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BREXIT: WHAT ECONOMIC IMPACTS DOES THE LITERATURE ANTICIPATE?

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The results of the June 2016 referendum in favour of the UK leaving the EU opened a period of huge economic and political uncertainty in the UK, and in the EU27. A large number of official and academic analyses have been published that address the economic impact of different modalities of Brexit. Section 1 analyses possible models for the future UK-EU relationship, from remaining in the single market and in the customs union, to a Free Trade Agreement (FTA) or world trade organization (WTO) rules. Section 1 also discusses the future of UK trade regulations (tariff and non-tariff barriers, trade agreements) and the various channels through which Brexit could have an impact on the UK economy (trade, foreign direct investment (FDI), migration, productivity, fiscal policy). The UK must make a trade-off between ensuring access to the EU market and increasing its regulatory autonomy. Section 2 surveys studies released on the impacts of Brexit, over short- and long-term horizons, under different scenarios, from a soft Brexit to a hard Brexit and a no deal scenario. These studies provide very different results depending on the methods they use and the assumptions they adopt on the future relationship between the UK and the EU27, mainly on how they view the effects of trade openness and regulations on productivity, in level as in growth rate. Studies using gravity models and computable general equilibrium models generally find negative but small effects on UK GDP. Some studies increase these effects by adding the negative impact of a less open UK economy on labour productivity growth, even if Brexiteers want to open the UK to non-EU economies. Others believe that a liberalisation shock could boost output growth, but the UK is already a very liberal economy. The impact of Brexit on the GDP of the EU27 countries is on average 4 to 5 times smaller than on UK GDP, although some countries (Ireland in particular) are more affected. In the shorter term, uncertainty about Brexit has a negative effect on investment and exports, which is partly offset by lower interest rates and exchange rates.

Keywords: Brexit, UK economy, EU membership, Trade agreements.

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The results of the June 2016 referendum in favour of the UK leaving the EU opened a period of huge economic and political uncertainty in the UK, but also in the EU27.

The vote for Brexit was primarily due to political reasons, to the desire to regain national sovereignty, notably not to be subject to the decisions of European institutions or of the European Court of Justice (ECJ), and to be able to control EU workers' inflows. But the vote for Brexit paradoxically brought together the victims of globalisation (workers, fishermen, people living in regions hit by deindustrialisation) wanting more protection and supporters of a liberalisation shock that the EU would have prevented.

Nevertheless, the debate on Brexit, both before the referendum and during the lengthy exit negotiations, focused mostly on economic aspects. For some people, Brexit would have disastrous consequences for the British economy, as it would be deprived of the benefits of single market membership and forced to become less open, leading in the short-term to lower productivity growth and even to lower potential growth. For others, the impact of leaving the single market would be very limited and would be offset both by more openness with non-EU economies and by a liberalisation shock. This article intends to provide a critical review of the various economic analyses published in this debate.²

The UK was expected to leave the EU on 29 March 2019, two years after the UK government officially notified its decision to leave. Negotiations were painful, as the UK government had conflicting requirements: taking back control on several issues, such as getting free from EU rules and the jurisdiction of the ECJ, being free to sign trade deals with non-EU countries, and controlling EU workers' inflows into the UK, all while keeping free access to the EU single market. Some British politicians wanted the UK to remain in the single market and the customs union, while others wanted a clear break with the EU27; the UK government had to make a trade-off between keeping access to EU markets and its desire for autonomy in terms of economic standards, social regulations and trade agreements with non-EU countries. EU27 negotiators adopted tough guidelines, stating as a red line that the UK

2. This article focuses on macroeconomic analyses and does not review studies dealing with sector or regional aspects of Brexit.

could not stay in the single market or in the customs union without complying with the four “freedoms” of movement for goods, services, capital and labour. The need to avoid erecting a physical border in Ireland in order to safeguard the Belfast agreement further complicated the negotiations (for a discussion on UK-EU negotiations, see for instance, Mathieu and Sterdyniak, 2017, 2018a,b). In view of the difficulties of these negotiations, an exit without agreement (a “no deal Brexit”) appeared possible.

On 14 November 2018, the UK government and EU negotiators agreed on a withdrawal agreement and a political declaration on the future relationship between the UK and the EU27. This included a “backstop” clause: the UK will remain in the customs union until an agreement is reached that avoids a physical border in Ireland. The UK Parliament rejected the two texts, although the political declaration left open several possibilities for the future relationship. The UK Parliament voted against the agreement, against a new referendum on UK membership in the EU, against a no deal Brexit, and against new negotiations where the UK would ask to remain in the customs union. This led Theresa May to resign as leader of the Conservative Party and as Prime Minister. Boris Johnson, her successor since 24 July 2019, succeeded to reopen the negotiations with the EU27. The backstop has been excluded from the new agreement reached by the EU27 and the UK on 17 October 2019. Northern Ireland will be in a complex situation; it will remain in the UK customs union, but will have to remain aligned with a set of EU single market rules. The agreement stipulates that the EU27 and the UK will sign a free trade agreement (FTA) with zero tariffs and quotas, that “robust commitments on a level playing field should ensure open and fair competition”. But Boris Johnson failed when he tried to have the agreement approved by the British Parliament. With a view to ending the impasse on Brexit, the Parliament agreed to hold general elections on December 12. Depending on the outcome, the October 2019 agreement would come into force (if the Conservative Party has a majority of seats), new negotiations would be initiated and a referendum would be held to ask voters if they are in favour of the new agreement or of remaining in the EU (if the Labour Party won a majority of seats), or to revoke article 50 (Liberal Democrat proposal), meaning the UK would remain in the EU.

Section 1 analyses possible models for the future UK-EU relationship, ranging from staying in the EU single market and customs union to a Free Trade Agreement (FTA) or a (World Trade Organization) WTO regime. It discusses the future of UK trade regulations (tariffs, non-tariff barriers, trade agreements) and the various channels (trade, FDI, migration, productivity, fiscal policy) through which Brexit could affect the UK economy. Section 2 presents a survey of the studies released on the impact of Brexit, over short- and long-term horizons, under different scenarios, from a soft Brexit to a hard Brexit and a no deal scenario. These studies have very different results depending on the methods they use, on the assumptions they make on the future relationship between the UK and the EU27, and mainly on their view on the impact of trade openness and regulations on productivity, in level as in growth rate. Studies based on gravity models and computable general equilibrium (CGE) models generally find negative but weak effects on UK GDP. In some studies, the effects are amplified by adding the effects of a less open UK economy on labour productivity growth, even if Brexiteers want to open the UK more to non-European economies. Others believe that a liberalisation shock could boost growth, but the UK is already a very liberal economy. The impact on EU27 countries' GDP is on average 4 to 5 times lower than on the UK, although some countries (Ireland in particular) are more affected. In the shorter term, uncertainty about Brexit has a negative effect on investment and exports, which is partly offset by lower interest rates and exchange rates.

1. What model for the future UK-EU relationship?

As an EU member, the UK is part of the single market and hence of the customs union (no intra-EU trade tariffs, extra-EU common tariffs or trade agreements), and the UK also complies with common EU standards and regulations; it respects the four freedoms of movement (goods, services, capital and labour), recognizes the ECJ's jurisprudence, contributes to the EU budget, and takes part in decision-making within the Union.

The prospect of Brexit has opened a wide range of scenarios. However, the UK cannot remain in the single market if it wants to control workers' inflows from the EU into the UK, to no longer be subject to ECJ rulings, to be able to change its regulations and to sign bilateral trade agreements with third countries.

The scenario closest to remaining in the EU would be one where the UK joins the European economic area (EEA), like Norway. In intermediate scenarios, the EU would sign a free trade agreement with the UK, a deeper agreement than the one signed with Canada (Table 1). In case of no deal, the default scenario would be implementing World Trade Organization (WTO) rules, which would restrict access to EU markets for UK goods and services, but would give the UK more leeway to change its regulations and sign agreements with third countries. The UK must make a trade-off between keeping full access to the EU markets and having more regulatory autonomy.

Theresa May had said, already in her Lancaster House speech in January 2017, that none of the existing on-the-shelf models would be suitable for the UK and that a specific model needed to be found, taking into account the 46 years of ties with EU countries since the UK had joined. But the EU cannot “reward” a Member State (MS) for leaving the EU by granting a too privileged status to the UK in comparison with the EEA countries.

EFTA and EEA

The EEA brings together the EU MS, and three countries (Norway, Iceland and Liechtenstein), which are European Free Trade Association (EFTA) members. Switzerland is a member of EFTA, but not of the EEA. EEA countries guarantee the four “freedoms” (although Liechtenstein has been allowed to keep a quota system for immigration). They ensure free trade of industrial goods. The EEA agreement does not cover raw agricultural products and fishery products; these countries participate neither in the Common Agricultural Policy (CAP) nor in the Common Fisheries Policy (CFP). They are not members of the customs union and may have specific tariffs with third countries. Their financial institutions benefit from EU passporting rights. They contribute to EU budgets, in particular to cohesion policy (0.16% of GDP for Norway, Darvas 2016). They automatically apply EU directives, single market legislation, environmental, social policy and consumer protections, but have only an advisory role. In case of conflict, an EFTA Court of Justice has jurisdiction, but it cannot depart from the ECJ’s judgments.

