five times higher for the UK. As a percent of GDP, the average loss for the UK is about ten times higher or more.

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The model results in terms of the impacts on GDP are summarized in Fig. 1 below in billions of euros. The loss for the EU-27 is on the horizontal axis and for the UK on the vertical axis. This figure also contains a 45 degree line. All points are above this line, which indicates that the absolute loss is in all cases estimated to be higher for the UK than for the EU. Moreover, most of the studies (essentially all except CPB) align on a line with slope of two, implying that most studies find that the losses from Brexit would be twice as high for the UK as for the EU-27.

Why is the loss (from leaving the EU's internal market) distributed so asymmetrically? Economic theory predicts 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. Firms from the larger economy will be more likely to face an inelastic demand curve, allowing them to adjust their selling price for the tariff. By contrast, firms from the smaller economy are more likely to be price takers. They might thus have to cut the export price to keep market shares, and so bear the cost themselves. There is a fundamental reason why trade





**Fig. 1** Absolute losses for the UK and EU-27 GDP (in € Billion). Source: Author's own computations using data on GDP from OECD statistics (OECD 2016b). For the UK, the amount is converted from pounds to euros using the annual average exchange rate for 2015. The diamonds represent the different model-based estimates, labelled by author. Pes. = pessimistic scenario; Opt. = optimistic scenario; Booth = Booth et al. (2015); CPB = Rojas-Romagosa (2016); Aich. = Aichele and Felbermayr (2015); OECD = OECD (2016a); Ott. = Ottaviano et al. (2016)

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 (OECD 2016a; HM Treasury 2016). In various empirical studies taken into account in the two models, FDI is found to have a favourable impact on research and development (R&D) expenditures and thence on innovation, competitiveness, and general management quality.<sup>2</sup>

One outlier among the model results is that of Open Europe (Booth et al. 2015), 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 rest of the world, without negotiating counterpart concessions from anyone (Booth et al. 2015).

## Going beyond the Models: Lessons from Other Approaches

### *Transatlantic Trade and Investment Partnership*

Another way to estimate the costs of Brexit for the EU-27 is to use the studies done in preparation of TTIP, which would have involved the opposite of Brexit, namely an elimination of WTO MFN tariffs and a reduction of non-tariff barriers (NTBs).

<sup>2</sup> It is notable that two of the studies, by the OECD (2016a, b) and HM Treasury (2016), suggest significantly higher losses for the UK, which may be explained by the more extensive range of economic impacts that are accounted for, 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 from a macroeconomic point of view, meaning a reduction of GDP growth over a decade of around 0.75% annually.

The comparison between Brexit and TTIP is more interesting than appears at first sight. The U.S. economy is of course several times larger than that of the UK, but Transatlantic trade is of a similar order of magnitude to trans-Channel trade. Transatlantic goods trade in 2015 was only about 20% larger than the trade in goods between the UK and the EU-27. The impact of Brexit might thus be comparable to that of TTIP with the sign reversed. Trade in services is, however, is 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." (European Commission 2013; European Commission 2017)

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 U.S., and 0.4% of GDP due to the lowering (typically halving) of NTBs.

### *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 mirror the benefit of EU membership. There is substantial literature showing significant gains from EU and single market membership. If one were to accept the 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 computable general equilibrium (CGE) macroeconomic model (Worldscan [CPB 2006]) to calculate that the benefits of EU membership are 10% of GDP or more. A novel attempt was undertaken by Campos et al. (2014) based on a synthetic counterfactual for the EU countries which joined in 1973 or later. They suggest 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 also a little deeper, in the meantime, the implied costs of exiting might be today a little less high.

Another variant of the counterfactual approach is Breuss (2006) who compares Switzerland and Austria, given their respective choices for market integration in Europe, also finds large benefits for Austria. A related way to estimate the cost of Brexit is to consider the benefits expected from existing or planned free trade agreements of the EU with other nations around the globe. The exits costs can be derived from so-called impact assessment studies on the free trade agreements EU-Canada, EU-India, EU-Japan, EU-Mercosur, EU-Mexico and EU-South Korea.

