



HM Government

# EU Exit

Long-term economic analysis

November 2018





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November 2018

Presented to Parliament  
by the Prime Minister  
by Command of Her Majesty

November 2018



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# Executive Summary

As the UK leaves the European Union it does so with strong economic fundamentals. The economy is growing, unemployment is low and real wages are rising. The Government's future economic relationship with the EU and independent global trade policy will be important drivers of future trade flows both with the EU and the rest of the world. This will in turn influence productivity and economic output. Economic analysis can support an understanding of how these changes might affect the UK economy. But it does not seek to predict how the UK economy will perform in the future, not least because the UK's exit from the EU will be just one of a number of factors impacting economic growth.

The Government has undertaken economic analysis of EU exit under different scenarios, with the objective of providing Parliament and the public with an assessment of the long-term economic impacts of the UK's future relationship with the EU. The analysis compares potential future policy scenarios against today's arrangements, holding all other factors constant. The analysis considers the potential impacts from changes to specific trade-related policies, including analysis of EU trade costs and opportunities from an independent UK trade policy.

The Government's analysis brings together evidence from across Government, insight from external stakeholders and a range of data and analytical tools. It considers both the costs and benefits of moving to new trading relationships with the EU and the rest of the world. An integral part of this analysis is an assessment of how trade barriers could affect costs for businesses in the long run across different sectors of the economy, both as a result of different trading relationships with the EU and signing ambitious new Free Trade Agreements (FTA) with non-EU countries. The analysis uses macroeconomic tools to assess the potential overall impact on the UK economy of these changes in the long run.

**This analysis is not an economic forecast for the UK economy.** In particular:

- It only considers the potential economic impacts that are specific to EU exit. Leaving the EU is just one of many factors that will influence the UK's economic performance in the long run. Other factors such as the rise of global value chains, the increasing importance of services trade, technological developments, and global demographics are held constant;
- The analysis does not make judgements about any future UK Government policy decisions or responses; and
- The estimates show the relative impacts of different trading arrangements in the long term and do not estimate the absolute increase or decrease in economic output compared to today. The results therefore show the broad relative impacts of the different scenarios, and in all scenarios the economy would be expected to grow.

No modelling can completely capture the complex ways in which the UK economy could be affected by exiting the EU, particularly given the unprecedented circumstances of the UK's departure. **While the analysis draws on a robust set of tools and evidence, there is an inherent uncertainty around this type of economic analysis. The results are therefore presented as ranges, and should be interpreted with caution.**

### **Modelled scenarios**

In line with external studies and analysis previously undertaken by the Government, the work considers four analytical scenarios:<sup>1</sup>

- The policy position set out by the Government in the July 2018 White Paper on “The future relationship between the United Kingdom and the European Union” (“modelled White Paper”);
- A hypothetical FTA, with zero tariffs, reflecting average FTA non-tariff costs such as being outside the Customs Union and standard customs arrangements with the EU, regulatory barriers and other costs (“modelled average FTA”);
- An EEA-type scenario, which reflects being outside of the Customs Union and as such primarily reflects the costs of standard customs arrangements with the EU. Zero tariffs are applied (“modelled EEA-type”);<sup>2</sup> and
- A no deal scenario based on an assessment of average non-tariff barriers (NTBs) between countries trading on non-preferential World Trade Organization (WTO) terms and applying EU applied Most Favoured Nation (MFN) tariffs (“modelled no deal”).

The average FTA, EEA-type and no deal scenarios do not deliver the Government's policy objectives. These scenarios are therefore included as reference points. The EEA-type scenario would mean staying in the Single Market, implementing new EU legislation automatically and in its entirety, and continued free movement of people. An average FTA, EEA-type scenario or trading with the EU on WTO terms would not meet the Government's commitments to ensure no hard border between Northern Ireland and Ireland.

The UK and the EU have agreed the Political Declaration which sets the framework for the UK's future relationship with the EU. It sets out a free trade area for goods, including no tariffs, with ambitious customs arrangements. It will be the first such agreement between an advanced economy and the EU. It will also allow the UK to develop an independent trade policy beyond the partnership, with the ability to sign new trade deals with other countries.

Agreement of the Political Declaration will now be followed by negotiations on the legal text. The UK and the EU recognise that this means there could be a spectrum of different outcomes, and both have agreed that we should be as ambitious as possible. The UK has put forward proposals that would enable frictionless trade to be achieved outside the Customs Union and Single Market. That is not something that is accepted by everyone in the EU, but the UK has the ability in the future negotiations to continue to work for its objective of achieving frictionless trade.

Given the spectrum of outcomes, and ahead of the detailed negotiations on the legal text, an appropriate analytical approach to modelling the impacts of the Political Declaration is to present a range of possible outcomes. To do this, the analysis applies a sensitivity to illustrate the potential impact of higher NTBs, including checks at or behind the border and other regulatory costs. This illustrative sensitivity point reflects the midpoint in the difference of NTBs to trade between the modelled White Paper at one end, and the modelled average FTA scenario at the other, and does not represent an expected outcome.

<sup>1</sup> The four scenarios, and the policy assumptions underpinning them, were approved by ministers.

<sup>2</sup> The analysis isolates the impact of changing trading relationships, relative to a baseline of the UK's current trading arrangements with the EU. From the perspective of this modelling approach, the baseline of the UK's current trading arrangements is equivalent to membership of both the EEA and the Customs Union.

In each scenario, changes to UK-EU trade costs are considered. The analysis also considers ambitious new trade deals with the rest of the world by assessing the potential impact of eliminating tariffs and reducing non-tariff barriers with an illustrative range of potential partners.

The four scenarios, and the additional sensitivity, are then considered in two ways. The modelled White Paper and average FTA scenarios are compared against the no deal scenario. All of the scenarios are also compared against today's arrangements, as committed to Parliament on 19 November 2018,<sup>3</sup> but this is not a specific projection of future membership of the EU. This analysis does not consider any potential impact of the UK aligning with the EU as it changes its rules in the future. The future direction of EU policy is uncertain, and could have both positive and negative impacts on the UK economy.

This analysis looks only at the long-term economic impacts, and for this purpose the long term can be interpreted as around 15 years after the UK's new relationship with the EU comes into effect. It is focused only on the specific changes triggered by EU exit and as such is not an overall economic forecast. The analysis does not consider short-term operational or wider economic effects, including where there is potential for short-term effects to sustain in the long run.

### **Economic impacts**

It is expected that in all scenarios considered in this publication, the economy will continue to grow in the long run. The estimates show the relative impacts of different trading arrangements.

**The analysis shows that higher barriers to UK-EU trade would be expected to result in greater economic costs.**

The analysis compares the long-term economic impact of each of the modelled scenarios against today's arrangements, first considering trade effects only (migration effects are considered separately and described below). It also compares the central estimates of the modelled White Paper and modelled average FTA scenarios to the modelled no deal scenario over the long run, by again considering trade effects only.

Table E.1: Summary of trade only impacts on GDP compared to the modelled no deal scenario.<sup>4</sup>

Compared to modelled no deal (percentage point difference)	Modelled White Paper		Modelled average FTA
	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>5</sup>	
GDP	+6.9	+5.4	+2.7

*No migration or regulation effects. Central estimates only.*<sup>6</sup>

*Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.*

<sup>3</sup> [HC Deb \(19 November 2018\)](#), vol. 649, col. 661 "The baseline for this comparison will be the status quo - that is, today's institutional arrangements with the EU".

<sup>4</sup> Differences may not reconcile with other tables due to rounding.

<sup>5</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

<sup>6</sup> Ranges are not modelled for the differences between scenarios, or for the NTB sensitivity.

Table E.2: Summary of trade only impacts on GDP compared to today's arrangements.

Compared to today's arrangements (per cent change)	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	
				Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>7</sup>
<b>GDP</b>	-7.6 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.7 (-1.4 to -0.2)	-2.2

No migration or regulation effects. Central estimates and ranges in brackets.<sup>8</sup>

The analysis then considers the impact of these scenarios on different sectors of the economy, on the nations of Scotland, Wales and Northern Ireland, and on the English regions. **The analysis shows that the modelled White Paper scenario, and the sensitivity modelled as the difference between NTBs in the modelled White Paper and the modelled average FTA scenarios, would support higher economic output for all sectors, nations and regions than the no deal scenario.**

Free movement of people will end as the UK leaves the EU. Future migration arrangements will be determined in the UK's national interest, and will be set out in a White Paper, in line with the Government's overall policy to reduce net migration to sustainable levels. Changes to migration will have an impact on the economy. Migration is affected by both government policy and the relative strength of the economy and demographic factors. Ahead of final decisions on the UK's long-term migration arrangements, an illustrative range of potential changes to net EEA worker flows is analysed alongside changes to the economy from trade.<sup>9</sup> The analysis estimates that the illustrative scenario of zero net inflows of EEA workers could reduce GDP by around 1.8 per cent and GDP per capita by around 0.6 per cent in the long run, compared to today's arrangements. The analysis does not assume any changes to non-EEA migration. In the no change to migration arrangements scenario, any migration effects reflect only the impacts on migration of a smaller economy.

The analysis then combines the estimated impact of changes in trade policy, modelled illustrative migration arrangements, and the impact from potential regulatory flexibility in the long run from leaving the EU to describe an overall impact on the economy. The analysis also considers potential fiscal implications of these scenarios.

<sup>7</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

<sup>8</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

<sup>9</sup> The Government's migration analysis first establishes future flows of EEA workers independent of any policy changes.

**Table E.3: Summary of total GDP impacts (considering trade, migration, regulatory flexibility effects) compared to the modelled no deal scenario.**

Compared to the modelled no deal (percentage point difference)	Modelled White Paper		Modelled average FTA
	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>10</sup>	
<b>GDP*</b>	+6.9	+5.4	+2.7

Central estimates only.

Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.

The numbers are the same as in Table E.1 because the addition of migration and regulatory flexibility effects difference out. These effects are added into both modelled no deal and the scenarios presented in the table.

\* These results are for differences in GDP for zero net inflows of EEA workers. Results for GDP per capita, and for no change to migration arrangements are set out in section 4. They are not included in this table as they are broadly similar to the figures shown.

**Table E.4: Summary of total GDP impacts (considering trade, migration, regulatory flexibility effects) compared to today's arrangements, for the illustrative no change to migration arrangements and zero net inflows of EEA workers scenarios.**

Compared to today's arrangements (per cent change)		Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	
					Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>11</sup>
<b>No change to migration arrangements</b>	<b>GDP</b>	-7.7 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.4 to -0.9)	-0.6 (-1.3 to -0.1)	-2.1
	<b>GDP per capita</b>	-7.6 (-8.9 to -6.2)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.6 (-1.3 to -0.1)	-2.1
<b>Zero net inflows of EEA workers</b>	<b>GDP</b>	-9.3 (-10.7 to -8.0)	-6.7 (-8.1 to -5.1)	N/A <sup>12</sup>	-2.5 (-3.1 to -1.9)	-3.9
	<b>GDP per capita</b>	-8.1 (-9.5 to -6.8)	-5.4 (-6.9 to -3.9)	N/A	-1.2 (-1.9 to -0.7)	-2.7

Central estimates and ranges in brackets.<sup>13</sup>

<sup>10</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

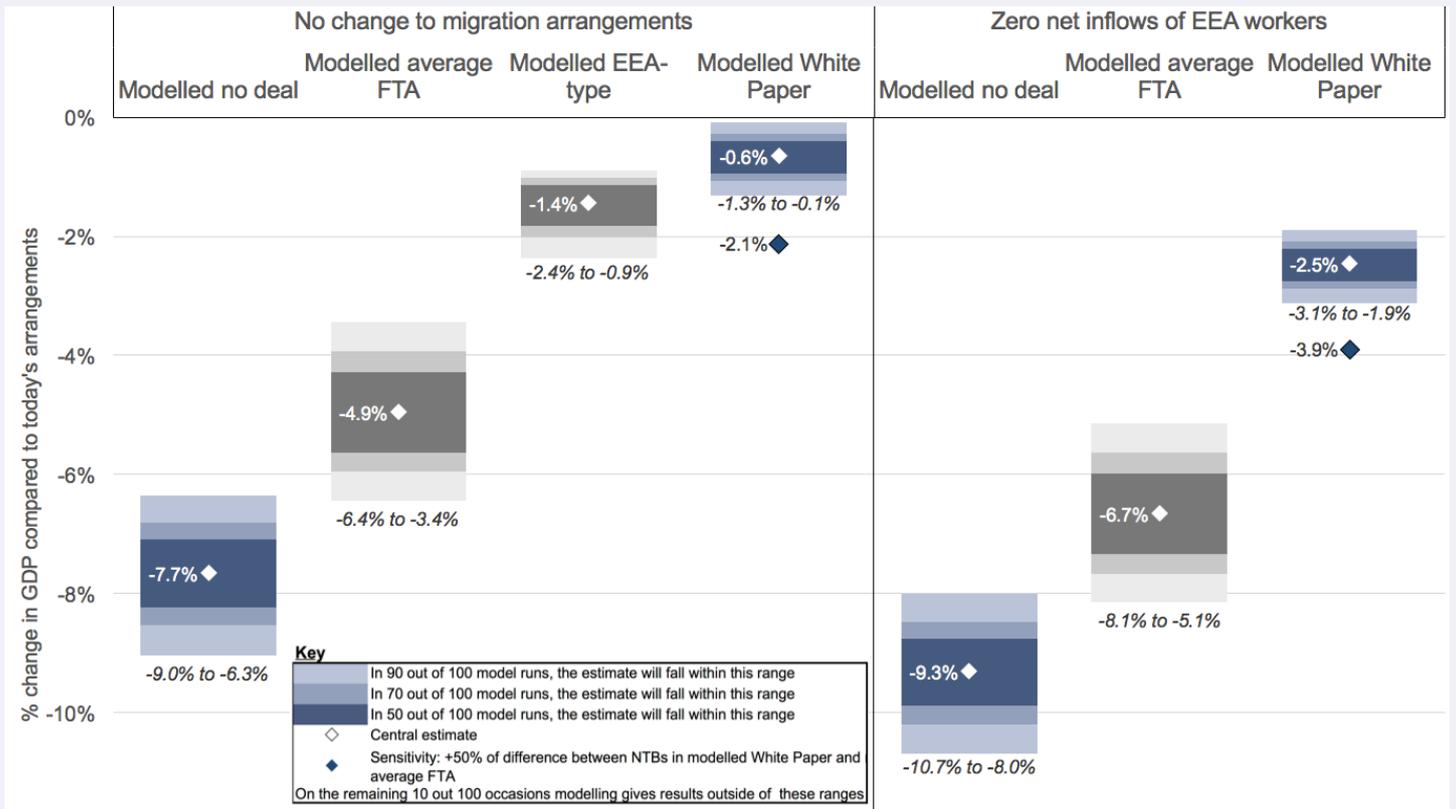
<sup>11</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

<sup>12</sup> Modelled EEA-type scenario is not shown because the illustrative zero net inflows of EEA workers migration scenario does not apply to the modelled EEA-type scenario.

<sup>13</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

These total impacts on GDP and GDP per capita are also shown in Figure E.1 and E.2 below. Figure E.3 demonstrates the different factors that drive the total GDP impacts, including new rest of world trade deals, additional regulatory flexibility, NTBs (at or behind the border) including customs costs, tariffs and changes in migration. Figures E.1, E.2 and E.3 include the impact of the modelled sensitivity from the White Paper scenario to illustrate that, if at-the-border or behind-the-border frictions and costs were higher, the impact on the economy would be greater.

**Figure E.1: Summary of total impacts on GDP compared to today's arrangements for the illustrative no change to migration arrangements and zero net inflows of EEA workers scenarios.**



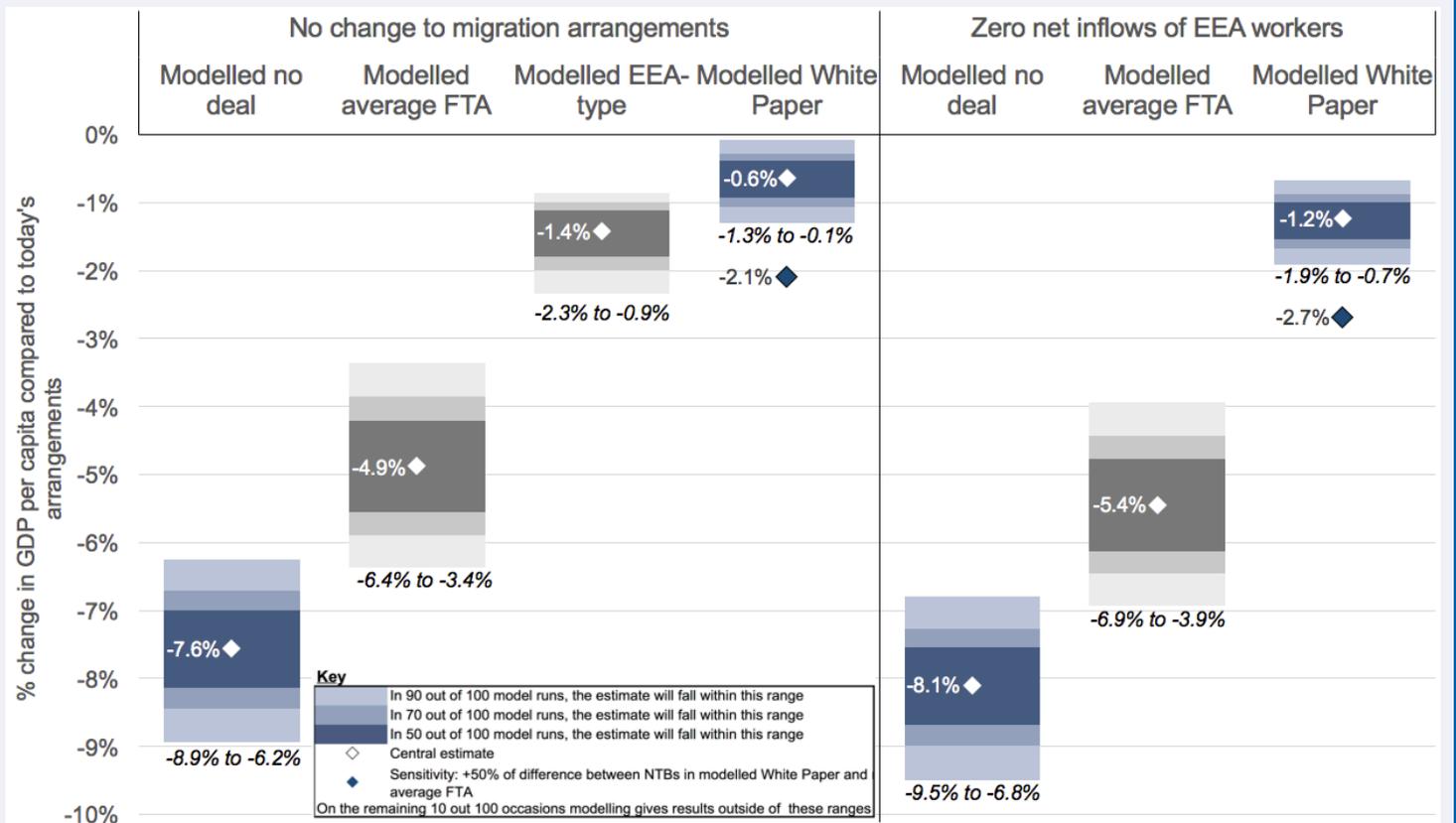
Central estimates and ranges.<sup>14</sup>

Under the illustrative zero net inflows of EEA workers scenario, migration impacts do not apply to a modelled EEA-type scenario. As such, they are not shown on the right hand side of the chart above.

This considers trade, migration and regulatory flexibility effects.

<sup>14</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

Figure E.2: Summary of total impacts on GDP per capita compared to today's arrangements for the illustrative no change to migration arrangements and zero net inflows of EEA workers scenarios.



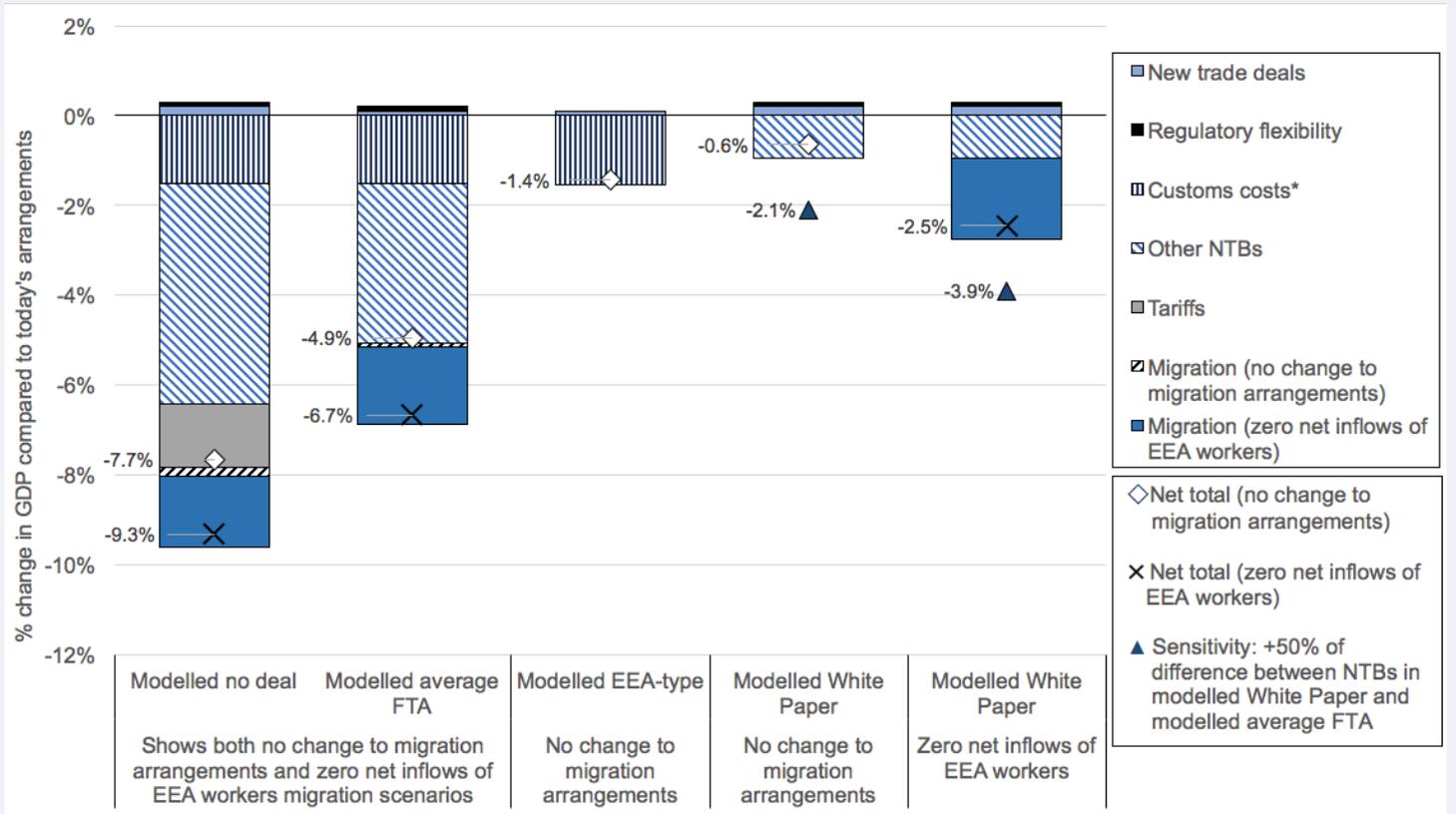
Central estimates and ranges.<sup>15</sup>

Under the illustrative zero net inflows of EEA workers scenario, migration impacts do not apply to a modelled EEA-type scenario. As such, they are not shown on the right hand side of the chart above.