Switzerland refused by referendum to join the EEA in 1992. Switzerland is linked to the EU by a set of 120 bilateral agreements, signed in 1999 and 2004; new agreements are submitted to a popular referendum. The EU wants these agreements to be renegotiated to

form a coherent whole. In 2014, however, a popular referendum restricted EU citizens' freedom to settle in Switzerland. In return, the EU blocked Swiss participation in EU programmes (such as Erasmus). A framework agreement could not be signed because Switzerland refused ECJ control over its implementation. Switzerland contributes sporadically to the EU budget (less than 0.1% of its GDP, Darvas, 2016). It takes part in the single market for goods, but its participation in the services market is limited. Swiss financial institutions do not have the passporting rights of the EEA.

A scenario for UK membership in EFTA, even extended to a full customs union, is not credible. The UK would have to continue to ensure freedom of installation for workers, to recognize the ECJ's authority, to apply EU directives, to contribute to the EU budget, without having any voice in the matter. The UK would not be free to conclude trade agreements with third countries. On the other hand, European institutions have until now refused to give more powers to an EFTA redesigned as a third circle of member states of the customs union and the single market, with a deliberative voice for directives concerning the single market, with an autonomous Court of Justice, but having neither to respect the freedom of installation of persons, nor to be part of a political integration project. They consider that such a circle would reduce EU autonomy and would increase the risk of EU disruption.

A customs union

Turkey is in a customs union with the EU (for industrial goods). But the relationship is asymmetric, as Turkey must align its trade policies with EU trade policy. Turkey is a rule-taker (Felbermayr *et al.*, 2019). FTAs signed by the EU do not automatically apply to Turkish exports, but they are binding for Turkish imports. For the UK also, the customs union could be limited to goods. But the EU27 refuses for the UK to remain in the customs union if it no longer respects the "four freedoms", if it does not recognize the ECJ's jurisdiction, and if it does not comply with EU standards in terms of labour laws and industrial and services regulations, which, according to the EU27, would allow the UK to practice unfair competition. Either the UK should meet standards agreed unilaterally by the EU, or the EU should commit to negotiate its standards with the UK (and other partner countries), which is problematic. Being in the customs union would prevent the UK from concluding trade agreements with third countries.

The WTO rules

If the UK left the EU without a deal, WTO rules would apply, implying introducing customs duties on merchandise imports (tariffs). Under WTO rules, countries must apply the so-called most-favoured-nation (MFN) clause, that is to say, apply to merchandise imports from each country the lowest tariff they apply vis-à-vis one country, except for the least developed countries or for countries which have signed a free trade agreement. The UK should then renegotiate all its trade agreements, not only with the EU, but also with third countries. This could take several years; the UK would be in a difficult position in the negotiations.

Given the MFN rule, neither the EU nor the UK would significantly increase their tariffs. The EU would apply MFN tariffs to imports from the UK. The UK could either apply the MFN tariffs to imports from the EU or, unilaterally, opt for lower tariffs for all its trading partners. This could lead to an asymmetric situation with no barriers for EU exports to the UK and barriers for UK exports to the EU.

In fact, it would seem difficult for the EU27 to introduce trade barriers with the UK while it signs FTA with many countries and areas in the world. This would be even more difficult if the UK introduces no tariffs and non-tariff barriers.

A Canada⁺⁺ free trade agreement?

The median solution is a free trade agreement with a content remaining to be defined. At minimum, this could be a trade agreement similar to the one signed by the EU with Canada. This agreement would probably include no tariffs for goods, limited agreements for services, including financial services (free access to EU markets being conditional on complying with EU regulations), mutual recognition of diplomas and qualifications, respect for protected geographical indications, participation in some European programmes or agencies, joint committees for the harmonisation and mutual recognition of standards, a permanent joint arbitration court, and a certain level of commitment to avoid tax and regulatory competition. The UK would not have to contribute to the EU budget, nor would it have to respect people's freedom of movement. The UK would be allowed to negotiate bilateral agreements with third countries, but a rule of origin would probably have to be introduced, which is costly.

As noted by Emerson *et al.* (2017), the agreements signed by the EU with Ukraine, Georgia and Moldova go further than the one with Canada. Moreover, these agreements contain only three of the four freedoms, as the EU did not wish to open its labour markets to workers from these countries. But these countries have unilaterally agreed to apply EU regulations, while in the case of the agreement with Canada both parties must symmetrically ensure that their regulations are equivalent.

Table 1. Main agreements that could be considered between the UK and the EU

	EEA	Customs union	FTA	WTO
Free trade with the EU	Yes, for industrial goods and services	Yes, for goods with possible exception for agricultural products. No, for services	Depending on the extent of the agreement	MFN rules
Customs union with the EU	No	Yes	No	No
Workers free movement	Yes	No	No	No
Contribution to the EU budget	Yes	No	No	No
Autonomous trade policy	Yes, in principle	No	Yes	Yes
Regulations	Set by the EU	Set by the EU	Negotiated	No
Conflict resolution	EFTA Court of justice, then ECJ	No or ECJ	Bilateral mechanisms	WTO mechanisms

Tariff and non-tariff barriers issues

In the absence of a customs and a single market agreement, issues would arise about tariff barriers (TBs) and non-tariff barriers (NTBs).

Tariff barriers

After Brexit, tariff rates could remain nil in a comprehensive FTA. In the WTO regime, they would at maximum be the MFN tariff rates currently applied by the EU (and the UK) to third countries. These rates are currently very low on average.

According to estimates by Dhingra *et al.* (2017), tariff rates for trade in goods between the UK and non-EU countries are currently 3% on average. They range from 0% for mining products, 2.5% for chemicals and electrical equipment, 6% for transport equipment and 10% for textiles (Table 2). According to estimates by the UK Office for Budget Responsibility (OBR, 2018b), MFN rates (weighted by the trade struc-

ture) would be 3.3% for UK exports to the EU and 4.4% for UK imports from the EU (Table 3). Emerson *et al.* (2017) estimate that average tariffs for UK exports to the EU would be 3.8%, but point out that these tariffs would range from 0 (for pharmaceutical products) to 9% (cars), 12% (clothes), 45% (cereals), and 50% (meat). According to estimates by the Institute for Fiscal Studies (Levell, 2018), average tariffs implemented between the UK and the EU would be around 2.4% for UK exports, although significantly higher for textile-clothing (8%), agricultural products (7%), and food products (22%). Tariffs would therefore have very heterogeneous impacts depending on the sector. As concerns agriculture (30% of food consumption in the UK is imported), these rates could raise consumer prices, but they could also lead to an increase in domestic output (IFS, 2018).

According to Clarke *et al.* (2017), introducing tariffs could raise UK consumer prices by 1%, but could raise prices of some food products like meat or dairy products by 8%. Conversely, according to the IFS (Levell, 2018), if the UK no longer applied any tariffs, this would reduce UK consumer prices by 0.7 to 1.2%, but only by 0.4% if the UK maintains its tariffs on imports for goods that the UK also produces.

Table 2. UK MFN tariffs with non-EU countries

	UK Imports*	UK Exports*
Agriculture, hunting, forestry and fishing	1.07	4.02
Mining and quarrying	0.00	0.00
Food, beverages and tobacco	6.19	2.08
Textiles and textile products; leather	10.7	8.73
Wood and products of wood and cork	2.74	3.16
Pulp, paper, printing and publishing	0.07	0.06
Coke, petroleum and nuclear fuel	2.51	3.36
Chemicals and chemical products	2.47	1.89
Rubber and plastics	5.25	5.28
Other non-metallic minerals	4.80	3.49
Basic metals and fabricated metal	1.47	1.00
Machinery, not elsewhere classified (nec)	2.34	2.00
Electrical and optical equipment	1.83	1.70
Transport equipment	5.55	6.26
Manufacturing, nec; recycling	1.44	1.76
Weighted average	2.94	2.86

*Actual applied MFN tariff for HS6 industries are aggregated to WIOD sectors using the trade between UK and non-EU countries as weights.

Source: Dhingra *et al.*, 2017.

Table 3. EU MFN tariffs by sector for UK trade

	UK Imports	UK Exports
Agriculture, hunting, forestry and fishing	5.9	5.6
Mining and quarrying	0.0	0.0
Food, beverage and tobacco	7.3	5.0
Textiles and textile products; leather	9.6	9.7
Wood and products of wood and cork	2.4	3.6
Pulp, paper, printing and publishing	0.0	0.1
Coke, petroleum and nuclear fuel	2.7	2.8
Chemicals and chemical products	2.7	2.2
Rubber and plastics	5.4	5.1
Other non-metallic minerals	3.8	3.3
Basic metals and fabricated metal	2.1	1.9
Machines, etc.	2.1	2.1
Electrical and optical equipment	2.0	1.6
Transport equipment	8.1	7.2
Manufacturing, etc.	1.7	1.7
Weighted average (by UK-EU Trade)	4.4	3.3

Source: OBR (2018b).

It seems unlikely that the EU27 would change its tariff rates after Brexit, which means that UK exports will be more expensive on EU27 markets (although Sterling may fall, see Bank of England 2018), with an MFN tariff rate of 3.3% on average. UK exports may also become more expensive in some countries, such as Japan or Canada, which will not accept maintaining with the UK their current FTA with the EU27.