Table 5 below summarises the expected benefits from these free trade agreements or plans. They involve different degrees of trade liberalisation and different levels of development. However, a general trend is clear. In all these cases, the EU would enjoy only a disproportionately small share of the total benefit, not just because it is economically larger than its counterparts but also for fundamental reasons, such as the greater

**Table 5** Model simulations of economic impact of free trade agreements on the EU and the partner economy

Free trade agreement	Type of model	Long-term effects on GDP
Country-pair EU-Canada European Commission (2011)	Econometric model and scenarios Computable general equilibrium (GCE) model Global Trade Analysis Project (GTAP) 4 scenarios Scenario A: 95% reduction in tariffs and less ambitious cuts in trade costs of services (taking the cuts used in the 2008 Joint Study [European Commission and Government of Canada 2008] and multiplying them by a factor of 0.6) Scenario B: 95% reduction in tariffs and ambitious cuts in trade costs of services (taking the cuts used in the 2008 Joint Study) Scenario C: 100% reduction in tariffs and cuts in trade costs of services as employed in the 2008 Joint Study multiplied by a factor of 0.6 (i.e. less ambitious liberalisation of services) Scenario D: 100% reduction in tariffs and cuts in trade costs of services as employed in the 2008 Joint Study (i.e. less ambitious liberalisation of services).	Absolute EU-27: +1964.22 to 3400.98 Canada: +1796.87 to 2931.87 Welfare of FTA measured by Equivalent Variations (GTAP) Scenario A versus scenario D  Percent EU-27: +0.02 to 0.03% Canada: +0.18 to 0.36% GDP percentage difference from baseline Scenario A versus scenario D
EU-India Felbermayr et al. (2016) <sup>a</sup>	IFO trade model (Aichele et al. 2014) Static General Equilibrium Trade Model Broad-based trade and investment agreement	EU28: +23 \$ bn India: +28 \$ bn = yearly add-up to GDP
EU-Japan Felbermayr et al. (2017) <sup>b</sup>	IFO trade model according to Aichele et al. (2014) Static General Equilibrium Trade Model <sup>c</sup> Conservative scenario (modelled on the experience of the EU-Korea trade agreement); European-Japanese free trade agreement abolishes non-tariff trade barriers only rudimentarily	EU28: +0.14% India: +1.30% = yearly add-up to GDP  EU28: +0.1% Japan: +0.23% = yearly add-up to GDP
EU-Mercosur Burrell et al. (2011)	GLOBE simulation results CGE model Scenario 2 = Mercosur request granted Reference scenario = No Doha Round agreement reached and Mercosur request not granted	EU12: +273.86 € bn in 2020 prices EU15: +5214.39 € bn in 2020 prices MERCOSUR: +1523.28 € bn in 2020 prices = absolute difference from reference scenario
EU-Mexico <sup>d</sup> Ecorys (2015); Ex-post analysis of 2000 agreement European Commission (2015); Ex ante analysis of agreement modernisation	GCE model plus gravity model Ex-post analysis of the current EU-Mexico FTA put in place in 2000. Ex ante analysis of agreement modernisation. 2 scenarios: conservative versus ambitious modernisation	EU12: +0.02% EU15: +0.02% MERCOSUR: +0.16% = percentage difference from reference scenario  Ex-post analysis: EU28: +0.01% Mexico: +0.34% Ex-ante analysis: Conservative modernisation EU28: +0.003% per annum by 2028 Mexico: +0.11% of GDP per annum by 2028

Table 5 (continued)

Free trade agreement	Type of model	Long-term effects on GDP
EU-South Korea CEPII/ATLASS (2010)	MIRAGE model (Decieux and Valin 2007) Computable equilibrium model Ex ante assessment of Free Trade Agreement (FTA) between the European Union and Korea which was implemented in 2011 Baseline 1: Doha: No agreement, FTAs: only those currently in force, Services: increase in Korean protection by 50% Baseline 2: Doha: standard liberalisation, FTAs: including also Korea-USA, Korea-Canada, EU-India, EU-Singapore, EU-Canada, Services: increase in Korean protection by 25%	Ambitious modernisation EU28: +0.01% Mexico: +0.39% = yearly add-up to GDP in 2028 EU: +0.07 to +0.08% South Korea: +0.46 to +0.84% Intervals = baseline 1 versus baseline 2