This considers trade, migration and regulatory flexibility effects.

<sup>15</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

**Figure E.3: Decomposition of total impacts on GDP compared to today's arrangements for the illustrative no change to migration arrangements and zero net inflows of EEA workers scenarios.**



Central estimates only. \*NTB estimates for the modelled no deal and modelled average FTA scenarios are derived from econometric modelling, which does not isolate individual NTB components. Customs costs for these scenarios are shown illustratively in line with the modelled EEA-type scenario estimates.

This considers trade, migration and regulatory flexibility effects.

There are a number of external assessments comparable to the modelled no deal, average FTA and EEA-type scenarios. The Government's estimates sit within the range of external estimates, noting that key differences between studies relate primarily to assumptions on changes to trade costs and how economic models simulate the economy's adjustment to these. Few studies have sought to model the stated government policy.

# Section 1 - Introduction

## 1.1 Context

1. The UK's exit from the EU represents a change in its relationships both with the EU and the rest of the world. The UK will be leaving the Customs Union and Single Market, which determine how goods, capital, services and people move between the UK and the EU. The UK will also be implementing an independent global trade policy which allows the UK to sign new Free Trade Agreements (FTAs) with non-EU countries.
2. The Government has undertaken long-term economic analysis of EU exit, with the objective of providing Parliament and the public with an assessment of the possible long-term economic impacts of the UK's future relationship with the EU.
3. The analysis compares potential future policy scenarios against today's arrangements, holding all other factors constant.
4. The UK and the EU have now agreed the Political Declaration which sets the framework for the UK's future relationship with the EU. This will now be followed by negotiations on the legal text. The UK and the EU recognise that this means there could be a spectrum of different outcomes, and both have agreed that we should be as ambitious as possible. The UK has put forward proposals that would enable frictionless trade to be achieved outside the Customs Union and Single Market. This is not something that is accepted by everyone in the EU, but the UK has the ability in the future negotiations to continue to work for its objective of achieving frictionless trade. Given the spectrum of outcomes and ahead of the detailed negotiations on the legal text, an appropriate analytical approach is to present a range of possible impacts of the Political Declaration.
5. The analysis considers the potential long-term impacts from changes to specific trade policies, including analysis of EU trade costs and opportunities from an independent UK trade policy. The long-term can be interpreted as around 15 years after the UK's new relationship with the EU comes into effect.
6. Free movement of people will end as the UK leaves the EU. Future migration arrangements will be determined in the UK's national interest, and will be set out in a White Paper, in line with the Government's overall policy to reduce net migration to sustainable levels. For the purposes of this analysis, decisions on trade and migration are assumed to be largely separate. However, ending free movement of people between the UK and the EU has economic consequences that are important to consider in analysing the impact of EU exit. Two illustrative variants for long-term migration arrangements have been used to estimate the wide range of possible impacts, reflecting the range of policy options. These are represented as no change to migration arrangements and zero net inflows of EEA workers. These scenarios illustrate a very wide range of impacts and are not intended to indicate any future migration arrangements. The analysis does not assume any changes to non-EEA migration. Potential migration impacts are then combined with trade impacts and an illustrative impact of regulatory flexibility to show the overall impact on the UK economy.
7. Changes affecting UK trade and migration will influence the size and shape of the UK economy. The UK is a large, developed economy, ranked the fifth largest in the world in 2017,<sup>16</sup> with

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<sup>16</sup> '[Gross domestic product 2017](#)', GDP ranking, World Bank, September 2018.

around 80 per cent of economic activity coming from services activities.<sup>17</sup> The UK is an open economy and is highly integrated into global supply chains. Trade has become increasingly important, rising from 36 per cent of GDP in 1967, to 62 per cent in 2017.<sup>18</sup> There were 3.5 million EU (excluding Irish) nationals living, working and studying in the UK in 2017.<sup>19</sup>

8. EU exit is just one factor that could influence the UK economy in the long run. Wider global trade and investment trends, such as growth in emerging markets, as well as new technologies, will also have an impact. These factors have not been modelled as part of this analysis, and are discussed in more detail in Section 2.6.
9. Theory and evidence<sup>20</sup> indicate that higher trade<sup>21</sup> increases economic output and prosperity over the long term through multiple channels. For example, trade allows countries to specialise more in their areas of comparative advantage and allows businesses to sell their goods and services to a larger market. To serve a larger market, firms scale up their workforce and production, increasing overall demand in the economy. Trade can increase productivity, a key driver of economic growth, by exposing firms to competition, best practice, new technologies and through investment. This can contribute to higher wages, employment and households' living standards.

## 1.2 Structure of the publication

10. The analytical approach and assumptions underpinning the analysis are explained in **Section 2**. This sets out the methodology the Government has taken, summarising the overall analytical framework, the scenarios modelled, key assumptions and the variety of tools and evidence that have been used. It also provides further explanation and context around domestic policy, wider global trends and opportunities outside of EU exit that have not been explicitly modelled.
11. **Section 3** details the potential changes in trade arrangements with the EU for different sectors of the UK economy under the modelled scenarios. The section includes assessments of possible changes to trade costs for five sector groups: manufactured goods, agri-food<sup>22</sup>, services, financial services and networks. These sectors have been defined for this publication in order to present the sectoral assessments and the analytical results in a consistent, accessible way. This section presents estimates of tariff and non-tariff barriers (NTBs) for each sector group.

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<sup>17</sup> ['GDP output approach - low-level aggregates'](#), ONS, September 2018.

<sup>18</sup> ['UK national accounts, The Blue Book 2018'](#), Aggregate of imports and exports, ONS, July 2018.

<sup>19</sup> ['Population of the UK by country of birth and nationality'](#), Tables 2.1 and 2.3, ONS, May 2018.

<sup>20</sup> Frankel, J and D. Romer, ['Does trade cause growth?'](#) The American Economic Review, June 1999.

<sup>21</sup> Specifically higher levels of trade intensity - increases in exports and outputs relative to the size of the economy.

<sup>22</sup> Agri-food includes agriculture, forestry and fisheries as well as beverages, tobacco and food.

12. The sectoral assessments set out an analysis of potential changes that different industries may face. These estimates can also be brought together as an input into the Government's long run trade and macroeconomic modelling. **Section 4** sets out the results of this analysis for the modelled trade scenarios. This estimates how economic output may change in the long run in response to the estimated changes in trade costs, through trade flows, sectoral economic activity, and real wages. The analysis also considers potential regional impacts. The potential effects of illustrative migration scenarios are set out separately from the trade effects. These are then combined with the trade analysis and the illustrative impacts of greater flexibility over UK regulations, to estimate the total impacts of EU exit. Finally, this section sets out the potential fiscal implications of these scenarios. This section also presents additional sensitivity analysis and provides guidance on interpreting the results.
13. **Section 5** presents the Government's assumptions, methodology and results in the context of a range of external studies. This demonstrates that the Government's analysis of the modelled precedent scenarios falls within the range of other comparable studies. Few studies have sought to model the stated government policy.

## Section 2 - Analytical approach

***The analysis makes use of the latest evidence, insight and analytical tools. The analysis considers four trade scenarios: the modelled White Paper scenario, a modelled no deal scenario (trading on EU Most Favoured Nation (MFN) terms), a modelled average FTA scenario and a modelled EEA-type scenario. Given the spectrum of outcomes, and ahead of the detailed negotiations on the legal text, the appropriate analytical approach to modelling the impact of the Political Declaration is to present a range of possible outcomes. To do this, the analysis applies a sensitivity to illustrate the potential impact of higher non-tariff barriers (NTBs), including checks at or behind the border and other regulatory costs. Opportunities for ambitious new trade deals with new partners in the rest of the world are also assessed. The Government then uses a macroeconomic model to assess the potential long-term impact on trade flows and the UK economy. Potential impacts of migration arrangements and flexibility over UK regulations are also considered in addition to trade impacts. Other sensitivity analysis illustrates the potential impact of changes to both policy and analytical assumptions.***

***In practice a number of wider external drivers of economic performance not related to EU exit will affect UK economic performance in the long run, including policy choices of the UK Government and devolved administrations. This analysis does not seek to assess these factors and, as such, should not be interpreted as an economic forecast. Similarly, the analysis does not seek to model short-term impacts. The Government's macroeconomic model is a standard tool for modelling trade arrangements, but results must be interpreted with caution given the inherent uncertainties around trade cost estimates and how the economy may adjust to these.***

### 2.1 Trade analysis overview

14. Trade analysis is used worldwide by national governments, international institutions and academics to inform trade policy and negotiations. Economic modelling provides a rigorous, consistent and quantitative means by which to assess options, complementing wider qualitative and quantitative analysis of trade policy choices.
15. Trade analysis can be used to assess prospective trade deals or provide a backward-looking assessment of the impact of previous trade policies.
16. The most common approach to evaluating trade deals uses real world trade data to estimate differences and changes in average trade barriers between different trading partners. This takes into account a range of other factors which affect trade.<sup>23</sup> For example, countries sharing a common border, language or history tend to trade more with one another. Countries with large economies and populations also tend to trade more with all partners.
17. There are two broad approaches to forward looking trade analysis: sectoral, focusing on a particular segment or sector of the economy; or macroeconomic, taking a broader look at the whole economy, recognising linkages and interdependencies between sectors.<sup>24</sup>
18. For this analysis, the Government has brought together both of these approaches and a variety of evidence. Trade costs are estimated within each of five sector groups for each modelled

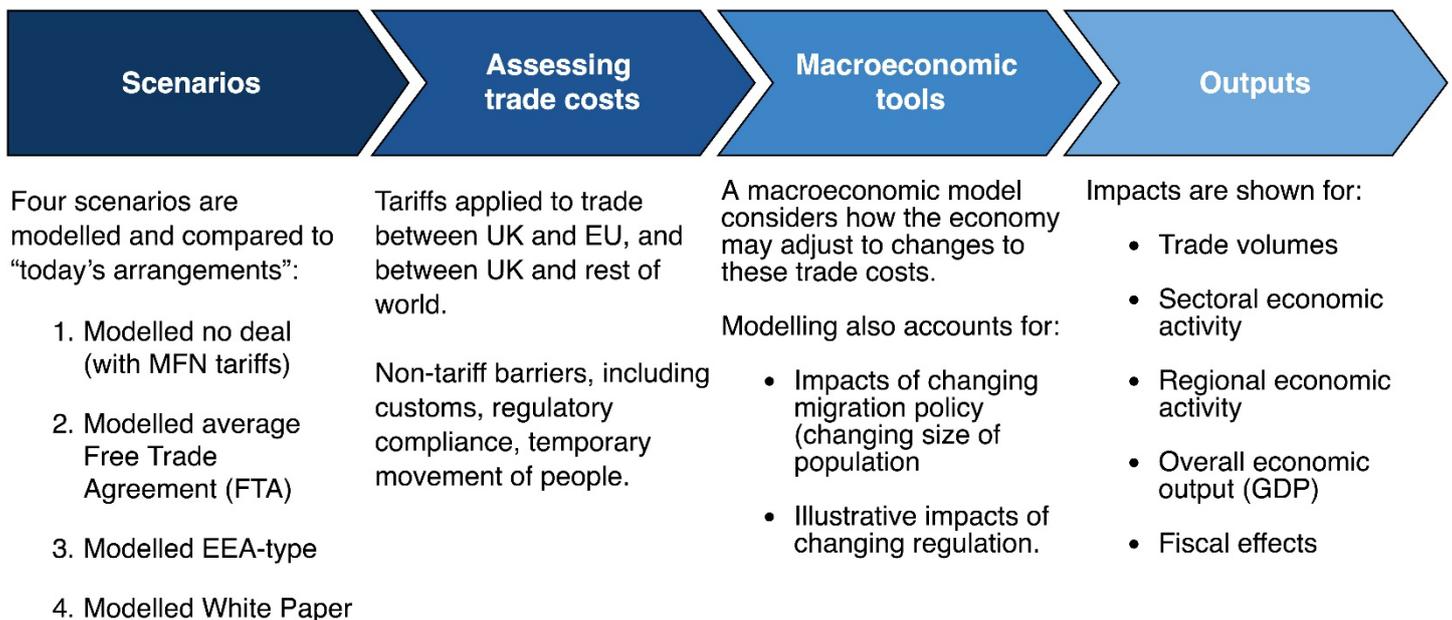
<sup>23</sup> ['The Gravity Equation in International Trade: An Explanation'](#), NBER Working Paper, August 2013.

<sup>24</sup> ['Demystifying Modelling Methods for Trade Policy'](#), WTO Discussion Paper, 2005.

scenario. These trade costs and assumptions then feed into a macroeconomic model to estimate the potential whole economy impacts in the long run, holding other factors constant. As is common to trade modelling, this analysis does not consider wider external drivers of economic performance and, as such, should not be interpreted as an economic forecast.

19. Migration effects are assessed separately. The Government's migration analysis first establishes the potential future flows of EEA workers independent of any policy changes. The analysis shows two illustrative variants for long-term migration arrangements.<sup>25</sup> This is represented as a range between no change to migration arrangements and zero net inflows of EEA workers. These scenarios illustrate a very wide range of impacts and are not intended to indicate any future migration arrangements. The analysis does not assume any changes to non-EEA migration. The migration effects are combined with the impact of the change in trade policy and the economic impact of some flexibility over UK regulations to estimate the overall economic impact on the whole economy.
20. The following sections describe the main scenarios included, as well as the overarching methodology, assumptions and analytical tools used. Further details on the Government's analytical approach can be found in the accompanying EU Exit Long-Term Analysis: Technical Reference Paper.

**Figure 2.1: Simplified illustration of the Government's analytical approach.**



## 2.2 Scenarios

21. The UK and the EU have now agreed the Political Declaration which sets the framework for the UK's future relationship with the EU. This will be followed by negotiations on the legal text that will set out in detail the UK's future trading arrangements. The UK and the EU recognise that this means there could be a spectrum of different outcomes, and both have agreed that we should be as ambitious as possible. Given the spectrum of outcomes and ahead of the detailed negotiations on the legal text, the analytical approach presents a range of possible outcomes of the Political Declaration.

<sup>25</sup> Long-term migration is defined as workers intending to stay more than one year in duration.

22. The Government's policy was set out in the July 2018 White Paper, "The future relationship between the United Kingdom and the European Union".<sup>26</sup>
23. In line with external studies and analysis previously undertaken by the Government, the work considers four analytical scenarios:
- The policy position set out in the July 2018 White Paper, "The future relationship between the United Kingdom and the European Union" ("**modelled White Paper**");
  - A hypothetical FTA, with zero tariffs, reflecting average NTB costs such as standard customs arrangements with the EU, regulatory and other costs ("**modelled average FTA**");
  - An EEA-type scenario, which reflects the UK being outside of the Customs Union, reflecting the average NTB costs, such as of standard customs arrangements with the EU. Zero tariffs are applied ("**modelled EEA-type**");<sup>27</sup> and
  - A no deal scenario, based on an assessment of average NTB costs between countries trading on non-preferential World Trade Organization (WTO) terms and applying EU Most Favoured Nation (MFN) tariffs ("**modelled no deal**").
24. The modelled average FTA, EEA-type and no deal scenarios do not deliver on the Government's objectives, and have been included for analytical purposes only. The EEA would mean staying in the Single Market, implementing new EU legislation automatically and in its entirety, and continued free movement. An average FTA, EEA-type scenario or trading with the EU on WTO terms would not meet the Government's commitment to ensure no hard border between Northern Ireland and Ireland.

### 2.2.1 Explanation of scenarios

25. The analysis of options uses a consistent baseline of an approximation of today's economic arrangements with the EU and the rest of the world.<sup>28</sup> This 'status quo' ("**today's arrangements**") comparison is consistent with most external studies and enables a meaningful assessment of the economic impacts of different scenarios to be made relative to a common baseline, as well as to each other. This analytical 'baseline' provides a snapshot of current market access and regulatory arrangements with the EU. It does not consider how UK or EU policy will change in the future including, for example, how EU regulation may evolve.
26. Consistent with previous Government analysis and external studies, the analysis has considered a variety of trading relationships ("scenarios") as an illustration of the sensitivity of results to different policy assumptions.<sup>29</sup>
27. A **modelled no deal** scenario is considered as an approximation of the UK's relationship with the EU in absence of an agreement. In these conditions, it is assumed that the UK and EU would trade on non-preferential WTO terms with tariffs set at EU applied Most Favoured Nation (MFN) rates.<sup>30</sup> The Government has analysed how countries trade on non-preferential WTO terms (both with each other, and the EU), and then has used global trade data on these trading relationships to estimate potential UK-EU trade costs.

<sup>26</sup> 'The future relationship between the United Kingdom and the European Union', HM Government, July 2018.

<sup>27</sup> From the perspective of this modelling approach, the baseline of the UK's current trading arrangements is equivalent to membership of both the EEA and the Customs Union.

<sup>28</sup> While not a specific projection of future membership of the EU, this baseline can be interpreted as the status quo comparison as committed to Parliament on 19 November 2018.

<sup>29</sup> The four scenarios, and the policy assumptions underpinning them, were approved by ministers.

<sup>30</sup> This is a modelling assumption only. The Government would be free to set its own tariff schedule post-EU exit.

28. This is not representative of possible government policy, as it would not meet UK objectives including avoiding a hard border between Northern Ireland and Ireland. Care should be taken in the interpretation of results, as the modelled no deal scenario does not perfectly reflect how the UK and EU might trade on WTO terms. The results could over- or under-state the impact of a no deal scenario in some areas. For example, the UK and EU start from a position of regulatory alignment, meaning that differences in regulation could be smaller than in typical trading relationships on WTO terms.<sup>31</sup> Conversely, many countries trading on WTO terms also have a range of side agreements for different products or sectors, which may be captured in the analysis and may therefore overstate the benefits of trading on WTO terms should the UK not achieve these. Modelling of the no deal scenario also focuses only on trading relationships, and as such, does not reflect any impacts of changes to wider aspects of the UK-EU relationship, for example cooperation on science and innovation.
29. A **modelled average Free Trade Agreement (FTA)**<sup>32</sup> scenario represents a hypothetical FTA, with zero tariffs, based on estimates of average NTBs between relevant FTA partners. These are used as a proxy for how the UK could trade with the EU under this type of arrangement. As such, it does not seek to define or model a bespoke agreement. This scenario is not indicative of government policy, as it would not meet UK objectives including avoiding a hard border between Northern Ireland and Ireland.
30. A **modelled EEA-type agreement** scenario represents membership of the Single Market, reflecting that non-EU EEA states are not part of the Customs Union<sup>33</sup> and there is free movement of people. For modelling purposes, in this scenario the UK is modelled as striking a deal with the EU with zero tariffs. This includes zero tariffs on agri-food products. This assumption differs from current EEA arrangements, where agri-food is excluded. Therefore, additional sensitivity analysis considers the impact of applying EU applied MFN tariffs to agri-food sectors. This scenario is not consistent with government policy as it would mean staying in the Single Market, implementing new EU legislation automatically and in its entirety, and would also mean continued free movement. It would also not meet the Government's commitment to ensure no hard border between Northern Ireland and Ireland. The analysis does not seek to project any changes to future EU regulation and how this might impact the UK.
31. A **modelled White Paper** scenario uses trade cost estimates based on policy assumptions set out in the Government's July 2018 White Paper, "The future relationship between the United Kingdom and the European Union".<sup>34</sup> Trade costs are estimated based on assumptions set out in the White Paper. Details of the relevant economic factors within this policy for each sector group of the economy are set out in section 3, with further information provided in section 2 of the Technical Reference Paper.
32. Sensitivity analysis illustrates the potential impact of different levels of trade costs, including checks at or behind the border and other regulatory costs. Ahead of detailed negotiations on the legal text, the analytical approach presents a range of possible outcomes of the Political Declaration. The analysis applies a sensitivity to illustrate the potential impact of higher NTBs, including checks at or behind the border and other regulatory costs. This illustrative sensitivity

<sup>31</sup> An adjustment is made for this in the analysis. Further details are set out in section 2.3.3 of the Technical Reference Paper.

<sup>32</sup> This scenario assumes a zero tariff agreement and uses estimates of average NTBs. This does not represent government policy and is for modelling simplicity. Historically, agri-food tariffs have been difficult to eliminate in FTAs, so an additional sensitivity with EU-applied MFN tariffs is considered (see section 4.9).

<sup>33</sup> Costs are assumed to arise from a customs border and the administrative requirements to trade under zero tariffs with the EU (rules of origin).

<sup>34</sup> ['The future relationship between the United Kingdom and the European Union'](#), HM Government, July 2018.

point reflects the midpoint in the difference of NTBs to trade between the modelled White Paper at one end, and the modelled average FTA scenario at the other and does not represent an expected outcome. For more details, see section 2.3.2.