Conversely, the UK may choose between two strategies to comply with WTO rules: to introduce MFN tariff rates on imports from the EU27, which may increase UK consumer prices, but the tax revenues from the tariffs could be used to cut other indirect taxes; or to lower most tariffs on imports from non-EU countries down to zero and introduce tariffs only on imports of goods such as in agriculture, where UK producers could raise their output.

Non-tariff barriers

Non-tariff barriers (NTBs) are inherently more difficult to assess. They will arise as soon as the UK leaves the single market due to administrative costs, tax issues, customs formalities, and checks on product origins. They will increase if EU and UK standards deviate. NTBs are

crucial to estimate the impact of Brexit in an FTA or a WTO regime. NTBs may be estimated by two methods, both unsatisfactory.

A first method is to set rather arbitrarily a tariff equivalent of these non-tariff-barriers. In the OBR overview (OBR, 2018b), NTBs are estimated to be on average equivalent to a 10% tariff barrier in a WTO regime (within a range of 6.5% to 12.9%); 6.5% following an FTA (with a range of 5.9% to 7%); or 3.4% in an EEA-type agreement (with a range of 2.8% to 4%). The IFS (2018) estimates, respectively, 11%, 7% and 4%. Besides, the IMF (2018b) chooses to consider higher levels: 20% for a WTO regime and 10% for an FTA.

A second method is to use a gravity model to evaluate the single market's impact on bilateral trade as compared to an FTA or to a WTO regime (as in Egger *et al.*, 1995). This requires being able to account for all other factors, such as geographical proximity, common language, common currency, and tariff barriers. This assumes that there is no hysteresis effect, that EU membership had the same impact for the UK as for the average of member states, and also that a standard FTA may be defined.

The soft Brexit scenario

At the beginning of 2019, the most likely scenario was that the 14 December 2018 withdrawal agreement would finally be approved by the UK Parliament. In that scenario, the UK would leave the EU on 31 October 2019, but a transition period would start and last until the end of December 2020. The transition period could be prolonged. The political declaration on the future economic relationship between the UK and the EU27 was rather vague. It remained a "Blind Brexit". After the 17 October 2019 agreement, a "soft" Brexit became again the most likely result. The UK would leave the EU on 31 January 2020, the transition period would last until the end of December 2020, but could be prolonged by an agreement. The new political declaration announces: "an ambitious, broad, deep and flexible partnership across trade and economic cooperation with a comprehensive and balanced Free Trade Agreement". As negotiations on future economic relationships could last for a long time, the divorce could be very gradual.

The UK would remain in the customs union, at least until the end of 2020; thereafter, relations between the UK and the EU27 would be governed by a free trade agreement, the content of which remains to be clarified. The EU27 would give UK goods access to the EU market provided that the UK commits to comply with technical and health

standards, intellectual property rules, and rules for appellations of origin. Similarly, the UK would commit to financial and banking standards so that its financial institutions benefit from equivalence. It would be a “deep and special partnership”.

This does not preclude that once the UK has left the customs union, it would have to renegotiate bilateral agreements with third countries. One may expect that countries having signed a free trade agreement with the EU (like South Korea, Mexico, Canada, Japan, or Singapore) will have the conciliatory position of merely duplicating the agreement with the EU. The UK also plans to sign free trade agreements with non-EU countries, including the US, China, India, Australia, New Zealand, the members of the Asian Trans-Pacific Partnership, and the Association of Southeast Asian Nations (ASEAN), but this will take several years. Trade with these countries is relatively limited because of both geographical and industrial specialisation reasons. The UK will have to make concessions, which will not be so easy. For instance, as concerns trade with the US, the UK could be requested to decrease its tariff rates on food, to reduce its sanitary standards, and to increase the prices of pharmaceutical products.³

In this scenario, obstacles to UK-EU relations would be rather limited. Currently, UK standards are in line with the single market rules. The UK withdrawal act from the EU has transposed all EU legislation into UK law. The UK government said it would maintain all rules needed for trade in goods with the EU. The UK (and the EU27) would have to choose between three positions: the UK continues to comply unilaterally with these standards; the evolution of standards is negotiated between the UK and the EU27; or the UK can unilaterally change its standards or refuse to follow changes in EU27 standards (implying UK standards may no longer be compatible with EU27 standards). The latter case would necessarily entail limitations on the access of UK products to the single market.

With regard to immigration, after Brexit, the UK would apply to immigration applicants from the EEA and Switzerland the same criteria as those currently applied to people coming from third countries,⁴

3. On 4 December 2019, the UK signed the Trade Agreement Continuity, with countries representing 22% of its trade with non-EU countries (<https://www.gov.uk/government/publications/uk-trade-agreement-continuity-statistics-and-analysis/uk-trade-with-trade-agreement-continuity-tac-countries-statistical-ad-hoc-release>).

4. Based on the Migration Advisory Committee's recommendations (Migration Advisory Committee, 2018).

allowing in mainly higher and medium-skilled workers earning at least 30,000 pounds per year (unless there is a lack of labour force in a given sector). EU immigration could be reduced by half (85,000 per year), which could reduce the labour force by 2.5% by 2030.

In the short run, the agreement would signal the end of uncertainty. It would put an end to the fears of a no deal exit, but also to the hopes that Brexit will finally not take place, so that its immediate macroeconomic impact will probably be limited. The appreciation of the British pound would be limited because of the UK's current account deficit and fears about the City's position; trade barriers created by the transition from the single market to an FTA would hamper exports, investments, and FDI. A significant rebound in GDP would be unlikely.

In the long run, one cannot rule out an adverse effect on the UK economy. This is at least what some studies' models describe. They consider that even a free trade agreement would restrict trade and FDI relative to single market membership. However, the size of trade barriers is difficult to predict accurately as the "deep and special partnership" project remains vague.

This scenario faces three problems: it is incompatible with the wishes of many Brexiteers, since the UK will have to make many commitments in fields where it will no longer have any say; and it dismisses the scenario where the UK would become a regulatory and tax haven. It assumes that standards and regulations remain the same in the UK and the EU, either because the UK implements EU27 decisions or because changes are agreed in common (but why would the EU give this specific power to the UK?). It assumes that the rules of origin will be applied smoothly, and that the UK will not soften its standards; if not, EU countries would be led to introduce physical border controls (with the specific Irish border issue).

The no deal scenario

Leaving the EU without a deal would be a huge break. It could have occurred on 31 March or 31 October 2019. A no deal is the first choice of hard Brexiteers so that the UK can recover a maximum of autonomy. Until now, the UK government, the UK parliament and EU institutions have tried to avoid this scenario. There is some consensus in the Member States to avoid a no deal and to give as much delay to the UK as necessary. So, a no deal scenario has now become very unlikely.

Before 17 October 2019, some commentators had been considering a sudden and chaotic exit. Overnight, UK citizens living in the EU27 would be deprived of all their rights, as would EU citizens living in the UK. Airline companies would lose their flight rights; UK lorries would no longer be allowed on continental European roads; diplomas, driving licences, and technical and food standards would lose mutual recognition. Trade between the UK and the EU27 would be more or less paralyzed by customs formalities, harming companies operating with just-in-time processes. According to some estimates, a 2-minute check for each lorry would increase waiting times at customs check points in Dover or Calais by 5 hours. If tariffs are introduced, all long-term contracts between UK and EU companies would have to be renegotiated. Judgments in courts would no longer benefit from reciprocal recognition. The UK could refuse to honour the financial commitments agreed in the withdrawal agreement, and the dispute could be brought before an international court. UK residents in the EU and EU27 residents in the UK would be in a legal vacuum. Such a chaotic Brexit would induce an immediate strong negative output shock (i.e. in the fourth quarter of 2019, if the UK had left without a deal on 31 October). But such a scenario is unlikely, because it would be harmful for both parties. In the months prior to March 2019, a number of contingency measures were enacted in the UK and in the EU27 countries to limit the short-term effects of no deal: planes will continue to fly, trains will be allowed to cross the Channel, etc. One may assume that there would be some sort of agreements in a no deal Brexit so as to limit the disruptive effects. These agreements would be more or less permanent. Contrary to what some fear, there is no reason why shortages (medicines, agricultural products) would occur in the UK, as neither the UK nor the EU have any reason to introduce barriers on EU exports into the UK. As concerns the Irish border, the UK will not erect a physical border. Will the Republic of Ireland take the responsibility of erecting one?

In the medium term, the UK would benefit only from the minimum terms of WTO rules, both for its relations with the EU27 and with countries covered by agreements with the EU (such as Canada or Korea), meaning that tariffs and non-tariff barriers would be introduced between the UK and the EU27. The UK would be able to sign free trade agreements with non-EU countries. However, given the geographical distances and specialisation of the UK economy, these agreements would be unlikely to raise significantly UK exports. And the

negotiations of these agreements would take time. The UK economy would inevitably suffer from lower exports to the EU; at the same time, imports would be reduced, which could have a positive impact on UK output (substitution effect), but negative impacts in terms of price increases and restrictions in the variety of products offered to consumers and for intermediate consumption. As concerns imports from the EU, the UK could choose between two strategies: responding by introducing non-trade barriers (which seems unlikely) or increasing openness (abolishing tariffs and limiting non-tariff barriers), which would limit the inflationary effects and disruption in production chains. But the absence of tariffs would also have to apply to third countries. The EU27 could choose between an openness strategy (avoiding to raise non-tariff barriers, quickly signing an FTA, accepting a non-physical barrier in Ireland with document checks only) and a strict strategy (with checkpoints at the UK-EU27 borders), which would be difficult to introduce unilaterally.