The numerical values given in the table should be understood to mean that GDP increases on a permanent basis to a level that is x percent higher by a target year in the future (e.g., 2028 or 2030) than it would be in the absence of (modernization of) a trade agreement. They do not represent a compound gain which would see GDP increasing by X percentage points each year. For more institutional details of the six bilateral trade agreements see <http://ec.europa.eu/trade/policy/countries-and-regions/countries/>

<sup>a</sup> One should note that the exit of the United Kingdom from the EU (Brexit) lowers the potential gains that India can hope to achieve by approximately one fifth. A new trade deal between the UK outside of the EU and India would prove to be marginally more beneficial for Britain than if the country had remained in the EU, whereas India would not incur any significant disadvantages. However, simulations confirm that the costs of Brexit would turn out to be more than ten times as big as the potential gains from a new India-UK deal (Roy and Mathur 2016; Felbermayr et al. 2016, p. 18)

<sup>b</sup> Virtually, Francois et al. (2016), employing data from 2007, conducted the seminal impact study referring to the opening of negotiations. However, the stance of the world economy and the deep parameters of the models have changed dramatically since then. Hence, we would like to refer to the most recent impact studies on a trade agreement between the EU and Japan in their predecessor study to Felbermayr et al. (2017). Benz and Yalcin (2013) investigate the economic effects of an encompassing liberalisation (non-tariff barrier (NTB) scenario) of trade between the EU and Japan. As a result, they come up with an increase in GDP growth compared to the status quo of 0.21% for the EU. Japanese GDP growth is forecasted to be larger by 0.86%. The authors also investigate the weaker variant of a mere tariff abolition (tariff scenario). In this case, both the Japanese and the EU GDP would also be affected positively, albeit to a lesser extent. EU real GDP would increase by 0.02% and Japanese GDP by 0.07%. Since the EU is a much larger market for Japanese products and services than Japan is for the EU, free trade would have a larger positive impact on Japan

<sup>d</sup> See also the impact study by Serrano et al. (2015) based on a gravity model according to Kεpαpαtsoglou et al. (2010) who, however, do not come up with concrete figures regarding GDP gains.

market power of its enterprises. With a changed sign, this implies that exiting these free trade agreements would impose the majority of the costs on the exiting country.

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 for countries concluding a free trade agreement. The EU benefit is quite large and should not be dismissed too swiftly.

## Conclusions

This paper has focussed on the economic impact of Brexit on the EU-27. Our main conclusions are the following. Trade between the UK and the EU-27 is of a similar order of magnitude as transatlantic trade (between the EU and the U.S.). Investment links between the UK and EU-27 appear to be stronger, but the picture is heavily influenced by financial transactions whose main purpose might be tax optimisation. For the EU, Brexit might be of comparable importance (with the opposite sign) as TTIP.

All available studies concur that Brexit will lead to a significant disruption of trade links and will impose economic costs on both sides. However, the EU-27 would bear only a disproportionately small share of the total cost. A similar picture emerges from the literature studying the potential benefits from free trade agreements the EU has, or is, negotiating with other countries (e.g. Japan, Korea, etc.). The relationship between economic size and bargaining power has two implications. First of all, the EU should have the stronger bargaining position in the negotiations on the future economic arrangements between the UK and the EU-27. The cost of the disruption resulting from not reaching an agreement would fall primarily on the UK. Second, Britain might have difficulties negotiating favourable trade arrangements with other large countries, such as the U.S., Japan or China. The most recent results from the general election of 2017 in the UK, and the uncertainty generated by it will of course tend to increase the economic costs of Brexit for the country even further via their negative impact on investment-type decisions.

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