## 2.3 Assessing changes and associated costs of new economic relationships

### 2.3.1 UK-EU tariff and non-tariff barriers methodology

33. All economic models are a simplified representation of reality, and therefore rely on inputs and assumptions to generate results. The inputs and methodological assumptions for this analysis are set out below. Further details and examples of potential trade barriers and associated costs to EU trade for key sectors are set out in section 3.
34. The Government has used a wide range of evidence and approaches to consider how trade costs differ in each scenario. These costs will be affected by changes in trade barriers resulting from new arrangements with the EU and new trade agreements with third countries (see section 2.3.4). Two principal trade barriers are estimated: tariffs and non-tariff barriers.
35. **Tariffs** are a tax or duty to be paid on a particular product that is imported or exported. These add directly to the costs of trade, increasing the price of traded goods. This analysis estimates the tariffs in each scenario. For EU member states, this analysis considers current “default” EU tariffs, and the agreed approach to tariffs set out in the Political Declaration.
36. **Non-tariff barriers (NTBs)** are administrative, technical and regulatory obstacles to trade. Some NTBs, such as customs procedures, can be incurred at the border, while others can be incurred “behind the border”, such as costs associated with the recognition of professional qualifications. NTBs are particularly important in influencing businesses' ability and willingness to trade, and are therefore crucial for understanding the potential impacts of changes in the UK's trading relationships.
37. The analysis considers the following full range of potential drivers of NTBs that could arise in different scenarios, and where the presence and scale of these barriers and costs differs across scenarios:<sup>35</sup>
  - i. **Customs and Rules of Origin (RoO) requirements** including assessment of the application of tariff rates, customs administrative costs such as documentary requirements, and associated delays at the border. RoO are the rules that traders must satisfy to qualify for tariff preferences under the EU's FTAs with third countries (i.e. regional content requirements). The associated administrative burden and supply chain impacts may impose extra costs on firms trading with the EU. In the event of no deal, UK firms exporting to the EU would not have to provide this proof as there would be no FTA with the EU and UK firms would therefore not be able to benefit from these tariff preferences.
  - ii. **Regulatory burdens and barriers to market entry** including the loss of mutual recognition of testing authorities, which might require goods to be re-approved before sale, divergent regulations meaning that there are different requirements for goods in different markets and the loss of mutual recognition of qualifications, which might require lengthier recognition processes or requalification before certain service providers can provide their services. Other barriers to market entry include restrictions on the provision of other services,

<sup>35</sup> Further detail is set out in Table 3A of the Technical Reference Paper.

national requirements, and the loss of “passporting” in financial services.<sup>36</sup> These could increase costs for service providers, or lead to additional barriers to trade.

- iii. **Movement of people including temporary mobility for business purposes.** Temporary mobility covers business travel to another country, including to provide a service in that country. In the absence of such arrangements, these barriers could affect businesses who provide services alongside goods exports, and all service exporters.
  - iv. **Other**, including trade costs affecting multiple sectors. Examples include data protection regulations, government procurement, cross-border VAT and intellectual property rights.
38. The Government's approach to estimating NTB costs is rooted in an analysis of global trade and validated against a variety of external evidence. Using robust methods common to international trade modelling and academic studies, real world data from existing trading relationships are used to estimate changes to trade costs in different sectors for different modelled scenarios.

#### **Estimating non-tariff barrier (NTB) costs**

The analysis has used a range of evidence and approaches to consider how UK-EU trade costs differ in each of the modelled scenarios including: econometric modelling, external literature, stakeholder evidence, Government policy experts' inputs and direct cost evidence (see Figure 2.2 and Technical Reference Paper, Section 3).

The analysis is anchored in econometric modelling to estimate NTBs for the **modelled no deal** and **modelled average FTA scenarios**, where there is appropriate trade data available. This is based on real world data from existing trading relationships and an approach that is well-rooted in international trade analysis. The advantage of this approach is that it captures all the NTBs that have an impact on trade. The unprecedented nature of the **modelled White Paper scenario** means it is not possible to model it directly using the econometric approach described. The analysis uses the modelled no deal estimates as an 'anchor' and complements this with a variety of evidence on trade costs in each sector to assess the potential changes in those costs in the modelled White Paper scenario. For the **modelled EEA-type scenario**, NTB costs predominantly arise from customs and rules of origin, reflecting the fact that EEA states are not part of the Customs Union. The Government's analysis estimates customs costs directly using UK-specific evidence from HMRC (see Technical Reference Paper, Box 2.A), to which cost estimates from the external literature are added (notably for rules of origin).

<sup>36</sup> '[Passporting](#)', Bank of England, accessed 13 November 2018. Passporting: “A firm authorised in an EEA state can carry on activities that it has permission for in its home state and any other EEA state by either establishing a branch or agents in an EEA state or providing cross-border services. This is known as 'passporting'.”

Figure 2.2: Simplified illustration of the Government's approach to assessing trade costs.



### 2.3.2 UK-EU trade: assumptions

#### Tariffs

39. The analysis produces a set of estimates for potential changes to UK-EU import tariff costs for each sector group in each scenario, expressed as a percentage of the value of UK-EU trade. It assumes that, compared to today's arrangements:
- a. Under the **modelled no deal scenario**, the UK and EU are assumed to apply the current EU-applied Most Favoured Nation (MFN) tariff schedule. These are the tariffs that EU countries charge other members of the WTO in the absence of preferential arrangements, and can differ significantly across both sectors and products.<sup>37</sup> For example, on average, additional tariffs for manufactured goods are equivalent to 3 per cent of the value of trade, and for agri-food 20 per cent of the value of trade.<sup>38</sup> A sensitivity analysis assuming UK tariffs are set to zero is also included.<sup>39</sup>
  - b. Under the **modelled average FTA scenario**, the UK is assumed to strike a deal with the EU with zero tariffs. Additional sensitivity analysis considers the impact of applying EU MFN tariffs to agri-food sectors, accounting for the fact that historically, agri-food tariffs have been difficult to eliminate as part of FTAs.
  - c. Under the **modelled EEA-type scenario**, the UK is assumed to strike a deal with the EU with zero tariffs. For modelling purposes this includes zero tariffs on agri-food products.

<sup>37</sup> Within certain sectors, the EU allows improved market access to WTO members at below EU-applied MFN tariff rates for set quantities through the use of tariff-rate quotas (TRQs). However, these have not been considered for the purposes of this modelling.

<sup>38</sup> EU applied MFN tariffs are trade-weighted using 2014-16 UK-EU trade data from TradeMap at the HS-8 level to the base GTAP 57 sectors. Tariffs for all GTAP 57 goods sectors are subsequently weighted to the modelling sectors using 2011 GTAP data. '[UK-EU trade 2014-16](#)', Trade Map, accessed on 20 November 2018; '[EU applied MFN tariffs](#)' Macmap, accessed on 20 November 2018; '[GTAP 57 2011](#)', GTAP, accessed on 20 November 2018.

<sup>39</sup> Sensitivity analysis included in section 4.9.

Agri-food is excluded from current EEA arrangements, so additional sensitivity analysis considers the impact of assigning EU applied MFN tariffs to agri-food sectors.

- d. Under the **modelled White Paper scenario**, the UK is assumed to maintain tariff-free trade with the EU, resulting in no new tariff costs.
40. The Government would be free to decide UK MFN tariff policy under all modelled scenarios. The assumptions set out above have been made for the purposes of this analysis and, as such, do not make assumptions about future government policy. Additional sensitivity analysis considers the impact of a range of potential policy measures.<sup>40</sup>

### Non-tariff barriers

41. The analysis estimates that NTBs differ between the modelled scenarios. Section 3 considers these differences in more detail for each of the five sector groups.
42. The analysis produces a set of estimates for potential changes to UK-EU NTB trade costs for each sector in each scenario, expressed as a percentage of the value of UK-EU trade. Based on the NTB assumptions set out in section 3, it finds that, on average, compared to today's arrangements:
- Under the **modelled no deal scenario**, additional NTBs are estimated to be equivalent to, for goods 6 to 15 per cent of the value of trade, and for services 4 to 18 per cent of the value of trade.
  - Under the **modelled average FTA scenario**, additional NTBs are estimated to be equivalent to, for goods 5 to 11 per cent of the value of trade, and for services 3 to 14 per cent of the value of trade.
  - Under the **modelled EEA-type scenario**, additional NTBs are estimated to be equivalent to, for goods 3 to 7 per cent of the value of trade, and for services 1 to 3 per cent of the value of trade.
  - Under the **modelled White Paper scenario**, additional NTBs are estimated to be equivalent to, for goods, 0 to 1 per cent of the value of trade, and for services 2 to 10 per cent of the value of trade.
43. Ahead of detailed negotiations on the legal text, the most appropriate analytical approach is to present a range of possible impacts of the Political Declaration. A sensitivity point is assessed, reflecting different trade barriers that could exist between the modelled White Paper and modelled average FTA scenarios. Specifically, this sensitivity point reflects the midpoint of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios. This sensitivity point has been chosen for analytical purposes and as such does not represent an expected outcome.
44. The analysis assumes that NTBs are the same in the UK and the EU. This is a simplification for modelling purposes, and does not prejudge future government policy. In reality, UK and EU exporters may face differing costs depending on future regulation in each market. Similarly, the modelling assumes that NTBs are the same across EU member states. In reality, differences between member states (regulatory or otherwise) mean there is likely to be some variation in NTBs encountered by businesses exporting to EU markets.

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<sup>40</sup> Sensitivity analysis included in section 4.9.

45. An adjustment is made to the NTBs to reflect the potential difference between joining and exiting a trade agreement, reflecting the UK's unique starting point. Further details are set out in section 2.3.3 of the Technical Reference Paper.

### 2.3.3 UK-Rest of World trade: methodology

46. As with UK-EU trade costs, the Government's approach to estimating UK-Rest of World (RoW) trade costs is rooted in an analysis of global trade. Real world data from existing trading relationships are used to estimate the average trade costs faced by importers and exporters in different sectors in each country, including how these costs could be reduced following the agreement of new FTAs.

### 2.3.4 UK-Rest of World trade: assumptions

47. The analysis considers an ambitious, illustrative scenario for future trade deals with new partners, recognising that there are a range of potential outcomes in the UK's pursuit of a global trade policy.
48. The analysis assumes that all EU trade agreements with third countries are transitioned in their current states to UK-specific arrangements, including those EU agreements that are provisionally applied or agreed but not yet ratified.<sup>41</sup> Therefore, the modelling does not capture any potential short run changes in the UK's trading relationships with these countries as a result of the UK leaving the EU.
49. In keeping with the Government's ambitious free trade agenda, the analysis also assumes that, in the long run, the UK secures new trade agreements with international partners. These agreements are assumed to cover a broad range of potential trading partners, including the United States, Australia, New Zealand, and other members of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership.<sup>42</sup> Assumptions for the illustrative range of new partnerships are set out in terms of changes to tariffs and non-tariff barriers. The Department for International Trade will provide country-specific assessments as appropriate in the negotiation of individual future FTAs. For modelling purposes, the analysis makes no assumptions about any additional agreements that the EU may strike with third countries.
50. The analysis assumes that the UK will be free to pursue new independent trade deals with the rest of the world following EU exit. Other factors could support or constrain the UK's trade with the rest of the world, which are not modelled. These include commitments under the modelled White Paper.

## Tariffs

51. The analysis assumes an ambitious scenario in which tariffs between the UK and potential third-country trade agreement partners are eliminated by FTAs following EU exit, under all modelled scenarios. For new trade partners, all tariffs are set to zero, while EU applied MFN tariffs are

<sup>41</sup> Only those EU agreements that existed up to 2011 are included in the base data for modelling. This includes EU trade agreements with Canada, Japan and Vietnam. See Technical Reference Paper for more details.

<sup>42</sup> For the purposes of EU exit modelling, the UK is assumed to pursue successful trade negotiations with the United States, Australia, New Zealand, Malaysia, Brunei, China, India, Mercosur (Brazil, Argentina, Paraguay and Uruguay) and the Gulf-Cooperation Council (UAE, Saudi Arabia, Oman, Qatar, Kuwait and Bahrain). For more details please see section 3.1 of the Technical Reference Paper.

applied to all other countries. This is an assumption made for modelling purposes only, and does not prejudge future government policy.<sup>43</sup>

52. The analysis estimates potential changes to UK-RoW import tariff costs for each sector group, expressed as a percentage of the value of UK-RoW trade with FTA partners. It assumes that, compared to today's arrangements, under **all modelled scenarios**, trade costs from import tariffs are zero for all FTA partners.

### Non-tariff barriers

53. The analysis assumes an illustrative reduction in NTBs with the rest of the world from future trade agreements. This is in line with analysis of current FTAs between advanced economies. Sensitivity analysis also considers the potential impact of further reductions in NTBs with these partners.
54. The analysis produces a set of estimates for potential changes to UK-RoW NTB costs for each sector group, expressed as a percentage of the value of UK-RoW trade. It assumes that, compared to today's arrangements, under **all modelled scenarios**, there is a reduction in NTBs equivalent to, for goods, 2 to 4 per cent of the value of trade and, for services, 3 to 5 per cent of the value of trade, on average.<sup>44</sup>
55. The analysis assumes the same level of NTB reduction across all scenarios. Further detail on the analytical approach and estimates is presented in the Technical Reference Paper.

### 2.3.5 Regulatory flexibility

56. The analysis uses an illustrative figure for the potential long-term GDP impacts of greater regulatory flexibility in policy areas no longer subject to EU law.
57. There is significant uncertainty around the potential impacts of regulatory flexibility. External studies make a wide range of estimates, ranging from a negative or zero net impact, to a benefit of 1.3 per cent of GDP. A number of these consider impacts of potential regulatory changes that would not be consistent with existing Government commitments.
58. Oxford Economics estimates a 0 to 0.13 per cent impact on long-term GDP from regulatory changes across labour, capital and product markets across two scenarios.<sup>45</sup>
59. The OECD note that “deregulation could benefit businesses, but the scope seems limited”.<sup>46</sup> In 2013, the UK was second in the rankings of the OECD Product Market Regulation indicator<sup>47</sup> and holds the ninth position in the World Bank's Doing Business ranking.<sup>48</sup>

<sup>43</sup> Additional sensitivity analysis considers the impact of agri-food tariffs between the UK and potential trade agreement partners remaining at their current levels. This is to account for the fact that historically, agri-food tariffs have been difficult to eliminate as part of free trade agreements. The results are presented in section 4.9.

<sup>44</sup> Ranges generated by the direction of bilateral trade to RoW trade partners.

<sup>45</sup> '[Assessing the Economic Implications of Brexit](#)', Oxford Economics, March 2016. The upper end of this range is from their “Liberal Customs” scenario, where, on regulation, they assume “revealed preference” for regulation whereby, if the UK is currently the least regulated member in the EU and there is another country in the dataset with a lower degree of regulation, they assume that following Brexit, the UK moves halfway towards the “best practice” level amongst OECD economies. The lower end of this range is from their “Populist MFN scenario” where they assume “do nothing” for regulation. Their analysis considers four potential scenarios for regulation post exit.

<sup>46</sup> '[The economic consequences of Brexit: a taxing decision](#)', OECD, April 2016.

<sup>47</sup> '[Economy-wide regulation](#)', OECD Product Market Regulation Statistics (database), OECD, accessed 26 November 2018.

<sup>48</sup> '[Doing Business 2019](#)', World Bank Group, October 2018.

60. Open Europe suggest gains of 0.7 per cent to 1.3 per cent of GDP.<sup>49</sup> The lower end of these gains assumes the repeal or scaling back of a range of EU-derived regulations including across social, employment, environment and renewables targets. Such changes would therefore not be consistent with UK Government policy to maintain or enhance standards and to continue to meet existing international commitments. The higher end of the range relies additionally on removing further regulatory requirements, including on climate change, energy performance of buildings, restrictions on GM crops, data protection, product standards, and health and safety.
61. The Centre for European Reform finds that changes to regulation would not result in “large gains in economic output”. They note that there may be “some gains from more relaxed standards in particular sectors, especially in technologies that may drive up productivity”.<sup>50</sup> The London School of Economics Centre for Economic Performance suggests that weakening “social, employment and environmental regulation to some degree”, even if it were politically possible, would “make little economic difference”.<sup>51</sup> Business bodies such as the EEF,<sup>52</sup> IoD<sup>53</sup> and CBI<sup>54</sup> have publicly expressed a preference to minimise regulatory change in most sectors to ensure stability for businesses and facilitate access to EU markets.
62. Recognising this range of estimates, the analysis focuses on the studies which assume relative regulatory efficiency rather than any fundamental changes in standards. An illustrative 0.1 per cent benefit to GDP in the long run is applied in all modelled scenarios except for the modelled EEA-type scenario.
63. It is important to note that in making this assumption:
- GDP impacts do not fully capture non-market impacts of regulation such as environmental protection or equality;
  - For modelling purposes, the cost of adopting new EU regulations is assumed to be zero. The analysis makes no assumptions as to how EU regulations could change in the future. As such, it does not capture any potential impact of alignment with EU rules in the future;
  - The UK-EU NTB estimates under the modelled no deal and modelled average FTA scenarios implicitly assume a degree of long-term regulatory divergence, as these are calculated using trade data between countries that do not have closely aligned regulation.

### 2.3.6 Summary of assumptions

64. Across all of the above areas, the key assumptions used in this analysis are set out in Table 2.1 below.

<sup>49</sup> ['What if...? The Consequences, challenges & opportunities facing Britain outside EU'](#), Open Europe, March 2015.

<sup>50</sup> ['Brexit and EU regulation: A bonfire of the vanities?'](#), Centre for European Reform, February 2016.

<sup>51</sup> ['The consequences of Brexit for UK trade and living standards'](#). LSE Centre for Economic Performance, March 2016. Also published as, 'The costs and benefits of leaving the EU: trade effects' Swati Dhingra, Hanwei Huang, Gianmarco Ottaviano, Joao Paulo Pessoa, Thomas Sampson, John Van Reenen, Economic Policy, 32(92) 651-705, 2017.

<sup>52</sup> ['UK Regulation Beyond Brexit: Creating the stability, certainty and clarity manufacturing need'](#), EEF, 2018.

<sup>53</sup> ['The business end of Brexit IoD survey on planning & trade'](#), Institute of Directors, November 2017.

<sup>54</sup> ['Smooth Operations: An A-Z of the EU Rules that Matter for the Economy'](#), Confederation of British Industry, April 2018.

**Table 2.1: Summary of headline analytical assumptions for each scenario compared to today's arrangements.**

Coverage	Impact channel	Modelled no deal scenario	Modelled average FTA scenario	Modelled EEA-type scenario	Modelled White Paper scenario
UK - EU	<b>Tariffs</b> <sup>55</sup> (as per cent of trade value)	UK and EU apply the shared UK-EU MFN tariff schedule. <i>Agri-foods: 20 per cent</i> <i>Manufactured goods: 3 per cent</i>	Zero tariffs	Zero tariffs	No tariffs
	<b>Non-tariff barriers</b> <sup>56</sup> (as per cent of trade value)	Customs administration costs and delays  Significant additional barriers in goods and services.  <i>Goods: 6 to 15</i> <i>Services: 4 to 18</i>	Customs administration and rules of origin costs, and delays  Additional barriers to goods and services trade.  <i>Goods: 5 to 11</i> <i>Services: 3 to 14</i>	Customs administration and rules of origin costs, and delays <sup>57</sup>  No additional barriers to goods and services trade.  <i>Goods: 3 to 7</i> <i>Services: 1 to 3</i>	No customs-related costs  Minimal additional barriers to goods trade. New barriers to service trade.  <i>Goods: 0 to 1</i> <i>Services 2 to 10</i>
UK - Rest of world	<b>Tariffs</b>	Illustrative ambitious elimination of tariffs between the UK and potential trade agreement partners following EU exit. Existing EU FTAs are rolled over to UK specific arrangements  <i>Zero tariffs for FTA partners, MFN tariffs for RoW (see WTO assumptions)</i> <i>Current EU MFN tariffs with other countries.</i>			
	<b>Non-tariff barriers</b> (as per cent of trade value)	No change in NTBs for all current EU trade deals. Illustrative ambitious reductions in NTBs with potential trade agreement partners. <sup>58</sup> <i>Goods: 2 to 4</i> <i>Services: 3 to 5</i>			
UK	<b>Regulation</b>	Some flexibility assumed for the UK to decide regulatory policy  <i>(Illustrative economic impact: 0.1 per cent of GDP).</i>		No regulatory flexibility.	Some flexibility assumed for the UK to decide regulatory policy <i>(0.1 per cent GDP).</i>

These are assumptions made to enable economic modelling, rather than statements of government policy.

For UK-EU NTBs, ranges reflect uncertainty around the central estimates and are calculated using statistical distributions from econometrics. For UK-RoW NTBs, ranges reflect the range of NTBs estimated across UK bilateral trade with RoW trade partners.

<sup>55</sup> EU-applied MFN tariffs are trade-weighted using 2014-16 UK-EU trade from TradeMap at the HS-8 level to the base GTAP 57 sectors. Tariffs for all GTAP 57 goods sectors are subsequently weighted to the modelling sectors using 2011 GTAP data. '[UK-EU trade 2014-16](#)', Trade Map, accessed on 20 November 2018; '[EU applied MFN tariffs](#)' Macmap, accessed on 20 November 2018; '[GTAP 57 2011](#)', GTAP, accessed on 20 November 2018.

<sup>56</sup> Aggregated to 'Goods' and 'Services' level for presentational purposes, see Technical Reference Paper.

<sup>57</sup> Costs are primarily assigned to goods sectors. Where new customs procedures affect cross-border activity in services (e.g. e-commerce), the costs are assigned to the relevant services sector. In the modelled average FTA and EEA-type scenarios firms must meet rules of origin, and the associated costs, to be able to pay zero tariffs. Firms may pay tariffs rather than face these costs.

<sup>58</sup> A sensitivity further significantly reduces NTBs with new trade deal partners (not modelled for the modelled White Paper and modelled EEA-type scenarios).