In case of a no deal Brexit, there is a big risk that multinational companies would relocate their factories and headquarters into the EU27 and that a substantial share of euro area banking and financial activities would leave London. The UK could however play the card of tax competition (in particular through cuts in corporate tax rates) and of a regulatory haven, especially in the financial sector. Brexit would allow the UK to strengthen its neoliberal model (see Labour Leave, Leave means Leave, and Economists for Free Trade, 2017). However, it is unlikely that the UK, already having very liberal legislation, would benefit from a significant growth shock induced by even more liberal reforms. Moreover, the UK can hardly avoid complying with international commitments (COP21 agreement, fight against tax optimisation, agreements on the exchange of information on tax and banking matters, Basel III agreement). The pound could fall. The revenues from the new tariffs could be recycled into lower VAT or indirect taxes, which would reduce the inflationary effect. A fall in the pound and lower tariffs on products from third countries could make EU products less competitive in the UK, while UK products exported to the EU would suffer from tariffs and non-tariff barriers, but would benefit from a lower exchange rate, so that the costs of a no deal would be shared between the EU27 and the UK.

2. The impact of Brexit according to macroeconomic studies

Economic reasons were not the main reason behind the Brexit vote. Nevertheless, it is part of the economists' job to try and evaluate the economic consequences of Brexit, even if this task is difficult for three reasons: first, nobody knows (even in November 2019) what Brexit will look like (soft or hard Brexit, with or without a deal, with or without a liberal deregulation policy shock, without tariffs or with MFN tariffs, with an FTA with non-EU countries); second, huge uncertainties remain on several economic channels such as labour and capital flexibility, as well as the impact of trade openness and FDI on productivity growth; and third, there is some doubt about the relevant economic tool: long-term equilibrium models or short-term macroeconomic ones? It should also be recalled that comparing papers is not straightforward, for two main reasons. First, papers were produced at different dates, and UK government plans have evolved over time. Second, some papers are presented as academic papers, while others are from official institutions (UK Treasury, OECD, etc.), most of them expecting Brexit to have negative economic impacts. Other papers are produced by fundamentally pro- or anti-European think tanks. However, all papers claim to provide an objective analysis. Brexit will have economic impacts through several channels that not all studies consider. We will mainly focus below on studies on the long-term impacts of Brexit (Tables 4 and 5).

Trade issues

All studies have to estimate the impact of Brexit on UK-EU27 trade flows. According to gravity models, trade between two countries can be predicted by using variables such as the size of the two countries considered, their geographical distance, a common language, historical links and variables such as membership in the same free trade area. Usually, a gravity model is used to estimate the fall in trade (and sometimes in FDI) that would result from the UK leaving the single market, accounting for the specific effects of single market membership as compared to an FTA or WTO regime. Some studies directly use these estimates to evaluate the whole reduction of trade between the UK and EU27; some embed a negative effect of NTBs similar to the average increase in trade resulting from joining the single market. Other studies set rather arbitrarily the NTBs which would result from leaving the single market for an FTA or WTO regime. The fall in trade is often estimated by inverting the past positive impact of single market

membership on trade flows. It may be argued that these estimates overvalue the impact of Brexit, as they imply a full symmetry (losses from leaving the single market are valued from gains from joining the single market) and do not account for hysteresis effects. It may also be argued that estimates are overvalued, as the impact of the single market has been weaker for the UK than for the average of other EU members (Coutts *et al.*, 2018). Some studies account also for the gains from potential free trade agreements with third countries. The estimations can be done at the global level, or at a sector level, and can incorporate intermediate goods flows, which is more accurate but requires being able to estimate NTBs from sector flows. In gravity models, the effect of Brexit on trade flows does not depend on estimates of foreign trade price elasticities; these are black boxes, although the effects depend heavily on these estimates in models estimating TBs and NTBs.

In gravity models, the issue of “trade diversion” is often poorly taken into account. If trade decreases between the UK and the EU27, it may increase between EU27 countries and with non-EU countries. From a European global perspective, in each market, the impact of tariffs and non-tariff barriers should be analysed precisely: for instance, on the UK market, French products will lose competitiveness vis-à-vis UK domestic products and non-EU products, but not with other EU MS. On the French market, the loss of competitiveness of UK products will benefit French and other EU products.

Efficiency effects

In a second phase, most studies use a CGE model⁵ to evaluate the efficiency losses resulting from these barriers, from lower trade, from smaller sectoral production which induces losses of economies of scale, and from smaller trade intensity of exchanges. With lower competition on markets, firms can increase their margins. The UK economy must produce goods to substitute imports and reduce its production of exported goods, which induces losses of efficiency, and consequently GDP or welfare losses. In general, the static effects obtained with a CGE model, even with a strong reduction of trade, are relatively small, since

5. In principle, a CGE model describes the functioning of the national economy from a neo-classical framework. Agents (households or businesses) optimize a utility function with perfect rationality and knowledge; prices equilibrate the different markets (goods, labour, financial markets); and the economy is in equilibrium (static or dynamic). Some CGE models deviate from this framework (taking into account the rigidity of prices and wages or imperfect information).

these models assume that full employment will be maintained with a high degree of capital and labour mobility between economic sectors.

Productivity effects

Some influential studies add dynamic effects: lower economic openness (in terms of trade or FDI) would reduce innovation incentives, the ability to import technological innovations, and competition pressure, and hence would result in a lower productivity growth in the UK economy. So these effects would play not only on the GDP level, but also on the GDP growth rate.

In these studies, the dynamic effects are very strong, but they have little empirical basis: the slowdown in productivity growth in advanced countries in recent years makes a strong impact of economic openness on productivity gains scarcely credible. The UK economy's openness has been increasing with large FDI inflows, but the impact on productivity growth has not shown up. Even if FDI inflows decrease after Brexit, they will remain relatively high. Above all, Brexiteers do not plan to close but, on the contrary, to open the UK economy more to the open sea, especially to the United States, China and Commonwealth countries, to increase market competition and encourage technological innovations.

Short-term issues

Some studies use macroeconomic models, where output is demand-driven. Trade barriers lead to a decrease in export and import volumes. Thus, the impact on output is uncertain, as UK imports from the EU exceed UK exports to the EU. The increase in import prices may induce a fall in UK households' incomes, and it will take time for UK producers to build production capacity to replace imports. The final results depend also on exchange rate developments: a weaker pound improves British competitiveness but reduces households' real incomes. In fact, the strong negative effects are often obtained via two assumptions: expectations of a strong long-run negative effect on GDP will induce a fall in equity prices and will immediately reduce households' consumption; and the uncertainty about trade conditions will reduce firms' investments.

Migration issues

EU immigration could be reduced, which may shrink the labour force, and also GDP, as full employment is assumed for the long term

(see above). Some studies predict that restricting immigration will have a negative effect on productivity if companies do not find the skilled labour they need. They also estimate that restrictions on unskilled labour immigration will oblige firms to invest in more productive equipment, but other studies consider that this will reduce incentives to increase UK workers' skills.

Fiscal issues

Brexit will allow the UK to save net transfers with the EU of around £9 billion (0.5% of GDP, OBR, 2018a). If the UK introduces MFN tariffs on imports from the EU27, the UK budget may gain £13 billion (own calculation according to Clarke *et al.*, 2017). If, on the contrary, the UK decides to cut all tariffs to zero, the loss will be around £13 billion (own calculation according to Levell, 2018). In March 2019, the general government deficit was only 1.2% of GDP. But if Brexit has a strong negative impact on UK GDP, the public deficit may widen. Thus, some studies anticipate that an expansionary fiscal policy will be run to support output after Brexit, while other studies consider that a restrictive fiscal policy will be necessary.

Exchanges rate issues

If tariff barriers and NTBs are raised, UK exports will be less competitive, but UK producers will be more competitive relatively to foreign importers, even if intermediate goods prices increase. The depreciation of Sterling will improve UK competitiveness. Most CGE models assume that, in the long run, external current accounts should be in balance. So, lower imports should be offset by lower exports, implying less efficient production.

Regulation issues

For most liberal economists, EU regulations are an obstacle to efficiency and growth. They are not adapted to the UK economy. So these economists consider that leaving the EU will allow a deregulation shock that will boost UK growth. But they forget that rules and norms have their justifications, many of them enshrined in international treaties that the UK should continue to comply with. The UK is already one of the less regulated OECD countries. The OECD product market regulation indicator was 0.79 for the UK in 2018, as compared to 1.4 for the OECD average, 1.11 for Germany, 1.22 for the Netherlands, and 1.55 for France. The OECD employment protection legislation indicator was

1.59 for the UK, as compared to 1.17 for the US, but 2.82 for France, 2.84 for Germany, and 2.94 for the Netherlands. Hence the gains from further deregulation could only be small for the UK. The corporate tax rate is already a low 19%, and was targeted for being cut to 17% in 2020 even before Boris Johnson became Prime Minister. It could be cut further to 12.5% (the current Irish rate, as was proposed by Jeremy Hunt in the race for the Conservative Party leadership in 2019). But large tax cuts would imply public and social spending cuts of the same magnitude, which is not in the Conservative Party's current programme, and would hit the poorest.