## 2.4 Macroeconomic tools

65. Changes to trade costs are considered across the economy at a sectoral level. These assessments inform the Government's understanding of the impacts of EU exit on each sector. However, on their own, they will not fully represent the complex ways in which EU exit will affect the UK economy.
66. These sectoral assessments are brought together with assumptions about future trade agreements in a macroeconomic model to consider economy level consequences of these changes. This model captures the potential responses of businesses and consumers to changes in trade barriers and costs. It allows for interactions between different areas of the economy and provides a richer view of how the economy might change in the long-term.
67. The Government has developed a comprehensive trade model, working with international trade economists. In particular, this model:
- Considers **long-term economic responses** that are not time profiled by year.
  - Incorporates **dynamic elements**, such as the **relationship between openness to trade and productivity**. For example, the model captures the fact that improved access to international markets allows sectors to expand.
  - Can incorporate additional **sensitivity analysis**, including the effects of changes in trade and productivity on business **incentives to invest and accumulate capital**. These effects are not considered as part of the model's central estimates.
68. In addition, the analysis then uses fiscal and regional models to consider how whole economy effects could differ between regions and affect the public finances. The impact of a range of migration scenarios is also considered (see section 2.4.3).

### 2.4.1 Regional modelling

69. The UK's exit from the EU will affect the regions and nations of the UK differently. The Government's approach to estimating the long-term economic effect of EU exit on English regions and Scotland, Wales and Northern Ireland takes overall UK estimates of exports and economic activity by sector, and distributes them to regions and nations, reflecting the sector mix of each area.
70. It follows that areas that trade more with the EU, or are more specialised in sectors facing potential new trade costs, are likely to be more affected. For instance, the North East is relatively specialised in the export of goods, whereas London is relatively specialised in the export of services. It follows that a scenario which has relatively better outcomes for goods would tend to result in the North East doing relatively better than London.
71. The approach also considers how the impact on one region or nation can flow through to other areas of the UK as a result of integrated supply chains.<sup>59</sup>
72. This analysis distributes overall UK estimates from the national model, which assumes full-employment and does not capture any short-run disruption. Therefore, the regional estimates

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<sup>59</sup> The regional results from the preliminary [Cross-Whitehall Analysis](#) published by the Exiting the EU Select Committee (March 2018) were provisional and reflected an early stage in the analysis. The modelling has been developed to better capture interregional linkages through supply chains, resulting in less variation between regions and nations than in March. However, the results in this publication no longer capture the impact of migration and are therefore not directly comparable with the preliminary estimates from March.

will not capture these factors. This analysis does not factor in the impact of changes in migration.

73. While this analysis considers Northern Ireland, it does not capture any short-term changes and does not account for specific factors relating to the border, including in the long-term.

#### 2.4.2 Migration

74. The analysis considers migration implications from leaving the EU, including the economic and fiscal impacts of ending free movement and determining an independent long-term migration arrangements in line with the UK's national interest.
75. The Migration Advisory Committee has published a comprehensive assessment of the role of EU migration in the UK economy.<sup>60</sup> This presented a range of evidence examining where EU nationals are working, contributing to UK economic output, generating tax revenues, and consuming goods and services. The report also considered how migrants affect productivity and innovation.
76. The analysis set out in this publication estimates the potential economic impacts of illustrative changes in net inflows of EEA workers. These include changes in the UK's population and workforce in the long run, which are then reflected in changes in GDP and GDP per capita.
77. The results consider expected changes to migration flows that might be driven by both changes to migration arrangements and changes to the wider economy affecting migrants' decisions to come to the UK. This analysis therefore shows two illustrative migration variants.

#### Scenarios

78. Free movement will end as the UK leaves the EU. The Government will be setting out its proposals for future migration arrangements in due course. This analysis therefore shows two illustrative variants for migration arrangements. This is represented as a range between no change to migration arrangements and zero net inflows of EEA workers. These scenarios illustrate a very wide range of impacts. While no change to migration arrangements is modelled, this is not reflective of government policy. The zero net inflows of EEA workers is a stylised variant and illustrative only.
79. The modelled migration scenarios are the same under each trade scenario, reflecting the fact that the UK will set migration arrangements independently, with the exception of the modelled EEA type arrangement, where free movement of people is assumed.

#### Approach

80. The impacts of changes in migration arrangements have been considered over a 15 year period, in order to be as consistent as possible with the Government's trade analysis.
81. The Government's migration analysis first establishes the potential future flows of EEA workers independent of any policy changes. This analysis draws upon evidence of the relationship between migration and its economic and demographic drivers.
82. The future flow of EEA workers is then adjusted to account for changes in the economy as a result of different trade arrangements. Any trade impact on the economy would be expected to itself affect migration flows, influencing EEA workers' decisions to come to the UK for work – independent of any change to the UK's migration arrangements.

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<sup>60</sup> ['EEA migration in the UK: final report'](#), Migration Advisory Committee, September 2018.

83. Changes to migration flows from migration arrangements decisions, using the illustrative policy changes on EEA workers, are then estimated.

### Limitations

84. This migration analysis draws upon a wide range of evidence on the labour market and demographic characteristics of migrants. However, estimating future levels of migration is difficult. Migration trends are the result of a range of factors affecting any individual decision to migrate, such as economic and demographic conditions in the home country of any individual migrant, economic conditions in the UK, or in other potential migration destinations. The migration modelling does not account for changes in migrant behaviour or labour market adjustments in response to any policy changes.

### 2.4.3 Fiscal modelling

85. Changes to the size and structure of the UK economy as a result of leaving the EU will have important implications for the UK's public finances. The analysis considers the impact on Public Sector Net Borrowing (PSNB) of different exit scenarios. This is done by estimating the indirect and the direct fiscal impacts of each scenario, as well as the debt interest consequences of any additional borrowing.
86. Indirect fiscal impacts are those related to changes to the size and structure of the economy as a result of the UK's exit from the EU. They include the economic impact of NTBs, tariffs, migration, regulatory flexibilities and increased trade with the rest of the world. The indirect fiscal impact of each scenario is estimated by applying fiscal ready-reckoners to the macroeconomic results in each scenario. Ready-reckoners use elasticities to quantify how a particular element of spending or taxation will change given a 1 per cent change in an underlying economic variable.
87. Direct fiscal impacts include the savings associated with increases in customs revenue and discontinuing payments into the EU Budget. They also include costs from the UK-EU financial settlement, future spending on EU-related programmes or their domestic replacement, and additional departmental spending on administration. In the modelled EEA-type scenario, future financial contributions to the EU are also considered. There is no precedent for estimating any financial contributions under the modelled White Paper scenario. The July White Paper set out that the UK will make an appropriate financial contribution where the UK participates in EU programmes or agencies, and this is open to negotiations.
88. Further detail on the analytical approach is presented in the Technical Reference Paper.

### 2.4.4 Additional sensitivity analysis

89. Economic modelling is inherently uncertain, and requires assumptions to be made about how individuals, businesses, and whole economies react to changes in circumstances. In addition, the UK's exit from the EU is unprecedented. This publication accounts for this by presenting all assumptions transparently, and presenting results in ranges.
90. Along with the sensitivity analysis set out in section 2.3.2, additional sensitivity analysis shows how changes to key assumptions may affect the results.
91. The analysis includes modelling of additional analytical and policy sensitivities including: the inclusion of business investment effects; further reductions in NTBs in rest of world trade deals; setting bespoke agri-food tariffs; and unilateral tariff liberalisation. These sensitivities are presented separately within section 4.

## 2.5 Analytical limitations

92. This analysis represents an objective and robust assessment of the potential size and direction of the key policy decisions shaping the UK's exit from the EU. As set out in section 2.4.4, economic modelling is an inherently uncertain exercise. The lack of comparable historical precedent of countries leaving major trading blocs adds further uncertainty around the likely response of businesses and households to EU exit. Therefore, modelling results should be interpreted with caution and excessive weight should not be given to any point estimates. In particular, in order to assess economy wide impacts, there is considerable aggregation to assess economic sector impacts. These sectoral level results should be treated with particular caution.
93. This analysis focuses on the **long-term** impacts of the UK's exit from the EU. The macroeconomic model intentionally isolates the trade impacts of exiting the EU,<sup>61</sup> assuming all other factors remain unchanged, and describes the impact on the UK economy after it has adjusted to the change in economic relationship.
94. Therefore, the analysis cannot incorporate or attempt to forecast any potential **short-term** disruption or any associated long run impacts. While some adjustment costs are expected in all scenarios, the analysis does not consider their size or direction, and does not attempt to forecast a specific future date when those adjustments will be complete. Similarly, the analysis does not account for any potential policy measures put in place to mitigate a no deal scenario. No macroeconomic effects of short-term impacts are considered.
95. Most studies indicate that the full impact of change to trade would take up to 15 years to fully work their way through the economy. These changes would not likely be uniformly distributed across the specified time period and should not be interpreted as a forecast of UK economic performance 15 years from after the UK's new relationship with the EU comes into effect.
96. The Government's macroeconomic model is a standard tool for modelling trade arrangements. Results must be treated with caution given the inherent uncertainties around trade cost estimates and how the economy may adjust to these.
97. All results should be considered as broad relevant impacts of different trade scenarios relative to how the economy would anyway be expected to grow. These do not represent an economic forecast.
98. This analysis does not consider any potential impact of the UK aligning with the EU as it changes its rules in the future. The future direction of EU policy is uncertain. The future direction of EU policy could both have positive and negative impacts on the UK economy.
99. The Government's agreement with the EU includes an implementation period. This agreement provides certainty for businesses and residents, facilitating the transition to the UK's future relationship with the EU. The analysis has not sought to capture these impacts, given its focus on long run impacts.

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<sup>61</sup> Including the ability to sign RoW free trade deals.

## 2.6 Key factors relevant to future economic performance not quantified in this analysis

### 2.6.1 Factors not modelled

100. The analysis focuses on the UK-EU trading relationship, which does not cover all aspects of the Future Economic Partnership, nor all aspects of the Future Partnership. As a result, a number of factors have not been quantified as part of this economic analysis including cooperation on security, access to waters and fishing opportunities, science and innovation, culture and education, development and international action, defence research and development and space.
101. In addition, the modelling does not consider:
- a. **Future domestic policy choices;**
  - b. **Global trends** such as the rise of global value chains, the increasing importance of services trade, changing demographics, technological advancement, and economic development.

### 2.6.2 Wider domestic economic policy not modelled

102. The long-term success of the UK economy will primarily depend on how Government, businesses and households adapt to changing global and domestic circumstances. The analysis has not sought to consider the potential impact of future domestic policy responses that the UK Government and devolved administrations may implement, including in a no deal scenario.
103. A central consideration will be raising productivity levels and boosting the earning power of people across the whole of the UK. Although the UK is one of the richest and most successful economies in the world, there is still a substantial productivity gap between the UK and its peers, including France, Germany and the USA. Closing this gap while maintaining employment levels would improve living standards across the country.
104. The Government's Industrial Strategy aims to raise productivity by focusing on policies in five key areas: ideas, people, infrastructure, the business environment and place. Policies include establishing a world-class technical education system, investing in greater maths education, driving a major upgrade to the UK's infrastructure, and making the UK the best place to start and grow a business.
105. Alongside this, the strategy identifies a set of long-term trends or Grand Challenges: Artificial Intelligence and Data Economy, Clean Growth, Future of Mobility and the Ageing Society, which are addressed more holistically to ensure that the interlinkages across different areas of policy are identified.
106. Finally, the strategy takes forward a new approach to engaging with business in the form of Sector Deals. These are developed in partnership with industry and local government, who are best placed to understand the challenges facing their respective areas.
107. In terms of trade policy, the UK Export Strategy,<sup>62</sup> published in August 2018, builds upon the UK's comprehensive trade and development agenda and follows a similar approach - working closely with businesses, industry, trade associations and representative bodies to explore the challenges faced by different UK firms at each stage of their export journeys, and where

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<sup>62</sup> '[UK Export Strategy](#)', Department for International Trade, August 2018.

justified, identifying the specific sectors and markets where government policy can add most value.

108. These supply side or 'microeconomic' policies are complemented by a 'macroeconomic' policy framework designed to deliver a stable and growing economy, low and stable inflation and sound public finances.
109. The analysis does not make judgements about future economic policy and no assumptions are made on the impacts of any future policy, including on seeking to realise any wider opportunities from exit beyond the illustrative new trade partnerships explicitly modelled with the rest of the world.

### 2.6.3 Global trends not modelled

110. Global trade has changed substantially in recent years, driven by increasingly integrated supply chains and production methods. For example, the following trends<sup>63</sup> may impact UK trade further in the coming years:
- a. **The rise of global value chains (GVCs):** Specialisation has seen different stages of production increasingly located across different parts of the global economy. This allows firms to focus on one element of production, making production cheaper and boosting their ability to compete in the global market. Around 80 per cent of total global trade in 2013 was linked to GVCs shaped by transnational corporations.<sup>64</sup> Going forward, the value to the UK of new FTAs could be increased if they encourage more closely linked value chains. These could facilitate access to intermediate goods which improve the quality of the UK's final goods, and, equally, allow access to new UK export markets.
  - b. **The increasing importance of services trade:** Globally, services are increasingly sold as a bundle with goods. For example, manufacturing firms may sell their products bundled together with maintenance support and customer services. Services such as research and development or accounting are also provided to goods manufacturers, and so are embodied within traded goods. As a result, services now account for almost 35 per cent of the value added in global manufacturing exports.<sup>65</sup> As a mature service-led economy, services account for nearly 80 per cent of UK GVA (£1.3 trillion),<sup>66</sup> and 85 per cent of UK jobs (25.9 million),<sup>67</sup> with opportunity to expand in response to access to new markets. This could be particularly important to UK digital and technology sectors. It is also possible that these positive benefits could spill over into UK goods trade, given the increasing interlinkages with services.
  - c. **Demographics and economic development:** Rising living standards are a key driver of growing global demand. The OECD predicts that by 2030, 4.9 billion people will be on a "middle income", up from only 1.8 billion people in 2009.<sup>68</sup> These rising household incomes are likely to shift existing tastes in goods and services towards those in which the UK specialises in exporting. For example, as living standards improve, demand for UK

<sup>63</sup> These trends have been selected for illustrative purposes only, and do not represent a complete assessment of global trade trends.

<sup>64</sup> Gross trade refers to gross exports. ['World investment report'](#), UNCTAD World Investment Report, 2013.

<sup>65</sup> ['International Trade and Balance of Payments, Trade in Value Added'](#), based on internal calculations using 2011 data, OECD, December 2016.

<sup>66</sup> ['GDP output approach - low-level aggregates'](#), ONS, September 2018.

<sup>67</sup> ['Employee Jobs by Industry'](#), ONS, June 2018; ['Self-employment Jobs by Industry'](#), ONS, June 2018. Average of 2017 quarterly figures.

<sup>68</sup> ['The Emerging Middle Class in Developing Countries'](#), OECD, January 2010.

specialisms such as services and luxury products could increase, extending UK opportunities for trade. The majority of the growth in “middle income” households is expected to come from China and India.<sup>69</sup> This suggests that non-EU markets could become increasingly important players in global trade, which could increase the economic benefit from the UK's independent trade policy.

Given the inherent uncertainty around these global trends, the analysis in this publication does not attempt to forecast how these trends might evolve over time. Some studies point to the scale of potential impacts. The IMF provide forecasts for trade growth which imply that the UK trade share with the EU can be expected to marginally increase over their forecast horizon, due to high expected trade growth in the EU.<sup>70</sup> The OECD provide long-term projections for global GDP growth, which can similarly be used to inform the assessment of how UK trade shares with different countries might evolve.<sup>71</sup> This data projects an increase in the GDP of middle income countries relative to high income countries. Applying these OECD long-term projections to the base data and the time horizon used in the Government's analysis, and making no changes for other long-term trends which would be expected to affect UK trade, would indicate only a small difference to the estimated trade impacts modelled in the Government's analysis. Over the long term, as incomes rise in these economies, and as they become more open to trade, the composition of both their supply of and demand for products and services with the rest of the global economy will change, affecting the pattern of global trade.

- d. **Technological advancement:** New technologies continue to transform the way ideas and information are communicated. Globally, the UK was ranked as the fourth most innovative economy in the world in 2018,<sup>72</sup> reflecting its market sophistication, creative outputs and infrastructure. The UK also continues to be Europe's top hub for international technology investors, with a record level of venture capital investment (£3 billion) in its technology sector in 2017 - almost double that seen in 2016<sup>73</sup> - while UK digital firms have seen their international trade grow by more than 20 per cent.<sup>74</sup> The UK's ability to stay at the forefront of innovation will impact on both what is traded and how it is traded, and the overall performance of the UK economy.

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<sup>69</sup> ['The Unprecedented Expansion of the Global Middle Class: An Update'](#), OECD, February 2017.

<sup>70</sup> Based on trade import and export volume growth from the IMF, ['World Economic Outlook'](#), October 2018.

<sup>71</sup> ['GDP long-term forecast'](#), OECD, July 2018.

<sup>72</sup> ['Global Innovation Index 2018'](#), Cornell University, INSEAD, World Intellectual Property Organisation, 2018.

<sup>73</sup> ['Record Year for London and UK Tech investment'](#), London & Partners, January 2018.

<sup>74</sup> ['DCMS Sectors Economic Estimates 2016: Trade'](#), Department for Digital, Culture, Media and Sport, August 2016.

## Section 3 - Sectoral implications for UK-EU trade barriers

*The analysis in this section illustrates the drivers of potential UK-EU trade barriers and associated costs for different sector groups within the UK economy. This analysis highlights the key tariffs and non-tariff barriers (NTBs) that each sector group may face. Depending on the scenario these could include customs procedures, regulatory burdens and restrictions on temporary mobility of people for business purposes. These barriers are estimated to be substantially lower in a modelled White Paper scenario than in a modelled no deal scenario. These assessments are valuable in their own right, but also as key inputs to the Government's macroeconomic modelling. Interactions between different sectors of the UK economy are considered in section 4, which sets out the macroeconomic modelling results.*

### 3.1 Potential changes in trade barriers with the EU and associated costs

111. EU exit will not affect all sectors of the economy in the same way. Levels of trade with the rest of the world vary by sector, as do the rules governing trade in each of the sectors. It is therefore important to consider the potential changes in trade barriers and the trade costs for different sectors of the economy.
112. This section illustrates the major potential economic changes to the trading relationship between the UK and the EU and associated trade costs for five broad sector groups across the economy,<sup>75</sup> which together cover the majority of the UK economy and all traded goods<sup>76</sup> and services.<sup>77</sup> These sector groups are further broken down into eleven sectors as described in Table 3.1 below.
113. In 2017, total UK-EU trade in goods and services was worth £621 billion and accounted for 49 per cent of total UK goods and services trade.<sup>78</sup>

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<sup>75</sup> Sector definitions have been purposely defined as mutually exclusive groups using 2 digit Standard Industrial Classification (SIC) codes in order to present sectoral assessments and outputs of the macroeconomic modelling in a clear and consistent way. These bespoke definitions and corresponding statistics presented may therefore not align with other government publications.

<sup>76</sup> ['UK GDP\(O\) low level aggregates'](#), ONS, September 2018.

<sup>77</sup> ['UK GDP\(O\) low level aggregates'](#), ONS, September 2018.

<sup>78</sup> ['UK Economic Accounts: all data'](#), ONS, September 2018.

Table 3.1: Mapping of the five sector groups into the eleven modelled sectors.

Five sector groups <sup>79</sup>	GVA <sup>80</sup> (sector group's proportion of UK total GVA, 2017)	UK-EU trade <sup>81</sup> (£ billion, 2016)	Proportion of UK trade for the sector group that is with the EU <sup>82</sup> (2016)	Eleven modelled sectors
<b>Manufactured Goods</b>	9 per cent	138	49 per cent	Chemicals, pharmaceuticals, rubber and plastic
				Machinery, electronics and aerospace
				Motor vehicles and parts
				Other manufacturing
<b>Agri-food (including fisheries)</b>	2 per cent	17	74 per cent	Agri-food (including fisheries)
<b>Services</b>	60 per cent	265	51 per cent	Business services
				Construction
				Public administration, defence, education and health
				Other services
<b>Financial Services</b>	7 per cent	35	38 per cent	Financial services
<b>Networks</b>	8 per cent	68	49 per cent	Networks
<b>Dwellings<sup>83</sup></b>	14 per cent	Largely not traded	Largely not traded	Not reported

<sup>79</sup> See Technical Reference Paper for sector definitions.

<sup>80</sup> 'UK GDP(O) low level aggregates', ONS, September 2018.

<sup>81</sup> 'Trade in goods and services by industry, experimental estimates', ONS, October 2018 for Manufactured goods, Agri-food and services. 'Geographical breakdown of the current account, The Pink Book', ONS, July 2018 for Financial Services and Networks. Sector definitions may not always align exactly due to data availability or disclosure. The 2016 data are used for consistency across all sector groups.

<sup>82</sup> 'Trade in goods and services by industry, experimental estimates', ONS, October 2018 for Manufactured goods, Agri-food and services. 'Geographical breakdown of the current account, The Pink Book', ONS, July 2018 for Financial Services and Networks. Sector definitions may not always align exactly due to data availability or disclosure.

<sup>83</sup> Dwellings is not a sector or sector group as defined in this publication. It is not a traded sector and as such is not included in any analysis of non-tariff barriers. It is included in the table for completeness of UK total GVA. See section 1.5 in the Technical Reference Paper.

114. For each sector group, this section sets out: descriptive statistics showing the sector group's size, including trade flows, and the potential new trade barriers and possible associated trade costs faced in the modelled scenarios.
115. Data and digital issues are incorporated into estimates for sector groups, with specific considerations for each also described separately.

## 3.2 UK Sectors

116. The following paragraphs set out the Government's analysis of potential changes to trade costs for each of the five sector groups in the context of the current economic output and trade flows.

### 3.2.1 Manufactured Goods

117. In 2017, the manufactured goods sector group accounted for around 9 per cent of the UK economy (£170 billion in GVA),<sup>84</sup> directly employing 2.4 million people (7 per cent of total UK jobs).<sup>85</sup> In 2016, the EU-27 was the UK's largest trading partner across almost all goods sectors, with 49 per cent (£138 billion) of the UK's total trade in the manufactured goods sector being with the EU-27.<sup>86</sup>

#### UK-EU potential trade costs: Summary

118. The Government's analysis has considered potential impacts of changes to trade arrangements for manufactured goods including tariffs, customs procedures and regulations.<sup>87</sup> Additionally, for sectors where trade in service products is important, trade barriers discussed in the services sector are also accounted for. The estimates for the barriers in each of the scenarios are set out in Table 3.2 below.

<sup>84</sup> ['UK GDP\(O\) low level aggregates'](#), ONS, September 2018.