Studies on Brexit's impacts on the UK economy

Before the referendum, in April 2016, the UK Government (HM Treasury, 2016a) published an evaluation of the impact of Brexit on the UK economy. The study used a gravity model, an empirical relation between economic openness and labour productivity, and the NiGEM model of the NIESR. According to the evaluation, a WTO scenario would reduce UK trade by 17 to 24%, and FDI by 18 to 26%; this restricted openness would reduce labour productivity (in level) by 3.7 to 7.7%; increased uncertainty would reduce physical and human capital formation in the short term, with persistent effects of 1% of GDP. The analysis did not incorporate deregulation effects or migration effects (it estimated that fewer EU citizens would work in the UK, but fewer British citizens would work in the EU). In the WTO scenario, after 15 years, UK GDP is smaller by 7.5% (between -5.4% and -9.5%); by 6.2% with a negotiated agreement like the one signed with Canada; and by 3.8% if the UK joined the EEA with an agreement like Norway. The study adds that if the UK remains in the EU, it will benefit from economic reforms in the EU, such as those included in the February 2016 agreement between the UK and the EU, from single market developments, and from new FTAs. These could increase UK GDP by up to a further 4%.

Table 4. Brexit: The channels of the long-term impacts (WTO regime)

	Trade	UK imports	FDI	Productivity level	Productivity growth	Migration	Fiscal policy	Deregulation
Oxford Economics (2016)	TB and NTB	MFN, NTB	No	No	Yes	Yes	Yes	Yes
HM Treasury (2016a)	Gravity model	Gravity model	Gravity model	Yes	No	Nil	Nil	Nil
OECD (2016)	Gravity model	Gravity model	Gravity model	Yes	Yes	Yes	Nil	Yes
NIESR (2016)	Econometric, estimation, TB	MFN, NTB	Yes	No	No	No	Yes	No
Rojas-Romagosa (2016)	Gravity model	Gravity model	No	CGE model	As a variant	No	No	No
Dhingra <i>et al.</i> (2017)	TB and NTB	TB and NTB	No	CGE model	As a variant	No	Yes	No
Leave Means Leave (2017)	?	0 tariff, 0 NTB	No	?	Positive	Yes	Yes	Yes
Vandenbussche <i>et al.</i> (2017)	TB and NTB	TB and NTB	No	No	No	No	No	No
Felbermayr <i>et al.</i> (2017,18,19)	Gravity model	0 barrier as variant	No	CGE model	No	No	No	No
CEPII (2018)	Gravity model	Gravity model	No	CGE model	No	No		No
Open Economy (2018)	TB and NTB	0 barrier as variant	No	No	No	No	Yes	Yes
Cambridge Econometrics (2018)	TB and NTB	TB and NTB	Yes	No	No	Yes	No	No
IMF (2018a)	TB and NTB	TB and NTB	No	CGE model	No	No	No	No
NIESR (2018)	TB and NTB	TB and NTB	Yes	No	Yes	Yes	Yes	No
IMF (2018b)	TB and NTB	TB and NTB	Yes	CGE model	No	Yes	No	No
HM Government (2018b)	TB and NTB	0 barrier as a variant	No	No	No	No	Yes	Yes
Bank of England (2018)	Gravity model	Gravity model	Yes	Yes	No	Yes	Yes	No

Source: Own compilation.

In a companion paper, in May 2016, the UK Government (HM Treasury, 2016b) studied the immediate economic impacts of a vote for leaving the EU. The study considers three key factors: 1) the “transition effect”: firms and households will anticipate a strong negative impact on GDP in the long term; they will immediately reduce their investment and their spending. 2) the “uncertainty effect”: the rise in uncertainty following the referendum will induce lower private spending. 3) the “financial conditions effect”: higher financial market volatility will induce a rise in all risk premia and a fall in the pound. The UK economy will immediately fall into recession. After two years, in the less pessimistic scenario, housing prices will be 10% lower; Sterling 12% lower; GDP 3.6% lower; and the unemployment rate will be 1.6 percentage points higher. These two publications have an ambiguous status, as they were presented by George Osborne, Chancellor of the Exchequer, as part of the UK government’s Remain campaign.

Similarly, in April 2016, the OECD (Kierzenkowski *et al.*, 2016) considered, strangely, that Brexit is “akin to be a tax, imposing a persistent and rising cost on the economy over time”. For the near term, the OECD estimated that a vote for Brexit would generate a strong uncertainty, increasing risk premia and hurting confidence. The financial market shocks were assumed to be of a similar magnitude as those observed in the 2011-12 euro zone crisis, with the corporate bonds rate rising by 150 basis points, Sterling falling by 10%, households’ saving rate rising by 1 percentage point, and UK exports falling by 8%. UK real GDP would be reduced by 0.5% in 2017 and 2018, and by 1.5% in 2019, when Brexit was to take place. By 2020, UK GDP would be reduced by 3.2% (and EU27 GDP by 0.9%).

For the longer term, the OECD study uses a CGE trade model with 57 sectors and the NiGEM model. It assumes that UK withdrawal from the EU would strongly reduce trade openness (15% in the central scenario) and FDI stocks (30% in the central scenario). This would induce a fall in productivity (as a result of reduced competition), a decline in the ability to import technical innovations, a reduction in the quality of firms’ governance, a slowdown in the goods market reforms, a fall in R&D, with all these factors inducing a slowdown in technical progress. Restrictions on immigration would reduce the quantity and skills diversity of workers. In the central scenario, Brexit would cost 5.1% of UK GDP (between 2.7 and 7.7%).

Many of the channels mentioned by the OECD are debatable. Despite its openness, UK productivity growth is already low. It has not accelerated in recent years despite the high level of FDI inflows. The UK plans to continue to attract FDI through tax and regulatory competition. The UK also expects to increase its trade with the US, China and emerging countries, which may be beneficial in terms of importing innovations. The “Global Britain” project does not plan to isolate the UK. According to the OECD, the UK would be better off staying in the EU, participating in deepening the single market and benefiting from the free trade agreements the EU is expected to sign in the coming years, which would increase growth in all EU countries. But one may question the credibility of this last statement, given the risk that these trade agreements are not signed (in particular the TTIP) and the problems they raise in terms of economic and social cohesion (generating winners and losers in signatory countries). The OECD does not ask the question of principle: should a country abandon its political sovereignty to benefit from the possibly positive effects of trade liberalisation?

In February 2016, the CBI (2016) reviewed the literature on the impact of EU membership on the UK economy. 12 studies were reviewed, covering 14 estimations, 7 of which were considered as serious by the CBI. For these 7 studies, the impact varied from -2.5% to +9.5% of GDP. The two most credible studies estimated a cumulated gain of 1% of GDP from trade tariff and NTB reductions, and the UK fiscal contribution, but the CBI adds 1.75% for FDI effects and 1.75% for increased competition effects due to the single market membership, to obtain a global effect of 5%. If one accepts some negative impacts of EU regulation and red tape, the gain is reduced to 4%, which is supposed to disappear with Brexit.

In March 2016, Oxford Economics (2016) used the Oxford Economics Global Model (GEM) to analyse the impact of Brexit. It considered 4 trade arrangements (MFN, FTA, BILateral Accord, CUStoms Union) and 3 economic policies (Populist, Moderate and Liberal). The negative effects of Brexit are higher in MFN, and progressively decrease in FTA, then BIL, and finally CUS, as trade reductions have an impact on productivity growth. The populist policy reduces migration and increases the size of the State. The liberal policy reduces the tax burden for business, eliminates all tariffs on third-country imports and implements “an aggressive set of deregulations”.

Strangely, Sterling remains at the same level in each scenario as in the baseline. The impact on GDP varies between -3.9% in the worst case (MFN and Populist) and +0.1 in the better case (CUS and Liberal); the strict impact of Brexit on UK GDP with an MFN scenario (without considering the other aspect of economic policies) seems to be only around 2 percentage points. The impact on trade is relatively weak (-9% in the worst case), and the methodology is rather vague.

In April 2016, Busch and Matthes (2016) released a Meta-Analysis of the economic impact of Brexit. They recognize that the more reliable studies estimate that the economic cost will remain moderate (1 to 5% of UK GDP), but they consider that these studies underestimate the risks, underestimate the effects on trade, and do not account for the dynamic effects on productivity, such that a UK GDP loss of 10% or more cannot be ruled out.

In May, an NIESR study (Ebell and Warren, 2016) incorporated in the NiGEM model a reduction in trade with EU countries with an econometric estimation of the impact of EU membership on trade, a modest increase in tariff barriers, a fall in foreign direct investment by 24% that induces a fall in private investment by about 0.5% of GDP, a lower UK net fiscal contribution to the EU, without dynamic effects on productivity and without migration effects. The effects on UK GDP appear weak by 2030: -1.8% in the EEA scenario; -2.1% in the FTA scenario; and -3.2% in the WTO scenario.