<sup>85</sup> ['Employee Jobs by Industry'](#), ONS, September 2018; ['Self-employment Jobs by Industry'](#), ONS, September 2018.

<sup>86</sup> ['Trade in goods and services by industry, experimental estimates'](#), ONS, October 2018. Trade statistics are presented on a sector basis rather than a product basis to ensure consistency with the macroeconomic modelling results. Statistics in this publication may therefore not align with other HM Government publications.

<sup>87</sup> Inputs to the macroeconomic model are considered on a sector basis rather than on a product basis.

**Table 3.2: Summary of key estimates of changes to trade costs for manufactured goods compared to today's arrangements.**

Compared today's arrangements (per cent change)	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	
				Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>88</sup>
<b>New tariffs (A)</b>	+3	Zero tariffs	Zero tariffs	No tariffs	No tariffs
<b>New non-tariff barriers (B)</b>	+10 (+6 to +13)	+8 (+5 to +11)	+5 (+3 to +7)	+1 (0 to +1)	+4
<b>Total changes to trade costs (A+B)<sup>89</sup></b>	+13 (+9 to +17)	+8 (+5 to +11)	+5 (+3 to +7)	+1 (0 to +1)	+4

Central estimates and ranges in brackets.<sup>90</sup>

Estimates are rounded to the nearest per cent. Owing to rounding, narrow ranges (less than one per cent variation) are not distinguishable in the table.

### Analysis of the modelled no deal scenario

**119.** In the modelled no deal scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 9 to 17 per cent of the value of trade compared to today's arrangements as a result of:

- **Tariffs:** tariff costs are assumed at average EU applied Most Favoured Nation (MFN) tariff rates for goods. On average, tariffs on manufactured goods are estimated to be equivalent to 3 per cent of the value of trade compared to today's arrangements.<sup>91,92</sup> These can vary significantly between sectors and products. For example, 1 per cent for machinery, electronics and aerospace, to 8 per cent for motor vehicles and parts.<sup>93</sup>
- **Customs procedures:** costs are assumed to arise from new customs procedures, including administrative costs and associated delays at the border.

<sup>88</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in non-tariff barriers between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for the NTB sensitivity.

<sup>89</sup> The range of total trade costs is the sum of tariffs and non-tariff barrier costs, where point estimates for tariffs are combined with a range of non-tariff barrier estimates. Figures may not sum due to rounding.

<sup>90</sup> The estimates provided are central estimates of the ranges given in brackets. All ranges are calculated using statistical distributions from econometrics.

<sup>91</sup> EU applied MFN tariffs are trade-weighted using 2014-16 UK-EU trade data from TradeMap at the HS-8 level to the base GTAP 57 sectors. Tariffs for all GTAP 57 goods sectors are subsequently weighted to the modelling sectors using 2011 GTAP data. '[UK-EU trade 2014-16](#)', Trade Map, accessed on 20 November 2018; '[EU applied MFN tariffs](#)' Macmap, accessed on 20 November 2018; '[GTAP 57 2011](#)', GTAP, accessed on 20 November 2018.

<sup>92</sup> '[European Commission Market Access Database](#)', European Commission, accessed 21 November 2018. HM Government will set out its plans for the UK's MFN tariff schedule before the UK leaves the EU. These tariffs would apply to all trade in goods in the absence of preferential trade agreements. They may differ from rates in the EU's Common Customs Tariff. A sensitivity applying zero tariffs is considered in section 4.9.

<sup>93</sup> '[World Tariff Profiles 2018](#)', WTO, 2018.

- **Regulation:** burdens on UK businesses exporting to the EU are estimated to arise from new compliance activity and authorisations required to sell certain products into the EU. This is assumed to lead to both costs and delays when goods are traded.
- **Restrictions on temporary mobility for business purposes** would inhibit the movement of people between the UK and the EU.

### Analysis of the modelled White Paper scenario

120. In the modelled White Paper scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 0 to 1 per cent of the value of trade compared to today's arrangements based on the following assumptions:
- **Tariffs:** continued tariff-free trade with the EU is assumed.
  - **Customs procedures:** no new customs procedures on EU trade are assumed.
  - **Regulation:** burdens for manufactured goods are assumed to be broadly similar to today's arrangements, as a result of regulatory alignment. This would be supported by continued UK participation in EU agencies for highly regulated sectors.
  - **Restrictions on the temporary mobility** of people for business purposes would exist compared to today's arrangements but would be partially mitigated by the proposed reciprocal framework for mobility. This framework for mobility would not impact on the Government's ability to set its migration arrangements in the national interest.
121. The spectrum of potential outcomes of detailed negotiations is addressed through a range of potential costs for this scenario. To illustrate potential additional NTBs, a sensitivity representing 50 per cent of the difference between the modelled White Paper and modelled average FTA estimates for this sector group is considered. This would result in additional estimated NTB costs equivalent to 4 per cent of the value of trade compared to today's arrangements.

### Additional scenarios

122. In the **modelled average FTA** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 5 to 11 per cent of the value of trade compared to today's arrangements. The modelled average FTA scenario would be based on mutual recognition agreements or regulatory cooperation that would lead to higher regulatory burdens than today's arrangements. It would also introduce Rules of Origin (RoO) costs needed to claim preferential tariffs, which are not required under today's arrangements.
123. In the **modelled EEA-type** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 3 to 7 per cent of the value of trade compared to today's arrangements. Estimates of new barriers include those associated with new customs procedures arising from customs administration costs. There would also be costs as businesses would need to comply with RoO requirements so they can access preferential tariff rates.

### 3.2.2 Agri-food

124. The UK agri-food sector group covers a range of unprocessed and processed food products, as well as agriculture, forestry and fisheries. In 2017, the sector contributed £41 billion to UK GVA (2 per cent of total GVA)<sup>94</sup> and 0.9 million jobs to the UK economy (3 per cent of total employment).<sup>95</sup> The UK agri-food sector group traded £17 billion of goods and services with the EU in 2016, 74 per cent of the sector group's trade.<sup>96</sup> In 2017, the fishing sector contributed £4 billion to UK GVA.<sup>97</sup>
125. As noted in section 2.6.1 the analysis does not assess the implications of access to waters and fishing opportunities. Although trade in fisheries products is included in the modelling, access to waters is a separate issue where the Government has separately set out its approach to becoming an independent coastal state.

#### UK-EU potential trade costs: Summary

126. The Government's analysis has considered potential impacts of changes to trade arrangements for agri-food products across tariffs; new customs procedures; checks to ensure human, plant and animal health; and regulatory burdens. Additionally, for sectors where trade in service products is also important, trade barriers discussed in the services sector are also accounted for. The estimates for the barriers in each of the scenarios are set out in Table 3.3 below.<sup>98</sup>

**Table 3.3: Summary of key estimates of changes to trade costs for agri-food compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>99</sup>
<b>New tariffs (A)</b>	+20	Zero tariffs	Zero tariffs	No tariffs	No tariffs
<b>New non-tariff barriers (B)</b>	+15 (+9 to +22)	+13 (+8 to +19)	+6 (+4 to +9)	+1 (+1 to +1)	+7
<b>Total changes to trade costs (A+B)<sup>100</sup></b>	+35 (+29 to +42)	+13 (+8 to +19)	+6 (+4 to +9)	+1 (+1 to +1)	+7

Central estimates and ranges in brackets.<sup>101</sup>

Estimates are rounded to the nearest per cent. Owing to rounding, narrow ranges (less than one per cent variation) are not distinguishable in the table.

<sup>94</sup> 'UK GDP(O) low level aggregates', ONS, September 2018.

<sup>95</sup> 'Employee Jobs by Industry', ONS, September 2018; 'Self-employment Jobs by Industry', ONS, September 2018.

<sup>96</sup> 'Trade in goods and services by industry, experimental estimates', ONS, October 2018. Trade statistics are presented on a sector basis rather than a product basis, to ensure consistency with the macroeconomic modelling results. Statistics in this publication may therefore not align with other HM Government publications.

<sup>97</sup> 'UK GDP(O) low level aggregates', ONS, September 2018.

<sup>98</sup> This includes agrifood tariffs set at zero. Historically such tariffs have been difficult to eliminate so a sensitivity with EU applied MFN tariffs has been considered.

<sup>99</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in non-tariff barriers between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for per cent NTB sensitivity.

<sup>100</sup> The range of total trade costs is the sum of tariffs and non-tariff barrier costs, where point estimates for tariffs are combined with a range of non-tariff barrier estimates.

<sup>101</sup> The estimates provided are central estimates of the ranges given in brackets. All ranges are calculated using statistical distributions from econometrics. Figures may not sum due to rounding.

### Analysis of the modelled no deal scenario

127. In the modelled no deal scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 29 to 42 per cent of the value of trade compared to today's arrangements as a result of:

- **Tariffs:** costs are assumed to be EU applied MFN tariff rates for agri-food. On average, tariffs in agri-food in a modelled no deal scenario are estimated to be equivalent to, on average, 20 per cent of the value of trade compared to today's arrangements.<sup>102</sup> This potentially increases prices of agri-food imports, benefitting UK producers, such as farmers, overall but increasing costs for UK consumers.
- **Customs:** new procedures resulting in additional administrative costs as well as associated delays at the border for agri-food businesses, as for the manufactured goods sector group.
- **Checks to protect human, plant and animal health** (sanitary and phytosanitary processes): these would result in additional checks and delays at the border to ensure compliance with new customs procedures and that food, plants and animals are traded safely.
- **Regulation:** burdens on UK businesses exporting to the EU would arise from new compliance requirements needed to sell certain products into the EU, leading to additional costs for agri-food businesses.

### Analysis of the modelled White Paper scenario

128. In the modelled White Paper scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 1 per cent of the value of trade compared to today's arrangements, based on the following assumptions:

- **Tariffs:** the modelled White Paper scenario assumes continued tariff-free trade with the EU.
- **Customs procedures:** the modelled White Paper scenario assumes no new customs procedures.
- **Checks to protect human, plant and animal health:** regulatory checks and delays at the border are assumed to be broadly similar to today's arrangements, as the UK would harmonise through alignment on rules that require border checks to **protect human, plant and animal health**.
- **Regulation:** some higher behind the border compliance costs are assumed, compared to today's arrangements, for those areas not covered by a common rulebook or equivalence agreements.

129. The spectrum of potential outcomes of detailed negotiations is addressed through a range of potential costs for this scenario. To illustrate potential additional NTBs, a sensitivity representing 50 per cent of the difference between the White Paper and average FTA estimates for this sector group is considered. This results in additional estimated NTB costs equivalent to 7 per cent of the value of trade compared to today's arrangements.

<sup>102</sup> '[European Commission Market Access Database](#)', European Commission, accessed 21 November 2018. HM Government will set out its plans for the UK's MFN tariff schedule before the UK leaves the EU. These tariffs would apply to all trade in goods in the absence of preferential trade agreements. They may differ from rates in the EU's Common Customs Tariff.

### Additional scenarios

- 130.** In the **modelled average FTA** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 8 to 19 per cent of the value of trade compared to today's arrangements. This is because assumed new customs procedures and regulatory checks at the border are estimated to lead to additional costs for UK businesses exporting to the EU. The increased physical checks at the border would be most notable for plant and animal health checks. There would be higher regulatory burdens compared to today's arrangements, as well as RoO costs required to claim preferential tariffs, which are not required under today's arrangements. Tariffs are assumed to be zero.<sup>103</sup>
- 131.** In the **modelled EEA-type** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 4 to 9 per cent of the value of trade than under today's arrangements. This is because, as with manufactured goods, there would be additional barriers associated with new customs procedures arising from customs administration costs. There would also be costs as businesses would need to comply with RoO requirements for UK businesses so they can access preferential tariff rates. Tariffs are assumed to be zero.<sup>104</sup>

### 3.2.3 Services

- 132.** The services sector group includes heavily traded sectors such as business services,<sup>105</sup> as well as sectors with lower trade flows, including construction, or public administration, defence, education and health services.
- 133.** In 2017, the services sector group made up the majority of the UK economy, contributing £1.1 trillion to UK GVA (60 per cent of UK GVA)<sup>106</sup> and 28 million jobs (80 per cent of UK jobs).<sup>107</sup> The UK traded a total of £265 billion in services with the EU in 2016, 52 per cent of the sector group's trade.<sup>108</sup> The UK has particular strengths in business services, for example, hosting global headquarters of four of the world's top ten law firms, and six of the world's top ten accountancy firms.<sup>109</sup> Although considered in separate sections, many of the channels of impact identified will also affect financial and network services in the same way.

### UK-EU potential trade costs: Summary

- 134.** The Government's analysis has considered potential impacts of changes to trade arrangements for services including: restrictions on temporary mobility for business purposes; possible new restrictions on investment and cross-border services activity for UK firms; regulatory burdens resulting from the loss of a framework for the recognition of professional qualifications; and restrictions on the exchange of personal data. Additionally, for sectors where trade in goods

<sup>103</sup> Historically such tariffs have been difficult to eliminate in FTAs so a sensitivity with EU applied MFN tariffs has also been modelled.

<sup>104</sup> This includes zero tariffs on agri-food products. Agri-food is excluded from current EEA arrangements so additional sensitivity analysis considers the impact of assigning EU applied MFN tariffs to agri-food sectors in section 4.9.

<sup>105</sup> Financial services is covered in section 3.2.4. Networks services are covered in section 3.2.5.

<sup>106</sup> '[UK GDP\(O\) low level aggregates](#)', 2016 data, ONS, August 2018. The 2016 data are used for consistency across all sector groups.

<sup>107</sup> '[Employee Jobs by Industry](#)', 2017 data, ONS, June 2018. The 2016 data are used for consistency across all sector groups.

<sup>108</sup> '[Trade in goods and services by industry, experimental estimates](#)', ONS, October 2018. For consistency with the macroeconomic modelling results the trade statistics presented are on a sector rather than a product basis. Therefore, headline figures may not align with other HM Government publications that are on a product basis. Sector definition does not exactly align due to disclosure.

<sup>109</sup> '[Networks: Fee data](#)', page 4, International Accounting Bulletin, February 2017. By fee income.

products is also important, trade barriers discussed in the manufactured goods section are relevant. The estimates for the barriers in each of the scenarios are set out in Table 3.4 below:

**Table 3.4: Summary of key estimates of changes to trade costs for services compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>110</sup>
<b>New tariffs (A)</b>	Zero tariffs	Zero tariffs	Zero tariffs	No tariffs	No tariffs
<b>New non-tariff barriers (B)</b>	+12 (+5 to +18)	+9 (+4 to +14)	+2 (+1 to +4)	+8 (+4 to +12)	+8
<b>Total changes to trade costs (A+B)<sup>111</sup></b>	+12 (+5 to +18)	+9 (+4 to +14)	+2 (+1 to +4)	+8 (+4 to +12)	+8

Central estimates and ranges in brackets.<sup>112</sup>

Estimates are rounded to the nearest per cent. Owing to rounding, narrow ranges (less than one per cent variation) are not distinguishable in the table.

### Analysis of the modelled no deal scenario

**135.** In the modelled no deal scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 5 to 18 per cent of the value of trade compared to today's arrangements, based on the following assumptions:

- **Restrictions on the temporary mobility of people for business purposes** would inhibit the movement of people providing services in person across the EU and vice versa. Many business services such as management consultants rely on their ability to fly in and fly out to services clients, often at short notice.
- **Restrictions on investment and cross-border services activity for UK firms.**
- **Regulatory burdens** resulting from the loss of **mutual recognition of professional qualifications**, would mean UK professionals may also face more burdensome recognition processes, or lose access entirely to the EU, requiring them to re-qualify in some cases.
- **Restrictions on the exchange of personal data** would make data flows between the UK and EU more difficult and add administrative costs, including due to reduced cooperation between UK and EU data protection authorities.<sup>113</sup>

<sup>110</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for the NTB sensitivity.

<sup>111</sup> The range of total trade costs is the sum of tariffs and NTB costs, where point estimates for tariffs are combined with a range of NTB estimates. Figures may not sum due to rounding.

<sup>112</sup> The estimates provided are central estimates of the ranges given in brackets. All ranges are calculated using statistical distributions from econometrics.

<sup>113</sup> Arrangements on the exchange and protection of personal data between the UK and the EU will sit alongside the future economic relationship, but would affect the UK economy. This impact is captured in the modelling.

### Analysis of the modelled White Paper scenario

136. In the modelled White Paper scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 4 to 12 per cent of the value of trade compared to today's arrangements based on the following assumptions.
- **Restrictions on the temporary mobility of people for business purposes** would exist compared to today's arrangements but would be partially mitigated by the proposed reciprocal framework for mobility. This framework for mobility would not impact on the Government's ability to set its migration arrangements in the national interest.
  - **Restrictions on investors and cross-border services suppliers** would be introduced compared to today's arrangements. However, these would be limited as a result of assumed commitments on services and investment liberalisation, providing broad market access and minimising discriminatory barriers.
  - **Regulatory burdens** relating to **recognition of professional qualifications** would be broadly similar to today, through a comprehensive system for mutual recognition. Regulated professionals would have the opportunity to demonstrate that they meet professional requirements across the EU.<sup>114</sup>
  - **Personal data:** free flow of personal data would continue between the UK and EU, with continued strong data protection standards and cooperation between data protection authorities.<sup>115</sup>
137. The spectrum of potential outcomes of detailed negotiations is addressed through a range of potential costs for this scenario. To illustrate potential additional NTBs, a sensitivity representing 50 per cent of the difference between the White Paper and average FTA estimates for this sector is considered. This results in additional estimated NTB costs equivalent to 8 per cent compared to today's arrangements.

### Additional scenarios

138. In the **modelled average FTA** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 4 to 14 per cent of the value of trade compared to today's arrangements. Typical trade arrangements do not significantly reduce regulatory barriers to trade; rather they generally aim to 'lock in' existing services liberalisation to ensure services markets that are already open to trade remain so. This tends not to offer significantly more market access than under WTO rules.
139. In the **modelled EEA-type** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 1 to 4 per cent of the value of trade compared to today's arrangements. This is because EEA states align with EU rules on services, so barriers to trade in services are not directly related to access to EU services markets. Rather, the services affected will be those inhibited by new customs procedures (such as courier and retail services), and services sold following the sale of goods (such as engineering or training services provided by manufacturing industries relating to their exports).

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<sup>114</sup> For example, an aptitude test or traineeship.

<sup>115</sup> Arrangements on the exchange and protection of personal data between the UK and the EU will sit alongside the future economic relationship, but would affect the UK economy. This impact is captured in the modelling.

### 3.2.4 Financial Services

140. In 2017, the financial services sector group contributed around 7 per cent to the UK's GVA (£131 billion in GVA),<sup>116</sup> and employed over 1.1 million people.<sup>117</sup> It also contributed 18 per cent to UK corporation tax receipts in 2017-18.<sup>118</sup> The UK and EU financial services markets are highly interconnected: UK-located banks underwrite around half of the debt and equity issued by EU businesses,<sup>119</sup> and around £1.4 trillion of assets are managed in the UK on behalf of European clients.<sup>120</sup> The UK traded a total of £35 billion in financial services with the EU in 2016, 38 per cent of the sector group's trade.<sup>121</sup>

#### UK-EU potential trade costs: Summary

141. The Government's analysis has considered potential impacts of changes to trade arrangements for the provision of UK-EU cross-border financial services, arising from barriers to market access due to the loss of EU "passporting", from restrictions on the temporary mobility of people for business purposes and from restrictions on the exchange of personal data. The estimates for the barriers in each of the scenarios are set out in Table 3.5 below:

**Table 3.5: Summary of key estimates of changes to trade costs for financial services compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>122</sup>
<b>New tariffs (A)</b>	Zero tariffs	Zero tariffs	Zero tariffs	No tariffs	No tariffs
<b>New non-tariff barriers (B)</b>	+13 (+4 to +22)	+13 (+4 to +22)	+1 (+1 to + 1)	+6 (+2 to +9)	+9
<b>Total changes to trade costs (A+B)<sup>123</sup></b>	+13 (+4 to +22)	+13 (+4 to +22)	+1 (+1 to + 1)	+6 (+2 to +9)	+9

Central estimates and ranges in brackets.<sup>124</sup>

Estimates are rounded to the nearest per cent. Owing to rounding, narrow ranges (less than one per cent variation) are not distinguishable in the table.

<sup>116</sup> 'UK GDP(O) low level aggregates', ONS, September 2018.

<sup>117</sup> 'Employee Jobs by Industry', ONS, September 2018; 'Self-employment Jobs by Industry', ONS, September 2018.

<sup>118</sup> 'Corporation Tax Statistics: 2018', page 17, HM Revenue & Customs, September 2018. Proportion is calculated by dividing 'Financial excluding life insurance' (£10.3 billion) by 'Total net receipts of corporation tax (inc. Bank Surcharge)' (£56.2 billion).

<sup>119</sup> 'Financial Stability Report: June 2017 Issue No. 41', page viii, Bank of England, June 2017.

<sup>120</sup> 'Asset Management in the UK 2016-2017: The Investment Association Annual Survey', page 17, The Investment Association, September 2017.

<sup>121</sup> 'Geographical breakdown of the current account, The Pink Book', ONS, July 2018. Financial services trade statistics are not published on an industry basis with a sufficient level of coverage to aggregate up to our defined sectors. These financial services trade statistics are therefore by product or type of service, with values representing trade in financial services products, rather than trade in the financial services sector. In addition, available financial services statistics do not align exactly with the sector definition used in this report. This data includes 'Insurance and Pension' and 'Financial'.

<sup>122</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for the NTB sensitivity.

<sup>123</sup> The range of total trade costs is the sum of tariffs and NTB costs, where point estimates for tariffs are combined with a range of NTB estimates. Figures may not sum due to rounding.

<sup>124</sup> The estimates provided are central estimates of the ranges given in brackets. All ranges are calculated using statistical distributions from econometrics.

### Analysis of the modelled no deal scenario

142. In the modelled no deal scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 4 to 22 per cent of the value of trade compared to today's arrangements based on the following assumptions:

- **Barriers to market access arising from the loss of “passporting”**<sup>125</sup> would prevent UK firms from providing financial services in the EEA from UK-based subsidiaries or branches based in the EEA. The relocation of activity into EU-authorized subsidiaries and the resultant fragmentation would be costly for firms. The UK could seek assessments of equivalence from the EU under its third-country equivalence regimes that provide access to some areas of EU financial services markets. However, while the UK and EU will have equivalent regimes at the point of exit, there are no guarantees that equivalence decisions will be granted immediately. The existing regimes are not comprehensive in scope. The existing regimes also do not provide for: institutional dialogue to support maintaining equivalent rules; a mediated solution where equivalence is threatened by divergence of rules; or phased adjustments and careful management of the impacts of change. To ensure the UK regime can continue to be deemed equivalent for the purposes of future decisions, the Government will need to bring forward legislation to ensure the UK regimes can be updated.
- **Restrictions on the temporary mobility for business purposes**, as discussed in the services sector, would also lead to higher costs. UK nationals visiting the EU for short-term business reasons may face administrative barriers or restrictions.
- **Restrictions on the exchange of personal data** would make data flows between the UK and EU more difficult and add administrative costs, including due to reduced cooperation between UK and EU data protection authorities.<sup>126</sup>

### Analysis of the modelled White Paper scenario

143. In the modelled White Paper scenario, additional trade costs on UK-EU trade are estimated to be equivalent to 2 to 9 per cent of the value of trade compared to today's arrangements based on the following assumptions.

- **Barriers to market access arising from the loss of “passporting”** would restrict the ability of UK financial services firms to provide services in the EEA from UK-based subsidiaries or branches based in the EEA. The modelled White Paper assumes that the UK will receive positive equivalence decisions under existing equivalence frameworks, at least six months before exit. It also assumes that the autonomous equivalence frameworks will be supplemented with close and structured cooperation, allowing for institutional dialogue, mediated solutions and phased adjustments. This will improve stability, providing UK firms with more predictable market access. It also assumes some expansion of the scope of current EU equivalence regimes to preserve mutually beneficial cross-border business models.

<sup>125</sup> 'Passporting', Bank of England, accessed 13 November 2018. Passporting: “A firm authorised in an EEA state can carry on activities that it has permission for in its home state and any other EEA state by either establishing a branch or agents in an EEA state or providing cross-border services. This is known as 'passporting'.”

<sup>126</sup> Arrangements on the exchange and protection of personal data between the UK and the EU will sit alongside the FEP but would impact on the UK economy. This impact is captured in the modelling.

- **Restrictions on temporary mobility for business purposes** would be minimised through a reciprocal framework for mobility, allowing for short notice, short term business visits between the UK and EU. This framework for mobility would not impact on the Government's ability to set its future migration arrangements in the national interest.
- **The free flow of personal data** would continue between the UK and EU, with continued strong data protection standards and cooperation between data protection authorities.<sup>127</sup>

144. The spectrum of potential outcomes of detailed negotiations are addressed through a range of potential costs for this scenario. To illustrate potential additional NTBs, a sensitivity representing 50 per cent of the difference in NTBs between the White Paper and average FTA estimates for this sector group is considered. This results in additional estimated NTB costs equivalent to 9 per cent compared to today's arrangements.

### Additional scenarios

145. In the **modelled average FTA** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to 4 to 22 per cent of the value of trade compared to today's arrangements. This is because FTAs do not typically provide meaningful market access for financial services, meaning UK firms would only rely on the mechanisms outlined in the modelled no deal scenarios described above.

146. In the **modelled EEA-type** scenario, additional trade costs on UK-EU trade are estimated to be around 1 per cent of the value of trade under today's arrangements. This is because in an EEA-type scenario, UK financial services firms would continue to be able to use the EU "passport" to provide cross-border financial services across the EEA. NTBs are assumed to arise but they would be very limited and related to very specific areas of financial services activity, making it marginally more costly for firms to perform cross-border business. There could also be economic impacts arising from being aligned with EU rules, which are not captured in the estimates.

### 3.2.5 Networks

147. The network sector group, which includes energy and transport services, provides vital connectivity within the UK and beyond. Energy and transport services are key enablers for both businesses and consumers. In 2017, it contributed 8 per cent to the UK economy (£140 billion in GVA)<sup>128</sup> and 1.9 million jobs.<sup>129</sup> The UK traded a total of £68 billion with the EU in 2016 in networks, 49 per cent of the sector group's total trade.<sup>130</sup> In 2017, transport networks also facilitated 55 million visits from the UK to the EU, with UK residents spending £27 billion.<sup>131</sup>

<sup>127</sup> Arrangements on the exchange and protection of personal data between the UK and the EU will sit alongside the FEP but would impact on the UK economy. This impact is captured in the modelling.

<sup>128</sup> '[UK GDP\(O\) low level aggregates](#)', ONS, September 2018.

<sup>129</sup> '[Employee Jobs by Industry](#)', ONS, Sept 2018 ; '[Self-employment Jobs by Industry](#)', ONS, September 2018.

<sup>130</sup> '[Geographical breakdown of the current account, The Pink Book](#)', ONS, July 2018. Statistics for trade in networks are currently not published on an industry basis with a sufficient level of coverage to aggregate up to our defined sectors. These trade statistics have therefore been produced on a product or type of service basis. The values of trade therefore reflect the value of trade in networks products not the value of trade for the networks sector. In addition statistics are not available that exactly align with the sector definitions used in this report. Here networks include 'Transport' and 'Travel'.

<sup>131</sup> '[Travel trends estimates: UK residents' visits overseas](#)', Table 5.01, ONS, August 2018.

## UK-EU potential trade costs: Summary

148. The Government's analysis has considered potential impacts of changes to trade arrangements for the networks sector group. The estimates for the barriers in each of the scenarios are set out in Table 3.6 below:

**Table 3.6: Summary of key estimates of changes to trade costs for networks compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>132</sup>
<b>New tariffs (A)</b>	+1 <sup>133</sup>	Zero tariffs	Zero tariffs	No tariffs	No tariffs
<b>New non-tariff barriers (B)</b>	+9 (+3 to +15)	+5 (+1 to +8)	+1 (0 to +1)	+1 (0 to +2)	+3
<b>Total changes to trade costs (A+B)<sup>134</sup></b>	+9 (+3 to +15)	+5 (+1 to +8)	+1 (0 to +1)	+1 (0 to +2)	+3

Central estimates and ranges in brackets.<sup>135</sup>

Estimates are rounded to the nearest per cent. Owing to rounding, small differences (less than one per cent variation) are not distinguishable in the table.

### Analysis of the modelled no deal scenario

149. In the modelled no deal scenario, additional trade costs on UK-EU trade are estimated to be equivalent to, on average, 3 to 15 per cent of the value of trade compared to today's arrangements.

### Analysis of the modelled White Paper scenario

150. In the modelled White Paper scenario, additional trade costs on UK-EU trade are estimated to be equivalent to 0 to 2 per cent of the value of trade compared to today's arrangements. This is the result of an increase in NTBs, although it is assumed that a significant proportion of this sector will face no new NTBs.

151. The spectrum of potential outcomes of detailed negotiations is addressed through a range of potential costs for this scenario. To illustrate potential additional NTBs, a sensitivity representing 50 per cent of the difference in NTBs between the White Paper and average FTA estimates for this sector group is considered. This results in additional estimated NTB costs equivalent to 3 per cent compared to today's arrangements.

<sup>132</sup> Sensitivity analysis highlights the impact on trade costs if the NTBs are higher than estimated in the Government's modelled White Paper scenario. The central estimate for a sensitivity point, reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios, is presented. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. Ranges are not estimated for the NTB sensitivity.

<sup>133</sup> Within the networks sector, tariffs can only apply to goods trade (products traded in energy) since services trade does not face tariffs. In the table the weighted average is taken across both goods and services for consistency with sector definitions used across the document. More detail is provided in the Technical Reference Paper.

<sup>134</sup> The range of total trade costs is the sum of tariffs and NTB costs, where point estimates for tariffs are combined with a range of NTB estimates. Figures may not sum due to rounding.

<sup>135</sup> The estimates provided are central estimates of the ranges given in brackets. All ranges are calculated using statistical distributions from econometrics.

## Additional scenarios

- 152.** In the **modelled average FTA** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to 1 to 8 per cent of the value of trade than under today's arrangements. This is because not all barriers to trade in energy and transport are addressed in typical FTAs. For example, in the transport sector group, Air Services Agreements are typically dealt with on a separate, bilateral basis. Therefore, under the modelled average FTA scenario, trade barriers are similar to those under the no deal scenario, which may overstate any potential additional trade costs.
- 153.** In the **modelled EEA-type** scenario, additional trade costs on UK-EU trade are estimated to be equivalent to 0 to 1 per cent of the value of trade under today's arrangements for energy and transport businesses, reflecting the similarity with today's arrangements.

### **Digital and data**

Digital and data issues are included within the modelling of the five broad sectoral groups above. The trade costs and impacts of different scenarios are therefore captured in the figures for sectoral groups. There are additional considerations specific to both areas.

#### **Digital**

The digital economy enables trade in both goods and services, as economic activity is increasingly carried out by digital means. In this analysis, digital includes: broadcasting, digital infrastructure, telecoms and elements of digital technology and e-commerce.<sup>136</sup> In 2017, digital contributed £118 billion (6.4 per cent) in GVA to the UK economy<sup>137</sup> and employed 1.5 million people.<sup>138</sup> The UK traded a total of £36 billion with the EU in digital trade in 2016, comprising 49 per cent of the UK's total digital trade.<sup>139</sup>

The modelled no deal scenario assumes higher trade costs on UK-EU trade in digital compared to today's arrangements. This is because the UK will no longer be part of the Digital Single Market (DSM), and would not benefit from specific Single Market measures, such as the Country of Origin principles for broadcasting.

The modelled White Paper scenario assumes slightly higher trade costs on UK-EU trade in digital compared to today's arrangements. Although the UK will no longer be part of the DSM, it assumes slightly higher trade costs are partially offset by an ambitious digital trade chapter, with arrangements that are better than average, for example, supporting non-personal data flows.

The modelled average FTA scenario assumes higher trade costs in digital compared to today's arrangements. This is because most FTAs have not included specific chapters on digital.

The modelled EEA-type scenario assumes no new trade costs on UK-EU trade in digital compared to today's arrangements. This is because EEA states are participants of the DSM.

<sup>136</sup> 'Digital' is defined in this publication as 2 digit Standard Industrial Classification (SIC) codes 58-63 ('Information and Communication') encompassing activities such as publishing, telecommunications and broadcasting. Alternative definitions of Digital are available, notably the wider "Digital Sector" definition used by Department for Digital, Culture, Media and Sport (DCMS) (see '[DCMS Sector Economic Estimates Methodology](#)', DCMS, August 2018). Statistics used in this publication therefore do not align with those produced by DCMS, and represent underestimates compared to DCMS figures of "Digital Sector" GVA, trade and employment.

<sup>137</sup> '[UK GDP\(O\) low level aggregates](#)', ONS, Sept 2018.

<sup>138</sup> '[Employee Jobs by Industry](#)', ONS, Sept 2018; '[Self-employment Jobs by Industry](#)', ONS, Sept 2018.

<sup>139</sup> '[Trade in goods and services by industry, experimental estimates](#)', ONS, October 2018.

## **Data**

The UK's data economy was estimated to be worth around £65 billion in 2016,<sup>140</sup> with external analysis predicting that data will benefit the UK economy by up to £241 billion between 2015 and 2020.<sup>141</sup> Individuals and organisations across the private, public and charity sectors increasingly depend on the use and exchange of personal and non-personal data, including across borders.

The modelled White Paper scenario assumes no new trade costs on UK-EU in data compared to today's arrangements. This is because free flows of personal and non-personal data would be maintained, and continue to be underpinned by strong data protection standards and cooperation between data protection authorities. The modelled White Paper assumes data adequacy has been granted by the EU.

The modelled EEA-type scenario assumes no new trade costs in data compared to today's arrangements. This is because EEA states benefit from the free flow of personal data and regulatory cooperation across the EEA.

The nature of the economic analysis of trade costs for the modelled no deal scenario and the modelled average FTA scenario means that “average” arrangements on data between countries are reflected in the modelled cost estimates. These scenarios do not fully capture the impacts of data adequacy decisions and therefore do not represent specific estimates of the likely outcome faced by the UK in these scenarios.

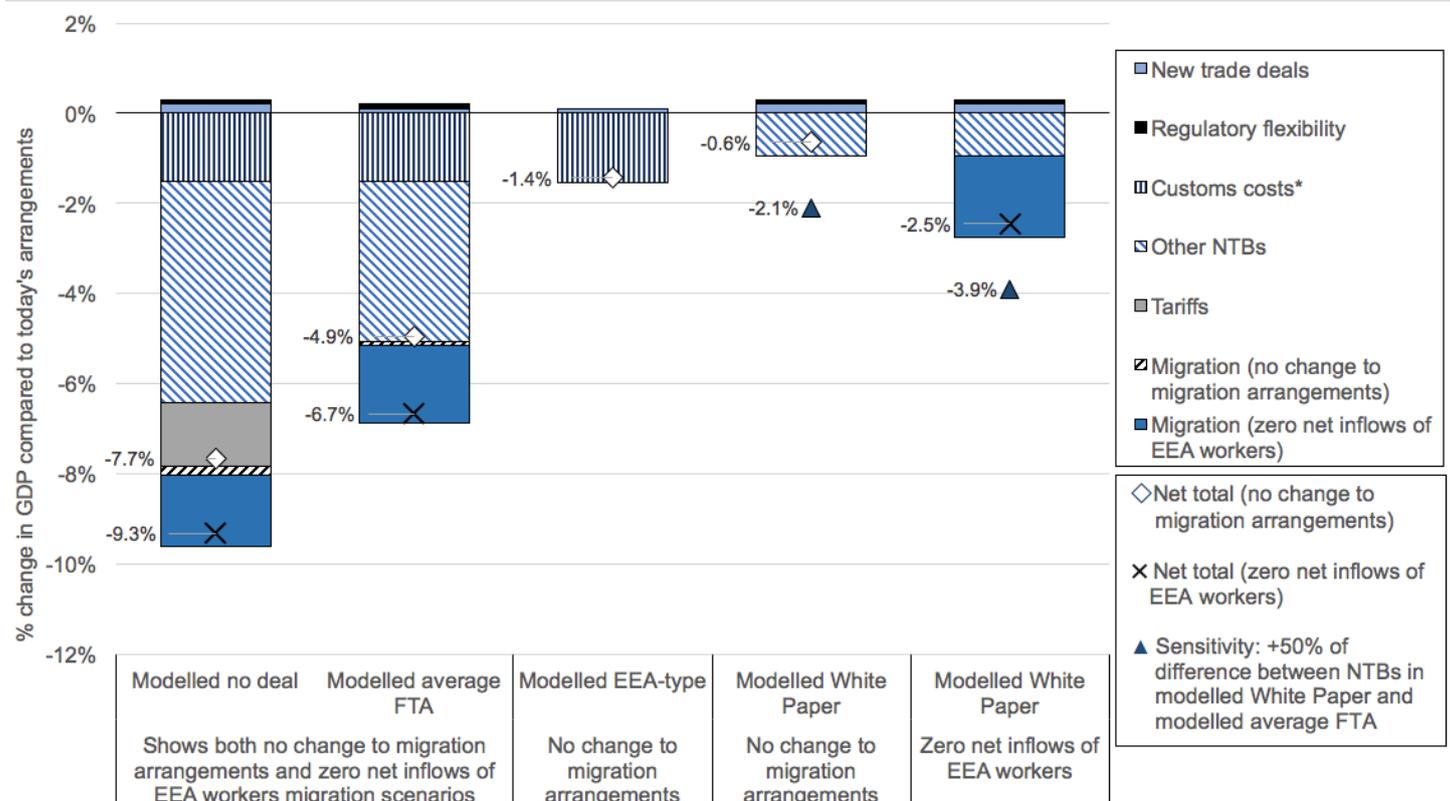
<sup>140</sup> ['The Data Economy Report 2018'](#), Digital Realty, 2018; and ['HMRC Exchange rates for 2018: monthly'](#), HMRC, October 2018 (Note: November exchange rate has been published).

<sup>141</sup> ['The Value of Big Data and the Internet of Things to the UK Economy'](#) page 6, CEBR and SAS, February 2016.

## Section 4 - Macroeconomic results

**This section sets out the potential long-term macroeconomic impacts of different UK-EU trading relationships on the level of economic output for the UK, regions and sectors. The economy would be expected to see overall growth in all modelled scenarios in the long run 15 year time horizon. Compared to today's arrangements, holding all other factors constant, each of the modelled scenarios is estimated to result in lower long run economic output (GDP). The results illustrate a wide range of impacts across the modelled scenarios, with the Government's White Paper scenario estimated to result in economic output around 7 percentage points higher than in the modelled no deal scenario in the long run. The analysis shows that higher non-tariff barriers (NTBs) would result in larger impacts on long run economic output. The impacts of migration and trade policy scenarios are presented separately, before being combined with the illustrative impact of regulatory flexibility to provide an indicative assessment of overall economic impacts on the economy. The key drivers of economic output impacts across the scenarios, relative to today's arrangements, are set out in Figure 4.1 below, with full details referenced throughout this section.**

**Figure 4.1: Decomposition of total impacts on GDP compared to today's arrangements for the illustrative no change to migration arrangements and zero net inflows of EEA workers scenarios.**



Central estimates only.

\* NTB estimates for the modelled no deal and modelled average FTA scenarios are derived from econometric modelling, which does not isolate individual NTB components.

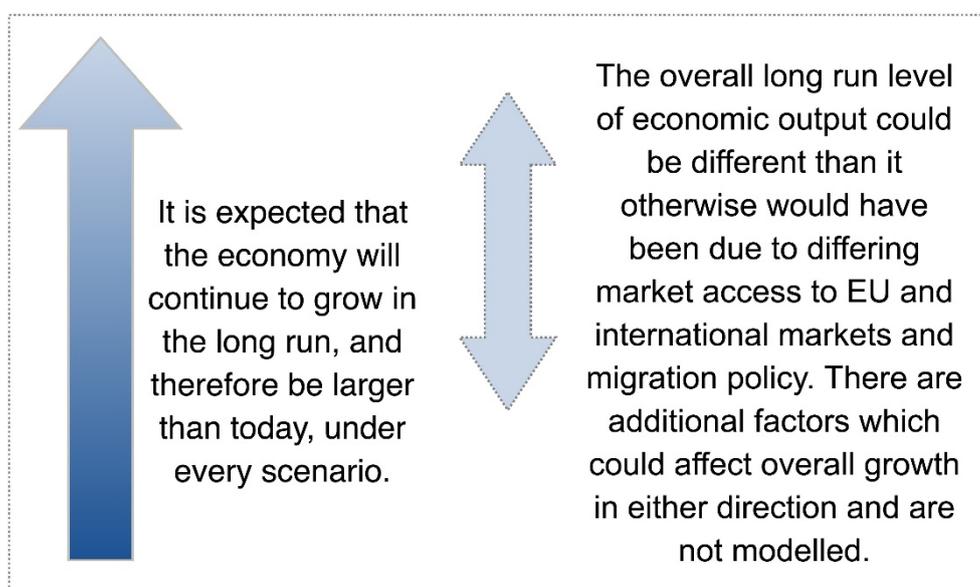
Customs costs for these scenarios are shown illustratively in line with the modelled EEA-type scenario estimates.

Analysis assumes no change to migration arrangements in a modelled EEA-type scenario.

## 4.1 Interpreting the results

154. These results set out the potential long run economic impacts of different UK-EU trading relationships, and the modelled benefits of assumed new trade deals agreed between the UK and non-EU countries, assuming no other changes. This analysis is not a forecast of the UK economy over a specific timeframe and does not model any transitional or short run impacts. These results present an estimate of the likely difference to the level of the economy across a range of metrics, including trade flows, GDP, GDP per capita, real wages, and sectoral and regional economic activity. The economic impacts of migration are also estimated, using two illustrative variants for migration arrangements, as well as considering the impact from regulatory flexibilities.
155. **It is expected that in all scenarios considered in this publication, the economy will continue to grow in the long run.** The results show the relative impacts of different trading, migration and regulatory arrangements and do not estimate the overall change in economic growth. The results illustrate how any changes to trade costs impact trade, and productivity and ultimately economic output (see Figure 4.2).

Figure 4.2: Interpretation of long-term analysis.



**Table 4.1: Summary of impacts on GDP and GDP per capita, compared to today's arrangements, for the illustrative no change to migration arrangements and zero net inflows of EEA workers.<sup>142</sup>**

	Compared to today's arrangements (per cent change)	Modelled White Paper				
		Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>143</sup>
<b>Trade impacts only (no migration effects, no regulatory flexibility impacts)</b>						
	<b>GDP</b>	-7.6 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.7 (-1.4 to -0.2)	-2.2
	<b>Per capita GDP</b>	-7.6 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.7 (-1.4 to -0.2)	-2.2
<b>Additional regulatory flexibility impacts</b>						
	<b>GDP</b>	+0.1	+0.1	0.0	+0.1	+0.1
	<b>Per capita GDP</b>	+0.1	+0.1	0.0	+0.1	+0.1
<b>Additional migration impacts</b>						
<b>No change to migration arrangements</b>	<b>GDP</b>	-0.2	-0.1	0.0	0.0	0.0
	<b>Per capita GDP</b>	-0.1	0.0	0.0	0.0	0.0
<b>Zero net inflow of EEA workers</b>	<b>GDP</b>	-1.8	-1.8	N/A	-1.8	-1.8
	<b>Per capita GDP</b>	-0.6	-0.6	N/A	-0.6	-0.6
<b>Overall impacts (trade, regulation and migration)</b>						
<b>No change in migration arrangements</b>	<b>GDP</b>	-7.7 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.4 to -0.9)	-0.6 (-1.3 to -0.1)	-2.1
	<b>Per capita GDP</b>	-7.6 (-8.9 to -6.2)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.6 (-1.3 to -0.1)	-2.1
<b>Zero net inflows of EEA workers</b>	<b>GDP</b>	-9.3 (-10.7 to -8.0)	-6.7 (-8.1 to -5.1)	N/A	-2.5 (-3.1 to -1.9)	-3.9
	<b>Per capita GDP</b>	-8.1 (-9.5 to -6.8)	-5.4 (-6.9 to -3.9)	N/A	-1.2 (-1.9 to -0.7)	-2.7

Central estimates and ranges in brackets.<sup>144</sup>

## 4.2 Trade volume impact of trade policy only

156. In isolation, changes in trade openness will influence economic behaviour, especially the buying (demand) and selling (production and supply) decisions businesses and consumers face. Lower

<sup>142</sup> Figures may not sum due to rounding.