In June, a study by CPB (Rojas-Romagosa, 2016) considers two scenarios: the WTO option (with MFN tariffs and NTBs of 12.9%, taken from Egger *et al.*, 2015) and the FTA scenario (with NTBs of 6.4%). Using a CGE model for the world economy, the author evaluates that, in the long run, a WTO regime would induce a GDP loss of 4.1% for the UK (0.8% for the EU27, but 3.7% for Ireland and 1.2% for Netherlands), with a fall by 23% of UK exports and imports. The author multiplies this effect by approximately 2 to integrate an “empirical relationship between opening to trade and productivity”. Hence, the GDP loss would be 8.7% (1.5% for the EU27). An FTA would induce a 3.4% loss (0.6% for the EU27) in static, which becomes 5.9% in dynamics (1.1% for the EU27).

Dhingra *et al.* (2017) use a CGE model. They consider a scenario where the UK remains in the single market as an EEA member with no new tariffs and an increase by 2.77 percentage points of NTBs for UK-EU27 trade, and a WTO regime scenario, where MFN tariffs apply for

trade between the UK and EU 27, with NTBs increasing by 8.31%. NTBs are assumed to be a quarter or three-quarters of NTBs between the US and the EU according to previous estimations. In the long term, the UK would lose 2.66% of GDP equivalent in the WTO regime (1.34% in the EEA). Of these 2.66 percentage points, 0.13 percentage point would come from the rise in tariffs, 1.31 percentage point from the rise in NTB, and 1.61 from the exclusion of the UK from future barriers reductions in EU integration. The trade effects would be high: UK exports to the EU would fall by 43%; UK imports from the EU would fall by 38%. The authors also estimate that Brexit would reduce FDI inflows into the UK by 22%. A simple econometric relationship between productivity, trade and FDI leads the authors to increase the loss up to 13.3% (up to 6.3% in the EEA case).

Table 5. Long-term impact of Brexit on UK GDP (in 2030, in GDP percentage point)

	Free Trade Agreement	WTO regime
Oxford Economics (2016)	-0.8/-3.1	-1.5/-3.9
HM Treasury (2016a)	-6.2 (EEA: -3.8)	-7.5
OECD (2016)		-5.1
NIESR (2016)	-2.1 (EEA: -1.8)	-3.2
Rojas-Romagosa, static/dynamic (2016)	-3.4/-5.9	-4.1/-8.7
Dhingra <i>et al.</i> (2017)	-1.3/-6.3	-2.7/-13.3
Leave Means Leave (2017)		+7.0
Vandenbussche <i>et al.</i> (2017)	-1.2	-4.5
Felbermayr <i>et al.</i> (2017)	-0.6	-1.4/-1.1**
Felbermayr <i>et al.</i> (2018a)*	-1.8	-3.2/-2.2**
Felbermayr <i>et al.</i> (2018b, 2019)*	-0.9	-2.8/-1.4**/-0.5***
Open Economy (2018)		-2.2
Cambridge Econometrics (2018)	-1.0/-1.6	-2.7/-3.0
IMF (2018a)	-2.5	-4.0
NIESR (2018)	-3.9	-5.5
IMF (2018b)	-3.1	-6.2
HM Government (2018b)	-6.7 (EEA: -1.4)	-9.3

*On real consumption; **Global Britain scenario; ***Hard-but-Smart Brexit.

Source: Own compilation.

Vandenbussche *et al.* (2017) use the World-Input-Output-Database to extend the traditional gravity model by including sector-level input-output linkages in production and by analysing trade in value added. They consider indirect effects (for instance: Hungary suffers from the

fall in German exports to the UK, as these exports include intermediate goods produced in Hungary). They do not take into account FDI, migration, productivity effects, or trade diversion. They assume that with a soft Brexit, tariffs will remain nil and non-tariff barriers will be 2.77% (in tariff equivalent, as in Dhingra *et al.*, 2017). With a hard Brexit, tariffs will be the MFN ones and non-tariff barriers will be 8.31%. The authors do not incorporate any macroeconomic equilibrium. So the effects are relatively weak: -1.2% for the soft Brexit; and -4.5% for the WTO scenario.

In November 2017, Felbermayr *et al.* (2017) evaluated three scenarios: a WTO scenario with MFN tariffs and NTB effects estimated by gravity equations; a Global Britain scenario with the WTO scenario and an FTA between the UK and US, Canada and Japan; and an FTA scenario with no customs tariffs and NTBs estimated as the cost-reduction of the EU-Korea FTA. The effects are huge on trade (in the WTO scenario, UK exports to Germany fall by 50%), but small on real consumption: 1.4% in the WTO scenario, 1.1% in the Global Britain one, and 0.6% in the FTA one. A second estimation in March 2018 (Felbermayr *et al.*, 2018a) gives higher effects on real consumption: 3.2% in the WTO scenario, 2.2% in the Global Britain one, and 1.8% in the FTA one. A third one in November 2018 (Felbermayr *et al.*, 2018b) gives intermediate effects: 2.76% in the WTO scenario, 1.4% in the Global Britain one, and 0.9% in the FTA one. The numbers are low, as other channels are not taken in account (such as migration, FDI or dynamic effects).

Sampson (2017) reviewed the literature on the economic impacts of Brexit. The author notes that most analyses conclude that in the long run Brexit will make the UK poorer, with considerable uncertainty on the size of the effects, and costs ranging between 1 and 10 per cent of UK per capita income. The author also notes that the effects are 2-3 times larger for models incorporating effects of trade barriers on productivity than for pure trade models (with technologies fixed). The author considers that many studies underestimate the effects of Brexit, as they do not account for all channels (such as the effects of less competition on goods markets, on firms' margins, on consumer choices, on innovation incentives; the effects of restricted immigration; and the specific impact on financial markets, etc.). The author recalls the economic arguments in favour of Brexit: the possibility to sign new trade agreements with non-EU countries and to deregulate the economy, but he estimates that they are not convincing.

For hard Brexiteers (Labour Leave, Leave Means Leave, and Economists for Free Trade, 2017), a net break with the EU could increase UK GDP by 7%. Leaving the EU would allow the UK to engage in a liberalisation shock – EU rules would be abolished for energy, finance, industrial and agricultural standards, medical and agronomy research – and in a strategy of opening its borders, possibly unilaterally, based on the theory according to which tariff or non-tariff trade barriers mainly harm the country introducing them. The immigration of unskilled workers would be strictly controlled, prompting British companies to upgrade production processes. The UK would leave the Common Agricultural Policy (CAP), which would allow lower food prices, and the Common Fisheries Policy (CFP), which would restore control of its territorial waters. The money saved from contributions to the EU budget would be reinvested to cut taxes and to help the productive sector. Finally, the British economy's competitiveness would be maintained by the fall in the Sterling exchange rate. GDP would be 7% higher, of which 4 percentage points would result from free trade (opening borders), 2 percentage points from deregulation, 0.2 percentage point from halting EU unskilled immigration, and 0.6 percentage point from ending UK contributions to the EU budget. It would benefit the poorest, currently victims of competition from migrant workers, of high housing prices (due to immigration) and of high food products prices (because of the CAP).

This assessment is questionable. It omits to consider that a fall in the Sterling exchange rate would raise prices in the UK, that rules and norms have their justifications, many of them enshrined in international treaties that the UK should continue to comply with, and that the UK is already one of the less regulated OECD countries. In the 17 October 2019 Revised Political Declaration, the UK accepts that: "the future relationship must ensure open and fair competition, encompassing robust commitments to ensure a level playing field. ... These commitments should prevent distortions of trade and unfair competitive advantages. To that end, the Parties should uphold the common high standards applicable in the Union and the United Kingdom at the end of the transition period in the areas of state aid, competition, social and employment standards, environment, climate change, and relevant tax matters. The Parties should in particular maintain environmental, social and employment standards at the current high levels provided by the existing common standards ... The future relationship should also promote adherence to and effective imple-

mentation of relevant internationally agreed principles and rules in these domains, including the Paris Agreement.”

Open Europe (Booth and Shankar, 2018) use a CGE model: they evaluate that a WTO regime will introduce border costs of 3.26% of goods prices and NTBs equivalent to NTBs between the US and Canada. They do not introduce any impact on productivity. The long-term impact of a no deal would be only 2.2% of GDP by 2030, which the authors translate into 0.17% per year for 13 years, without any analysis of how this would evolve until 2030. The long-term impact would be reduced to 0.5% if the UK embarks on unilateral trade liberalisation with third countries. The authors suggest offsetting this loss by various measures (boosting housing construction, reforming corporate taxation, boosting R&D, increasing female employment, maintaining an open immigration system, and especially developing artificial intelligence).

In January 2018, Cambridge Economics (2018) evaluated four Brexit scenarios: a Norwegian one (in the single market, but not in the customs union), a Turkish one (in the customs union, but not in the single market), an orderly move to WTO rules, and a no deal Brexit. It accounts for trade effects, impacts on investment, FDI and migration. The impact is negative but small. On GDP in 2030, it would be: -1% in the Norwegian scenario, -1.6% in the Turkish one; -2.7% in an orderly move to WTO; and -3% in the no deal Brexit (but, as the population is 2.2% lower due to lower migration, GDP per capita declines by only 0.5%).