<sup>143</sup> Sensitivity analysis highlights the impact on GDP and GDP per capita if the non-tariff barriers are higher than estimated in the Government's modelled White Paper scenario. The central estimate for a sensitivity point, reflecting 50 per cent of the difference in non-tariff barriers between the modelled White Paper and modelled average FTA scenarios, is presented. Implicitly, the modelled White paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. Ranges are not estimated for the NTB sensitivity.

<sup>144</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

trade barriers such as a fall in tariffs with trading partners, reduce the price of UK exports and imports, which would be expected to incentivise businesses to trade more and enable consumers to purchase more goods from abroad. Conversely, higher trade barriers between countries would be expected to raise the cost of exports and imports and incentivise a focus on the domestic market.

157. The analysis estimates that new trade barriers between the UK and the EU would be expected to result in lower UK-EU trade volumes in the long run, compared to today's arrangements (see Table 4.2). The impact on sectors is higher for those where the share of EU trade compared to total trade is higher.
158. The analysis shows that UK trade with the EU in terms of trade volumes is highly sensitive to the addition of new NTB and tariff costs. This reflects closely integrated supply chains and price sensitivities in traded goods and services. There could also be some domestic substitution including on-shoring of some supply chains. Estimates show businesses would also shift some of their trade to other markets where barriers become relatively lower, with trade with non-EU partners replacing some of the lost trade with the EU.

**Table 4.2: Summary of UK-EU trade volume impacts compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled no deal scenario	Modelled average FTA scenario	Modelled EEA-type scenario	Modelled White Paper	
				Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>145</sup>
UK-EU total trade volumes	-37 (-42 to -32)	-25 (-31 to -19)	-6 (-11 to -4)	-6 (-9 to -3)	-13
UK exports to EU	-35 (-40 to -30)	-24 (-30 to -17)	-5 (-9 to -2)	-4 (-8 to -2)	-11
UK imports from EU	-39 (-43 to -34)	-26 (-32 to -20)	-8 (-12 to -5)	-7 (-10 to -4)	-14
UK-rest of world total trade volumes	+6 (+6 to +7)	+5 (+5 to +6)	+4 (+4 to +4)	+4 (+3 to +4)	+4
<b>Total trade volumes</b>	<b>-15</b> <b>(-18 to -13)</b>	<b>-10</b> <b>(-13 to -7)</b>	<b>-1</b> <b>(-3 to 0)</b>	<b>-1</b> <b>(-3 to 0)</b>	<b>-4</b>
<b>Total UK exports</b>	<b>-12</b> <b>(-13 to -10)</b>	<b>-8</b> <b>(-10 to -5)</b>	<b>-1</b> <b>(-2 to 0)</b>	<b>0</b> <b>(-1 to +1)</b>	<b>-3</b>
<b>Total UK imports</b>	<b>-18</b> <b>(-21 to -16)</b>	<b>-12</b> <b>(-15 to -9)</b>	<b>-2</b> <b>(-4 to -1)</b>	<b>-2</b> <b>(-4 to 0)</b>	<b>-5</b>

Central estimates and ranges in brackets.<sup>146</sup>

The benefits of new trade deals with countries outside of the EU are captured in the UK-rest of world total trade volumes. Estimates are rounded to the nearest per cent. Owing to rounding, narrow ranges (less than one per cent variation) are not distinguishable in the table.

This does not include migration or regulatory flexibility effects.

<sup>145</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for the NTB sensitivity.

<sup>146</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

### Analysis of the modelled no deal scenario

159. The increase in trade barriers under the modelled no deal scenario is estimated to result in lower UK-EU trade volumes compared to today's arrangements. While UK imports and exports are both affected by similar increases in trade costs, the volume of imports is affected more as a result of a fall in domestic incomes and demand. Some trade is estimated to shift to non-EU markets, with total trade with the rest of the world expected to grow as a result of this and new trade deals.

### Analysis of the modelled White Paper scenario

160. As set out in section 3, the analysis estimates that the modelled White Paper scenario would result in a modest increase in trade costs with the EU compared to today's arrangements. As a result, the macroeconomic analysis estimates that UK-EU total trade volumes would be lower compared to today's arrangements.

161. The analysis estimates that the modelled White Paper scenario with an additional sensitivity for potential higher levels of NTBs with the EU would result in lower trade volumes between the UK and EU compared to today's arrangements as a result of higher NTBs, particularly for manufactured goods sectors which trade most with the EU.

### Analysis of other scenarios

162. Trade barriers in the **modelled average FTA scenario** are estimated to result in lower total UK trade with the EU compared to today's arrangements. In the **modelled EEA-type scenario**, trade barriers are higher than today's arrangements resulting in lower EU trade. This is driven by customs costs on goods.

### Comparison to modelled no deal scenario

163. Table 4.3 sets out comparisons between the modelled White Paper and modelled average FTA scenarios, and the modelled no deal scenario.

**Table 4.3: Summary of trade volume impacts compared to the modelled no deal scenario.**

Compared to modelled no deal scenario (percentage point difference)	Modelled White Paper		
	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>147</sup>	Modelled average FTA
<b>Total trade volume impact</b>	+14	+11	+5

Central estimates only.<sup>148</sup>

Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.

This does not include migration or regulatory flexibility effects.

164. The impact on UK-EU trade volumes is substantially smaller in the modelled White Paper scenario than in the modelled no deal scenario, reflecting lower trade barriers with the EU. At the same time, the increase in trade with the rest of the world is somewhat smaller than in the

<sup>147</sup> Sensitivity analysis highlights the impact on GDP if the NTBs are higher than estimated in the modelled White Paper scenario. A sensitivity point is measured reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent.

<sup>148</sup> Ranges are not modelled for the differences between scenarios, or for the 50 per cent NTB sensitivity.

modelled no deal scenario as the incentive to shift trade to non-EU markets is lower. Overall, the impact on total UK trade is considerably smaller in the White Paper scenario.

### 4.3 Impact of trade policy on economic output

165. Openness to trade benefits the economy and raises output through a number of channels. Higher trade volumes create a larger market for firms to sell their goods and services into, allowing for the most productive to expand. Openness can increase competition between firms, incentivising specialisation, innovation and the adoption of new technology, through greater returns to new investment. These factors help to drive up productivity and long-term growth, while also expanding consumer choice and reducing prices. The expansion in production also drives increases in real wages and incomes, which further supports demand in the economy. A reduction in trade volumes between countries would be expected to lower productivity and long-term growth.
166. Table 4.4 shows the estimated impact on economic output (measured by GDP) and real wages of the above trade impacts, independent of any additional impacts from migration (covered in section 4.7) and regulatory flexibility.<sup>149</sup>

**Table 4.4: Summary of trade only impacts on GDP and real wages compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>150</sup>
<b>GDP</b>	-7.6 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.7 (-1.4 to -0.2)	-2.2
<b>Real wages</b>	-10.0 (-11.8 to -8.3)	-6.4 (-8.5 to -4.2)	-1.5 (-2.8 to -0.9)	-0.9 (-1.9 to -0.1)	-2.7

Central estimates and ranges in brackets.<sup>151</sup>

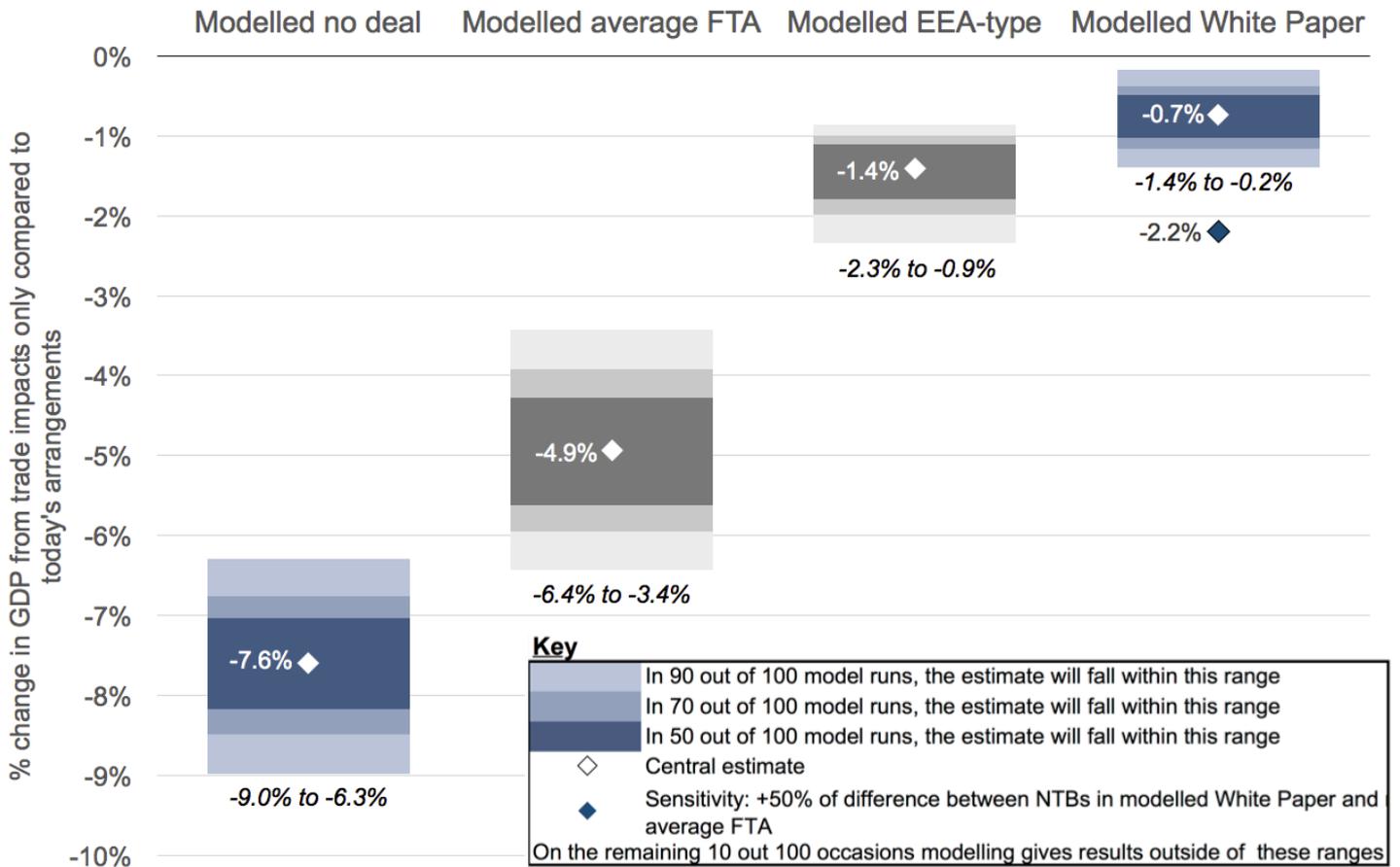
This does not include migration or regulation effects.

<sup>149</sup> The assumption of fixed population in the model implies that GDP per capita impacts of trade-related effects are the same as GDP impacts.

<sup>150</sup> Sensitivity analysis highlights the impact on GDP and real wages if the NTBs are higher than estimated in the Government's modelled White Paper scenario. The central estimate for a sensitivity point, reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios, is presented. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. Ranges are not estimated for the NTB sensitivity.

<sup>151</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

Figure 4.3: Summary of trade only impacts on GDP compared to today's arrangements.

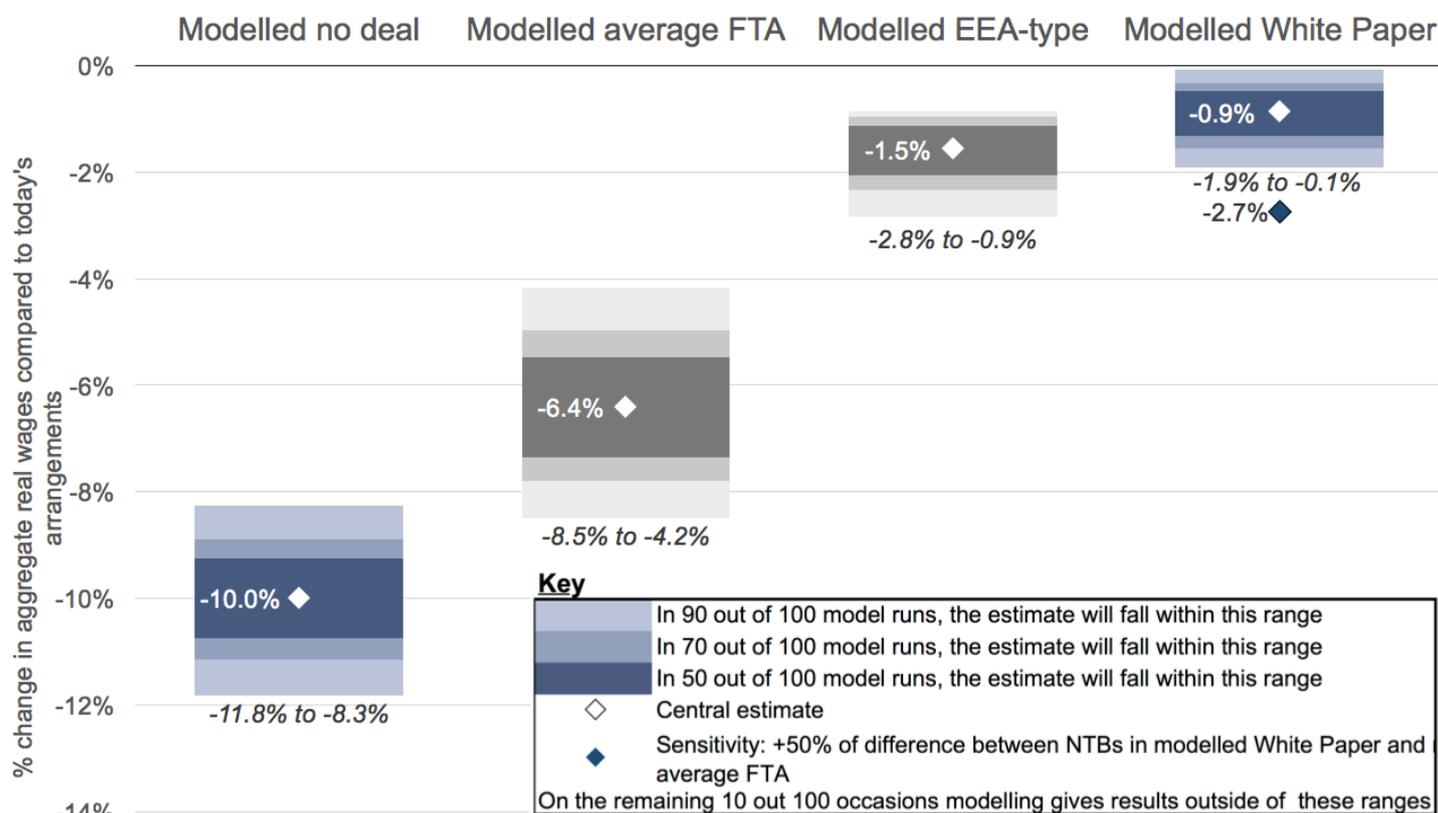


Central estimates and ranges.<sup>152</sup>

The benefits of new trade deals with countries outside of the EU are captured.

This does not include migration or regulatory flexibility effects.

<sup>152</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

**Figure 4.4: Summary of trade only impacts on aggregate real wages compared to today's arrangements.**

Central estimates and ranges.<sup>153</sup>

This does not include migration or regulatory flexibility effects.

### Analysis of the modelled no deal scenario

**167.** The lower GDP in the modelled no deal scenario, compared to today's arrangements, is a result of the larger trade reductions discussed above. This reflects the combined impact of trade frictions on firms' gross output, their productivity and households' purchasing power. High trade barriers depress the demand for labour and increase the cost of imported goods and services.

**168.** The GDP impact can be decomposed into changes in real wages, capital earnings and tax revenues. Real wages fall by more than GDP across the modelled scenarios; and this is balanced by capital earnings and tax revenues, which fall by less than GDP on average in all scenarios.

### Analysis of modelled White Paper scenario

**169.** Compared to today's arrangements, economic output and real wages in the modelled White Paper are estimated to be moderately lower in the long run.

**170.** The modelled White Paper scenario with an additional sensitivity demonstrates lower economic output and real wages resulting from higher levels of NTBs.

<sup>153</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

## Analysis of other scenarios

171. Compared to today's arrangements, GDP and real wages are lower in the **modelled average FTA scenario** due to customs and other NTB costs.
172. Compared to today's arrangements, GDP is lower in the **modelled EEA-type scenario** reflecting the impact of customs administration costs. The GDP impact is also greater than the modelled White Paper scenario despite similar aggregate trade impacts. This reflects greater increases in trade barriers on goods vis-a-vis services in the modelled EEA-type scenario, where a greater reduction in demand for UK goods feeds through into lower intermediate demand for services, as goods manufacturers are consumers of business and financial services. In the modelled White Paper scenario in contrast, while services barriers are higher than in the modelled EEA-type scenario, the barriers on goods trade are lower and this leads to a smaller overall impact.

## Comparison to modelled no deal scenario

173. Table 4.5 sets out comparisons between the modelled White Paper and modelled average FTA scenarios, and the modelled no deal scenario.

**Table 4.5: Summary of trade only impact on GDP and real wages compared to the modelled no deal scenario.**

Compared to modelled no deal (percentage point difference)	Modelled White Paper		
	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>154</sup>	Modelled average FTA
<b>GDP</b>	+6.9	+5.4	+2.7
<b>Real wages</b>	+9.1	+7.2	+3.6

Central estimates only.

Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.

## 4.4 Sectoral impacts of trade policy only

174. Trade policy, and openness to trade in particular, will influence the size and shape of the UK economy and can result in movement of economic activity between sectors. The macroeconomic analysis considers the economic impact on five sector groups and a further breakdown of eleven sectors of the economy, based on the characteristics and estimated changes to trade barriers for the sectors as described in section 3.
175. The results are driven by each sector group's relative openness to trade, the barriers that the sector group faces in the scenarios and the level of integration the sectors have with the rest of the UK economy. As the economy adjusts to the changes in trade costs, economic activity will shift between sectors depending on how they are affected by changes to trade barriers.
176. The sectoral analysis does not factor in the impact of changes in migration.

<sup>154</sup> Sensitivity analysis highlights the impact on GDP if the NTBs are higher than estimated in the modelled White Paper scenario. A sensitivity point is measured reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent.

**Table 4.6: Summary of trade only impacts on sector group economic activity compared to today's arrangements.**

Compared to today's arrangements (per cent change in GVA)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>155</sup>
<b>Manufactured Goods</b>	-12 (-14 to -10)	-8 (-11 to -4)	-2 (-5 to -0.5)	-0.1 (-0.4 to +0.2)	-2
<b>Agri-food</b>	-11 (-12 to -9)	-7 (-9 to -5)	-3 (-5 to -2)	-2 (-2 to -2)	-4
<b>Services</b>	-8 (-10 to -6)	-5 (-7 to -3)	-1 (-2 to -0.8)	-0.9 (-2 to -0.1)	-2
<b>Financial Services</b>	-9 (-11 to -6)	-7 (-9 to -4)	-1 (-2 to -0.8)	-0.8 (-3 to -0.2)	-4
<b>Networks</b>	-4 (-5 to -2)	-2 (-3 to -0.3)	+0.2 (-0.3 to +0.7)	+0.8 (+0.3 to +1)	-0.4

Central estimates and ranges in brackets.<sup>156</sup>

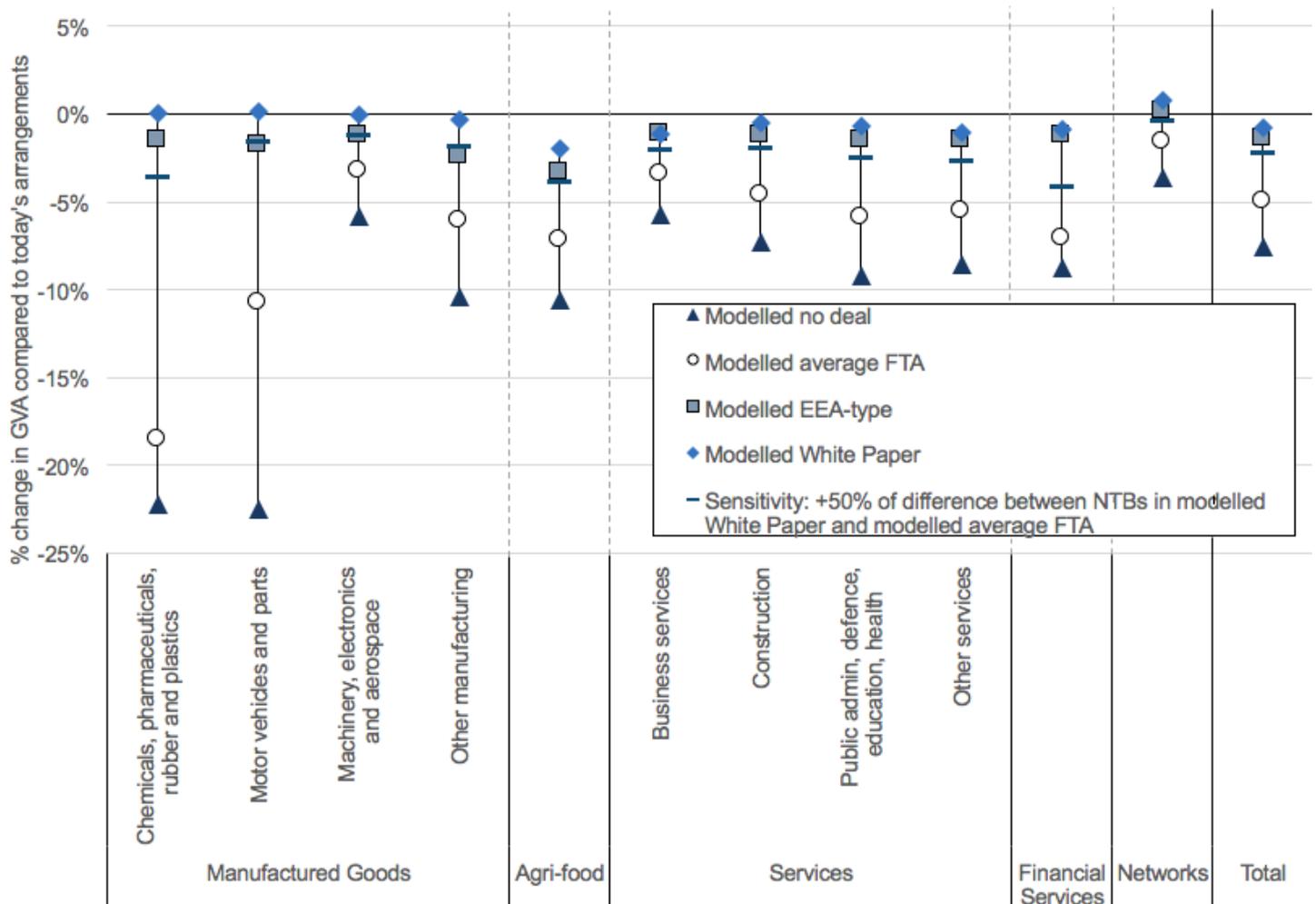
The benefits of new trade deals with countries outside of the EU are captured.