In January 2018, Coutts *et al.* (2018) undertook a critical analysis of previous estimates of Brexit impacts. They note that there is no evidence that joining the EU has increased UK economic growth. They point out that most studies had overestimated the impact of the Brexit announcement. Finally, they estimate that gravity models are fragile, as the estimations are affected by trade with small emerging countries, as many studies do not take into consideration that the impact of EU membership is much smaller for the UK than for the EU MS as a whole, as one cannot assume that the benefits of trade with EU member countries would be fully reversed when leaving the EU. They notice that many studies forget about the impact of the fall in Sterling. They recall that most FDI involve mergers and acquisitions rather than physical investment. They observe that the results of most studies finding a link between trade, FDI and productivity are dominated by emerging economies and special cases like Ireland. They estimate that CGE models are

not based on any empirical evidence. As a conclusion, they present their own estimation, with the CBR macro-econometric model of the UK economy in the case of a Brexit scenario, with a 2-year transition to an FTA and an increase in trade with non-EU countries. In 2030, UK GDP will be 2% below the baseline, but GDP per capita will return to the baseline level.

In October 2018, the OBR (2018b) published a detailed description of the channels through which Brexit could affect the UK economy and a summary of previous studies. Also in October 2018, the Institute for Government (Tetlow and Stojanovic, 2018) published a study for a non-technical audience.

In November 2018, the IMF (2018b) added effects from higher trade barriers, lower migration and reduced inward FDI and incorporated adverse effects from a fall in FDI on innovation and on firms' governance. It assumes that labour reallocation will be easy in the UK. So, the IMF estimates that UK GDP will fall by 3.2% (2.6/3.9) in an FTA scenario and by 6.5% (5.2/7.8) in a WTO scenario. In the WTO scenario, 4.8 percentage points come from trade barriers, 1 percentage point from migration, and 0.4 percentage point from lower FDI. The IMF considers that these effects could be reduced by an active labour market policy.

In November 2018, the NIESR (Hantzsche *et al.*, 2018) used the NiGEM macroeconomic model to evaluate the impact of Brexit. In case of a no deal exit, EU/UK trade would decrease by 56% in the medium term (half of it immediately). Migration flows would fall from 200 000 to 100 000 a year. FDI would be reduced by 24%. Sterling would fall by 13.5%. Total factor productivity would decrease by 1.4% in the long term. UK potential growth is currently 1.9% per annum (1.45% productivity and 0.45% employment); it would fall to 1.3% (1.2% productivity and 0.1% employment). The GDP loss would be 5.5% in 10 years, of which 1.8 percentage points due to lower trade, 1.7 percentage point due to less net migration, 1.4 percentage point due to a productivity effect, and 0.4 percentage point due to lower FDI. In the case of a deal with a comprehensive FTA, the GDP loss would be 3.9% in 10 years.

In November 2018, the UK government (HM Government, 2018b) evaluated the increases in trade costs (tariffs and non-tariff barriers) and the impact of migration policy and introduced them in a macroeconomic model. Four scenarios are addressed. The first one

corresponds to the HM Government's White paper (HM Government, 2018a); an exit with a comprehensive agreement (free trade for goods, no tariffs, customs agreement, frictionless trade outside the customs union and the single market, and restriction of migration, which may be unacceptable for the EU27); for UK-EU trade, tariffs are nil; NTBs are 0.5 per cent for goods, and 6 per cent for services. The second scenario corresponds to an EEA-type agreement (with automatic implementation of EU legislation and no restriction of migration, which does not deliver the Government objectives), tariffs are nil; and NTBs are 5 per cent for goods, and 2 per cent for services. The third scenario corresponds to an average FTA agreement (zero tariffs but non-tariff barriers of 8 per cent for goods and 8.5 per cent for services). The fourth scenario corresponds to a no deal (MFN tariffs and NTBs of 10.5% for goods; 11% for services). Immigration barriers reduce UK GDP by 1.8%. The flexibility of regulatory policy increases GDP by an illustrative 0.1%. Relative to a base scenario, the GDP loss in the long term would be respectively -2.5, -1.4, -6.7 or -9.3%. In the no deal case, UK-EU trade decreases by 37% and UK-non EU countries trade increases by 6%. Due to the fall in GDP, public sector borrowing increases by 2.4% percentage points of GDP in the no deal scenario. Exchange rate developments are not discussed. In a sensitivity analysis, the study estimates that, in the no deal scenario, the negative impact could be 2.3 percentage points higher if private investment falls due to a lower rate of return, but the impact could be 0.8 percentage point lower under unilateral trade liberalization.

In November 2018, also, the Bank of England (Bank of England, 2018) used a gravity model to evaluate the impact of Brexit on total trade and FDI, and then introduced the impact of trade openness and FDI on productivity. It considers a fall in the UK exchange rate to equilibrate the current account and an increase in uncertainty, which decreases private spending. It presents five scenarios. In no deal scenarios, the UK applies the MFN tariff (3.2% in weighted average); the UK recognises EU product standards, but the EU does not reciprocate. In an Economic Partnership scenario, which corresponds to the November 2018 Political Declaration, the GDP level, relative to a trend scenario,⁶ increases by 1.75% in a close partnership, and decreases by 0.75% in a less close partnership. Inflation remains near 2%; and Ster-

6. According to the Bank of England, the November 2018 baseline scenario is already 3% lower than the May 2016 baseline scenario.

ling appreciates by 5% (close partnership) or by 2% (less close partnership). In a “Disruptive no deal Brexit”, GDP falls by 3%, Sterling depreciates by 15%, house prices fall by 14%, inflation accelerates to 4.25%, and the Bank rate increases to 1.75%. In a “Disorderly no deal Brexit”, GDP falls by 8%, Sterling depreciates by 25%, house prices fall by 30%, the inflation rate increases up to 6.5%, and the Bank rate increases to 5.5%. The Bank of England estimated that UK banks will be able to support such a shock, because it is smaller than the last stress tests the BoE imposed. In a scenario of transition to a WTO regime, the GDP impact will range between -2.5% (prepared transition) and -5.5% (unprepared transition), with Sterling depreciating by 8%.

In May 2019, Felbermayr (Felbermayr, 2019) suggested that in the event of a no deal Brexit the UK may decide not to increase its tariffs and NTBs, but, on the contrary, in what the author names a “Hard-but-Smart Brexit”, to cut all its tariffs for non-EU producers to the current level for EU producers, i.e. zero, and not to introduce more border controls. UK exporters would however suffer from tariffs and NTBs from EU27 countries, and some sectors (like agriculture and food products) would suffer from non-EU producers’ competition, but UK producers would benefit from lower prices for their intermediate goods, and UK consumers would benefit from the fall in prices of imported goods. According to a simulation, the Hard-but-Smart Brexit would induce a loss of real consumption of 0.5% in the UK and 0.6% in the EU27. From a political point of view, this strategy would induce an asymmetrical situation where EU27 countries would have to introduce physical controls and barriers, whereas the UK would appear as an open country, which may reinforce the UK position in the negotiations.

The most recent survey by Campos (2019) deals with political and economic aspects. The author estimates that the net benefits for the UK of EU membership would be 8.6% of GDP. The author discusses the motivation of the vote for Brexit between economic factors and sovereignty issues; he stresses the effects of the “China shock” on regions that voted for Brexit; he recalls that Ireland, the UK and Sweden were the first to be opened to workers from the New Member States in 2004, with large inflows from 2004 to 2016; he estimates that both trade with advanced countries and FDI increase productivity. Thus, the author recognizes that canonical, static models indicate a loss of only 2% to 3% of UK GDP, but the loss rises to 8% for an exit with WTO rules, although with fragile models. He recalls the UK productivity

paradox. He recalls also that the single market has allowed the UK to develop financial services and the automobile and pharmaceutical industries.

The impact on the EU27

Some studies give estimates of the impact of Brexit for the EU27. In a first analysis, as the UK-EU trade ratio to GDP is 4.65 times higher for the UK than for the EU, the impact should be 4.65 times larger for the UK than for the EU27, but this depends on trade structure; one may think that there is a non-linearity, as less competitiveness from British firms is less important on EU markets than less competitiveness from EU firms on UK markets; the UK may benefit from ending its transfers to the EU27, which would hit EU MS; the UK may choose to not increase the barriers on EU27 exports; the UK may choose to sign FTA with non-EU countries; but on the contrary, some migration flows, some multinational firms, and some FDI will move from the UK to the EU27. The depreciation of Sterling could spread the loss between the UK and the EU27.

The impact differs among EU MS according to the importance of their trade, direct and indirect (by intermediate consumption included in UK imports, etc.), and to the trade structure. Ireland is the most affected country, due to the size of its trade with the UK, in particular for agricultural products, but the impact will depend on the status of the Irish border.

In “gravity plus CGE” models, the impact is always large on trade but relatively small on GDP. For instance, in Mayer *et al.* (2018), the single market membership doubles trade in goods between MS, but increases their GDP by 4.4% only (and by 2.3% for the UK).

Felbermayr *et al.* (2018b) use a model with a multi-sector input-output analysis and a precise evaluation of the impact of EU membership for the UK. They find that UK manufacturing exports to the EU27 would fall by 32%, while EU27 manufacturing exports to the UK would fall by 31%. In the long term, the loss in real consumption would be relatively small, as long-run productivity effects are not considered: 2.76% for the UK, 0.78% for the EU27, Ireland being the most affected country (8.16%), and then Luxembourg (due to the financial links) and Malta (Table 6). The impact on the UK is 3.5 times the impact on the EU27. More openness from the UK towards non-EU countries (“A Global Britain”) would significantly reduce the cost for the UK and

slightly increase the costs for EU27 MS. A deep and comprehensive free trade agreement copied on that of the EU with Korea would substantially limit the negative impact of Brexit. In the case of a Hard-but-Smart Brexit (where the UK decreases all its tariffs and does not introduce NTBs), the impact on the EU27 will even be similar to the impact on the UK.

Table 6. The impact of Brexit on real consumption (in %)

	Hard Brexit	Global Britain	FTA	Hard-but-Smart
UK	-2.76	-1.43	-0.93	-0.50
EU27	-0.78	-0.83	-0.20	-0.60
Germany	-0.72	-0.80	-0.20	-0.48
France	-0.52	-0.54	-0.10	-0.40
Italy	-0.40	-0.43	-0.09	-0.31
Spain	-0.39	-0.42	-0.13	-0.29
Belgium	-1.40	-1.46	-0.29	-0.96
Netherlands	-1.64	-1.71	-0.37	-1.06
Ireland	-8.16	-8.22	-3.08	-5.39
Malta	-5.19	-5.16	-0.76	-3.36
Luxembourg	-5.23	-5.46	-2.15	-3.15

Source: Felbermayr *et al.* (2018b); Felbermayr (2019).

The CEPII produced similar estimates (Vicard, 2017; Mayer *et al.*, 2018). The authors first evaluate the impact of Brexit on UK trade, then the impact of lower trade on GDP. The evaluation gives high numbers for the trade impacts, but low numbers for the GDP impact. Even more striking, in the case of a trade agreement, trade between the UK and the EU would be reduced by 36%, but trade between the UK and non-EU countries would increase by 12%. In the case of a trade agreement, long-term GDP losses would be 2.4% for the UK and 0.4% for the EU27. In a relationship under WTO rules, the loss would be 2.9% for the UK and 0.5% for the EU27. For the UK, an FTA with Canada, the USA and Australia could reduce the loss by 0.5% of GDP. Losses would be very uneven among EU27 MS, and would be similar for Ireland and the UK. The study assumes that the UK will apply MFN tariffs and NTBs, while the UK may prefer to apply lower tariffs and to avoid NTBs.

Table 7. Impacts of a WTO scenario on EU and selected EU MS GDP (in %)

	Rojas-Romagosa (2016)	Vandenbussche <i>et al.</i> (2017)	Mayer <i>et al.</i> (2018)
UK	-4.1	-4.47	-2.9
EU27	-0.8	-1.54	-0.6
Germany	-0.6	-1.76	-0.4
France	-0.6	-1.25	-0.3
Italy	-0.5	-1.23	-0.2
Spain	-0.9	-0.91	-0.3
Belgium	-2.1*	-2.35	-0.8
Netherlands	-1.2	-2.59	-0.8
Ireland	-3.7	-5.74	-3.2
Luxembourg	—	-1.51	-1.9

*Belgium and Luxembourg.
Source: Rojas-Romagosa (2016), Vandenbussche *et al.* (2017), Mayer *et al.* (2018).

According to the IMF (2018a), the output loss would be 2.5% for the UK with an FTA, and 4% in the no deal case. For the EU27, the loss would be respectively 0.8% and 1.5% of GDP, but Ireland would be particularly hit, followed by the Netherlands, Denmark and Belgium. However, Ireland could attract some FDI currently located in the UK.

Bisciari (2019) averages six studies on the long-term impacts on GDP in a WTO scenario. The negative impact would be 3.2% of GDP for the UK; it would be larger for Ireland (3.6%) and Malta (3.4%); and the negative impact would be 0.6% for the EU27 (1% for the Netherlands, 0.85% for Belgium, 0.35% for Germany, 0.3% for France and 0.2% for Italy).

In fact, according to the studies considered, the ratio between the impact on UK and EU27 GDP ranges from 2.7 to 7.6 (table 8).

Table 8. Long-term effects of a WTO regime on EU27 and UK GDP (in percentage points of GDP)

	EU27	UK	UK/EU27 Ratio
Rojas-Romagosa (2016)	-0.8/-1.5	-4.1/-8.7	5.1/5.8
Dhingra <i>et al.</i> (2017)	-0.35	-2.65	7.6
Mayer <i>et al.</i> (2018)	-0.5	-2.9	5.8
Vandenbussche <i>et al.</i> (2017)	-1.54	-4.47	2.9
Felbermayr <i>et al.</i> (2018, b)	-0.78	-2.76	3.5
IMF (2018a)	-1.5	-4.0	2.7
Bisciari (2019)	-0.6	-3.2	5.3

Source: Own compilation.

The short-term impacts of Brexit

It is difficult to assess the short-term impacts of a no deal exit, which could have occurred on 31 October 2019. It would probably lead the pound and business investment to fall, but also to stock-building for precautionary reasons at the household and firm level. The largest uncertainty lies in foreign trade. The UK could decide not to introduce tariffs (except for agricultural products) or non-tariff barriers. But the EU27 would feel obliged to do so, with the difficult issue of the Irish border. Countries linked by an FTA with the EU may consider that these agreements are extended to the UK, or that they are obsolete. In November 2019, among the 36 FTA that the UK is part as an EU member, 13 have already been replicated (see note 3), but problems remain with Japan, Canada, Egypt and Turkey. The biggest risk, which is difficult to assess, is a disruption of production chains, but firms probably will have taken measures to avoid this. Conversely, there is no risk of a financial crisis, as the UK has kept its monetary power and since the UK banking system is strong enough (see Bank of England, 2018). The Bank of England only announced that it will act “to bring inflation sustainably back to 2% while supporting jobs and activity”. The UK government could run an expansionary fiscal policy (as the budget deficit planned for 2019 is only 1.3% of GDP). The effect on equity prices and on business investment will depend on the ability of the Government to define a new growth strategy for the UK.

Events since 2016 make unlikely developments such as those presented by Standard & Poor’s (S&P Global, 2018), where a no deal would cause heavy drops in housing prices (-15%) and equity prices (-14.5%), inducing a fall in household consumption (-7% after 2 years), i.e. a fall in GDP by 5.6% in 2020. Similarly, the scenarios (stress tests) by Bank of England in September 2018 of a fall by about 35% of house prices and of a financial crisis like in 2008 seem now a bit exaggerated.

According to the NIESR’s October 2018 forecast (Hantzsche *et al.*, 2018), after a no deal the pound would fall again by 10%. The government would recycle half of UK net contributions into public spending (i.e. 0.25 point of GDP). The induced decline in GDP would be 2.9% in 2020, of which 2.2 percentage points from investment, 1.3 percentage point from private consumption, 0.4 percentage point from public consumption, and a 1.0 percentage point positive effect from trade.

According to the last IMF scenarios (IMF, 2019), a no deal scenario would induce, after 2 years, a negative effect of about 3.5% of UK GDP and about 0.5% of EU27 GDP. The IMF assumes that UK exports to the EU27 will be subject to MFN rules, while the UK will set tariffs unilaterally to zero for 87% of its imports; NTBs will be increased by an additional 14 per cent (in tariff equivalent terms); net immigration flows from the EU27 will be reduced by 25 000 people per year; financial conditions will be slightly tightened (+20 basis points for the UK corporate bonds spread); and the fall in the pound will be weak. In the long term, potential output would decline by 3% in the UK (as trade barriers decrease the returns on capital, hence the capital stock, while the size of the labour force would diminish under immigration restrictions) and by 0.3% for the EU27. For the longer term, this evaluation appears low relative to other studies.

A moderate estimate can lead to the assumption that Sterling could fall by around 10% (the same order of magnitude as in 2016) and temporary agreements would limit supply chain disruptions, so that the foreign trade contribution could be slightly positive (on the order of 0.2 percentage point of GDP); economic policy would be slightly expansionary (on the order of 0.2 percentage point of GDP); the inflationary effect of the depreciation would be on the order of 1.5%, which would induce consumption to fall by around 0.8 percentage point of GDP; finally, an 8% fall in business investment (i.e. 0.8% of GDP) could be limited by a credible pro-business policy. In these conditions, the negative impact on UK output would be limited to 1.4% of GDP in 2020. But this is an optimistic scenario.

3. Conclusion

The economic literature gives diverging assessments of the impact of Brexit, depending on scenarios and assumptions. In a WTO scenario, the impacts on UK GDP range from -13.3% to +7% in the long run. The median is on the order of -4.5%. Many studies overestimate, sometimes for political reasons, either the negative impact of Brexit on future productivity growth in the British economy, or the positive impact of further deregulation. The slowdown in the British economy following the referendum was much weaker than announced by some analyses. So far, Brexit has not allowed economists to restore a reputation that has been somewhat tarnished by their blindness before the financial crisis.

The accumulation of bilateral trade agreements would create a more and more complicated world trade system; one may advocate the return of unified rules under WTO supervision, which should consider labour rights, social protection, health and ecological standards and the fight against climate change.

Although some degree of harmonization is needed for standards and taxation, a country should not be obliged to abandon its domestic sovereignty in order to benefit from free trade advantages. This advocates for a third circle around the EU.

Initially, it could have been feared that the prospect of Brexit would weaken the EU, by showing that a country could decide to leave it. But the EU27 has shown unity in the negotiations on tough and uncompromising positions. It became clear that it was politically difficult and economically hazardous to leave. The EU is more or less like a golden cage, from which it is difficult, if not impossible, to get out.

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