This does not include migration or regulatory flexibility effects.

<sup>155</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

<sup>156</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo process, which draws several thousand input values from their full distributions.

Figure 4.5: Summary of trade only impacts on UK sectors, compared to today's arrangements



Central estimates only.<sup>157</sup>

This does not include migration or regulatory flexibility effects.

Other sectoral modelling suggests economic output in the agriculture sector could increase in a no deal scenario with EU MFN tariffs, although this is at the expense of consumers who face higher costs (see box on Agri-food additional modelling).

The benefits of new trade deals with countries outside of the EU are captured.

Sectoral GVA excludes tariff revenue.

### Analysis of the modelled no deal scenario

177. The macroeconomic analysis indicates that a modelled no deal scenario would result in lower economic activity (GVA) in all sector groups of the economy compared to today's arrangements (see Table 4.5).<sup>158</sup>

178. The **manufactured goods** sector group, representing 8 per cent of economic production,<sup>159</sup> is estimated to be the most affected sector group in the modelled no deal scenario, compared to today's arrangements. This sector group trades heavily with the EU and would face increases in

<sup>157</sup> The ranges around these results are set out in the Technical Reference Paper. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

<sup>158</sup> GDP (gross domestic product) and GVA (gross value-added) are closely related concepts. They differ by taxes and subsidies, which can be difficult to robustly attribute to a particular sector.

<sup>159</sup> 'UK GDP(O) low level aggregates', ONS, September 2018.

NTB and tariffs. In particular, within manufactured goods, heavily traded sectors such as chemicals, pharmaceuticals, rubber and plastics and motor vehicles and parts are estimated to see the largest reduction in economic activity.

### **Agriculture modelling**

The modelling results suggest that the agri-food sector is particularly affected across the scenarios. However, other analysis has looked at the agriculture sector at a more disaggregated and detailed level, allowing for consideration of the complex and variable tariff structure in the agri-food sector.<sup>160</sup> These approaches generally find the sector would benefit from higher tariffs, with domestic producers benefitting (given the UK is a net-importer of agri-food products), though this may result in higher prices for consumers. These results generally derive from models which consider the direct impact on the sector but do not tend to account, as macroeconomic models do, for changes in demand from the rest of the economy – which can be lower when the overall size of the economy falls (though this effect is likely to be limited in this sector given low levels of substitution away from food consumption). This difference in results between modelling approaches is unlikely to significantly affect the overall economy-wide modelling estimates given the size of the agriculture sector.

179. The **financial services** and **services sector groups**, representing 80 per cent of economic production,<sup>161</sup> are also estimated to see lower economic activity compared to today's arrangements;<sup>162</sup> however, the impact is smaller than manufactured goods and agri-food. The service sector is more domestically focused in its economic activity, leading to a smaller estimated effect from the rising trade barriers.
180. Although the direct impact of new barriers is estimated to be lower, services are purchased by many other sectors of the economy, including those within the manufactured goods sector group. The modelling captures this indirect impact of the demand for services falling from other sectors of the economy alongside the direct impact from new barriers to trade.
181. Economic activity in the **networks sector group**, 8 per cent of economic production<sup>163</sup>, is also estimated to be lower.

### **Analysis of modelled White Paper scenario**

182. The modelled White Paper scenario is estimated to result in lower economic activity than under today's arrangement in most sector groups.
183. In a number of sectors, the range indicates a small positive impact compared to today's arrangements is possible. However, outcomes at each end-point of the range are less likely to occur than central estimates. In **manufactured goods**, a positive impact is possible as a result of low trade barriers with the EU combined with additional opportunities outside of the EU in trading more with the rest of world. It is however important to note that the central estimate for economic activity is lower relative to today's arrangements.
184. The **networks** sector group (which includes energy) is also estimated to see a small impact across the range of modelled scenarios compared to today's arrangements, despite higher

<sup>160</sup> For example '[EU – UK agricultural trade: state of play and possible impacts of Brexit](#)', European Parliament, Policy Department for Structural and Cohesion Policies, October 2017; '[Impacts of Alternative Post-Brexit Trade Agreements on UK Agriculture: Sector Analyses using the FAPRI-UK Model](#)', Agri-Food and Biosciences Institute, August 2017.

<sup>161</sup> '[UK GDP\(O\) low level aggregates](#)', ONS, September 2018.

<sup>162</sup> Please note that the statistics for services trade has higher uncertainty around it than goods trade given the difficulty in estimating flows. Please see Technical Reference Paper, sections 5 and 7 for further information.

<sup>163</sup> Please note that the statistics for services trade has higher uncertainty around it than goods trade given the difficulty in estimating flows. Please see Technical Reference Paper, sections 5 and 7 for further information.

trade barriers. As the products supplied by the networks sector are important inputs into most sectors, businesses are less able to substitute to lower cost alternatives. As a result, demand does not change substantially in response to changes in costs, leading to a small change in sector economic output.

- 185. Services and financial services** sector groups are estimated to see a small negative impact on output in the modelled White Paper scenario. While the sector group see a comparatively large increase in NTBs with the EU, this impact reflects the importance of domestic demand and their supply of services to goods sectors, which are impacted less significantly.
- 186.** The sensitivity run on the modelled White Paper scenario demonstrates the additional negative impacts as NTBs rise towards those in the average FTA scenario. The NTBs rise more in manufactured goods than in services, leading to an increase in barriers to sectors that trade the most with the EU.

### Analysis of other scenarios

- 187.** The **modelled average FTA scenario** results in lower economic activity across all sector groups compared to today's arrangements, particularly in **chemicals, pharmaceuticals, rubber and plastics**.
- 188.** The **modelled EEA-type scenario** results in lower economic activity across most sector groups compared to today's arrangements. Goods sectors see the largest negative impact driven by customs costs.

### Comparison to modelled no deal scenario

- 189.** Table 4.7 sets out comparisons between the modelled White Paper and modelled average FTA scenarios, and the modelled no deal scenario.

**Table 4.7: Summary of trade only impacts on sector groups compared to the modelled no deal scenario**

Compared to modelled no deal (percentage point difference in GVA)	Modelled White Paper		
	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>164</sup>	Modelled average FTA
<b>Manufactured Goods</b>	+12	+10	+4
<b>Agri-food</b>	+9	+7	+3
<b>Services</b>	+7	+6	+3
<b>Financial Services</b>	+8	+5	+2
<b>Networks</b>	+4	+3	+2

Central estimates only.

This does not include migration or regulatory flexibility effects.

Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.

<sup>164</sup> Sensitivity analysis highlights the impact on GDP if the NTBs are higher than estimated in the modelled White Paper scenario. A sensitivity point is measured reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent.

## 4.5 Regional impacts of trade policy

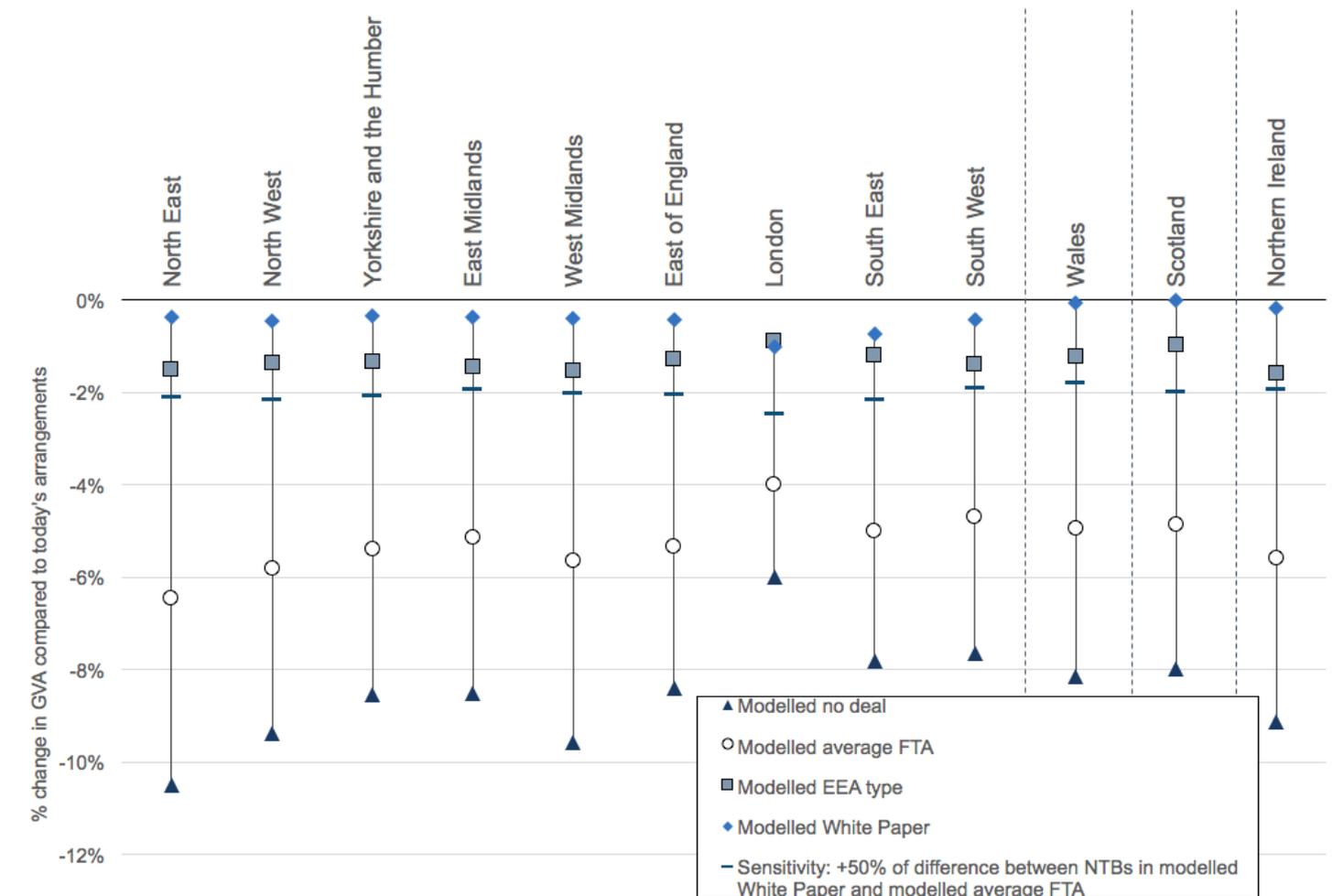
190. The impact of the UK's exit from the EU will vary between the nations of the UK and English regions.<sup>165, 166</sup> Areas that trade more with the EU, or are more specialised in sectors facing potential new trade costs, are predicted to be most affected.
191. The Government's approach to estimating the long-term economic effect of EU exit on nations and regions uses estimates of UK exports and economic production in each sector, distributing them to nations and regions, reflecting sectoral specialisation of each region. For instance, the North East is relatively specialised in the export of goods, whereas London is relatively specialised in the export of services. It follows that a scenario which has relatively better outcomes for goods would tend to result in the North East doing relatively better than London. The approach also considers how the impact on one region can flow through to other areas of the UK as a result of integrated supply chains.
192. The impacts on nations and regions do not make any assumptions about the future policy choice by the devolved administrations in areas where they have competence.
193. The regional analysis distributes overall UK estimates from the national macroeconomic model, which assumes full employment and does not capture any short-term disruption. The regional analysis does not factor in the impact of changes in migration. Under the illustrative migration scenario of zero net inflows of EEA workers, the regional impacts would likely be greater.

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<sup>165</sup> The analysis uses Nomenclature of Territorial Units for Statistics (NUTS) 1 classifications to capture national and English regional impacts.

<sup>166</sup> The regional estimates from the preliminary Cross-Whitehall Analysis published by the Exiting the EU Select Committee (March 2018) were provisional and reflected an early stage in the analysis. The model has been developed to better capture interregional linkages through supply chains, resulting in less variation between regions and nations. However, the regional analysis in this publication does not factor in the impact of changes in migration and is therefore not directly comparable with the preliminary estimates in March.

**Figure 4.6: Summary of trade policy impacts on UK nations and English regions compared to today's arrangements.**



Central estimates only.<sup>167</sup>

The benefits of new trade deals with countries outside of the EU are captured in these estimates.

This does not include migration and regulatory flexibility effects.

### Analysis of the modelled no deal scenario

194. The Government's analysis of the modelled no deal scenario estimates that all nations and regions of the UK would have lower economic activity in the long run compared to today's arrangements.
195. The impact varies across the nations of the UK, largely driven by sectoral impacts (see section 4.4). For example, the manufactured goods sector group is particularly affected in the modelled no deal scenario and the analysis indicates that Northern Ireland, Wales and Scotland would all see sizeable reductions in their level of economic output.
196. Within England, the estimated impact varies between regions also largely driven by sectoral impacts. For example, motor vehicles and parts and chemicals, pharmaceuticals, rubber and plastics are particularly affected in the modelled no deal scenario and, as a result, the North East sees the largest impact on economic activity. Conversely, the smallest change to economic

<sup>167</sup> The ranges around these results are set out in the Technical Reference Paper.

activity is estimated for London, since it is relatively more specialised in business services and financial services that are relatively less affected in the modelled no deal scenario.

### Analysis of modelled White Paper scenario

197. The Government's White Paper scenario is estimated to result in moderately lower economic output for Scotland, Wales and Northern Ireland, compared to today's arrangements. Wales and Scotland have a relatively larger specialisation in energy which is estimated to perform relatively well, and therefore experience a relatively smaller impact.
198. Within England, London, is estimated to be most affected in the modelled White Paper scenario, followed by the South East, although impacts are still small relative to other scenarios. This is driven by the larger increase in trade costs in financial services and business services relative to good sectors compared to today's arrangements.
199. For the sensitivity run on the modelled White Paper scenario, the higher NTBs increase the estimated regional impacts relative to today's arrangements. This does not include migration or regulatory flexibility effects.

### Analysis of other scenarios

200. In the **modelled average FTA** scenario, all nations and regions of England are estimated to have lower economic output compared to today's arrangements. In the **modelled EEA-type** scenario, economic activity is also lower than today's arrangements.

### Comparison to modelled no deal scenario

201. Table 4.8 sets out comparisons between the modelled White Paper and modelled average FTA scenarios, and the modelled no deal scenario.

**Table 4.8: Summary of trade policy impacts on UK nations and English regions compared to the modelled no deal scenario.**

Compared to modelled no deal (percentage point difference in GVA)	Modelled White Paper		
	<i>Modelled White Paper</i>	<i>Modelled White Paper with 50 per cent NTB sensitivity<sup>168</sup></i>	<b>Modelled average FTA</b>
<b>North East</b>	+10.1	+8.4	+4.0
<b>North West</b>	+8.9	+7.2	+3.6
<b>Yorkshire and the Humber</b>	+8.2	+6.5	+3.2
<b>East Midlands</b>	+8.2	+6.6	+3.4
<b>West Midlands</b>	+9.2	+7.5	+3.9
<b>East of England</b>	+8.0	+6.3	+3.1
<b>London</b>	+5.0	+3.5	+2.0
<b>South East</b>	+7.1	+5.7	+2.8
<b>South West</b>	+7.2	+5.7	+2.9
<b>Wales</b>	+8.1	+6.4	+3.2
<b>Scotland</b>	+8.0	+6.0	+3.1
<b>Northern Ireland</b>	+8.9	+7.2	+3.5

<sup>168</sup> Sensitivity analysis highlights the impact on GDP if the NTBs are higher than estimated in the modelled White Paper scenario. A sensitivity point is measured reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent.

*Central estimates only.*

*Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.*

*This does not include migration and regulatory flexibility effects.*

## 4.6 Migration impacts

- 202.** Free movement of people will end as the UK leaves the EU. This will have an effect on the UK economy alongside changes in the UK's trading relationships with the EU and the rest of the world. For the purposes of this analysis, decisions on trade and migration are assumed to be largely separate, with the exception of the modelled EEA-type arrangement. Ahead of the final decisions on the UK's future migration arrangements, this analysis considers the potential economic impacts of two illustrative variants for migration arrangements, as set out in section 2.4. This section considers the impacts of migration only, with combined impacts discussed in the following section.
- 203.** The results in this section estimate two separate effects of long-term migration flows: first, those due to changes to the wider economy driven by trade changes, which affect EEA workers' decisions to come to the UK (denoted 'no change to migration arrangements' in Table 4.9), where lower economic output reduces the incentives for workers to emigrate to the UK; second, those due to changes to migration arrangements.
- 204.** Two illustrative variants for migration arrangements are shown. This is represented as a range between no change to migration arrangements and zero net inflows of EEA workers. The analysis does not assume any changes to non-EEA migration. While no change in migration arrangements is modelled, this is not reflective of government policy. Zero net inflows of EEA workers is stylised and illustrative only. The migration estimates are based on a horizon 15 years after the UK's future relationship with the EU comes into effect, consistent with the trade analysis.
- 205.** The impact of GDP and GDP per capita is shown for all scenarios. In the two scenarios, changes in net migration affect the size of the labour force, with GDP impacts resulting from this. The impact of lower migration on GDP per capita is smaller than on GDP reflecting the smaller size of the population. GDP per capita is a more appropriate measure of the impact on the living standards of the UK resident population. However, total GDP is more important when considering the impact on the public finances.
- 206.** The economic impacts of the illustrative migration variations are combined with all modelled trade scenarios, with the exception of the modelled EEA-type scenario where no restriction to EEA worker inflows is considered.

**Table 4.9: Summary of additional GDP, population and per capita GDP impacts of illustrative migration scenarios compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>169</sup>
<b>Additional GDP impact</b>					
No change to migration arrangements	-0.2	-0.1	0.0	0.0	0.0
Zero net inflows of EEA workers	-1.8	-1.8	N/A	-1.8	-1.8
<b>Population impact</b>					
No change to migration arrangements	-0.1	-0.1	0.0	0.0	0.0
Zero net inflows of EEA workers	-1.2	-1.2	N/A	-1.2	-1.2
<b>Additional GDP per capita impact</b>					
No change to migration arrangements	-0.1	0.0	0.0	0.0	0.0
Zero net inflows of EEA workers	-0.6	-0.6	N/A	-0.6	-0.6

Central estimates only. Impacts assumed to occur over 15 years, with no accounting for labour market adjustment.

207. The illustrative migration scenario of zero net inflows of EEA workers leads to the same total reduction in labour supply across all scenarios, and hence to the same impact on GDP and GDP per capita. The EEA type scenario would see continued free movement. Under no change to migration arrangements, the impact on GDP is driven by migration flows impacted by the size of the economy, which are assumed to be lower when the economy is smaller. This impact is greatest in the modelled no deal and average FTA scenarios.

## 4.7 Overall economic impacts combining trade, migration and regulation effects

### 4.7.1 GDP and GDP per capita

208. The following section sets out the overall economic impact on the whole economy, combining the estimated impact of the change in trade policy and the modelled illustrative changes in migration. GDP per capita impacts are also shown, which are a more appropriate measure of the impact on the UK resident population.

<sup>169</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

209. In addition, the illustrative 0.1 percentage point economic benefit of greater flexibility over UK regulations discussed in section 2 is included in all modelled scenarios with the exception of the modelled EEA-type scenario.

210. The combined impact on GDP and GDP per capita is summarised in Table 4.10.

**Table 4.10: Summary of overall GDP and GDP per capita impacts of combined trade, migration and regulation effects compared to today's arrangements, for the illustrative no change to migration arrangements and zero net inflows of EEA workers scenarios.<sup>170</sup>**

Compared to today's arrangements (per cent change)		Modelled White Paper				
		Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>171</sup>
No change to migration arrangements	GDP	-7.7 (-9.0 to -6.3)	-4.9 (-6.4 to -3.4)	-1.4 (-2.4 to -0.9)	-0.6 (-1.3 to -0.1)	-2.1
	GDP per capita <sup>172</sup>	-7.6 (-8.9 to -6.2)	-4.9 (-6.4 to -3.4)	-1.4 (-2.3 to -0.9)	-0.6 (-1.3 to -0.1)	-2.1
Zero net inflows of EEA workers	GDP	-9.3 (-10.7 to -8.0)	-6.7 (-8.1 to -5.1)	N/A <sup>173</sup>	-2.5 (-3.1 to -1.9)	-3.9
	GDP per capita	-8.1 (-9.5 to -6.8)	-5.4 (-6.9 to -3.9)	N/A <sup>174</sup>	-1.2 (-1.9 to -0.7)	-2.7

Central estimates and ranges in brackets.<sup>175</sup>

### Analysis of the modelled no deal scenario

211. The migration, regulatory and trade impacts on GDP are broadly additive. The increase in the GDP impact, from the 'trade only' effects, under no change in migration arrangements is relatively small, with a slightly higher effect in the modelled no deal scenario due to the larger GDP impact which reduces the incentive for EEA workers to come to the UK. Assuming zero net inflows of EEA workers leads to roughly a 1.8 percentage points greater impact in headline GDP terms compared to 'trade only' effects, but this falls to a 0.6 percentage points greater impact in GDP per capita terms reflecting the fact that lower net migration implies a smaller resident population.

<sup>170</sup> The estimates provided are central estimates of the ranges given in brackets. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

<sup>171</sup> Sensitivity analysis highlights the impact on GDP if NTBs are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in NTBs between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for the NTB sensitivity.

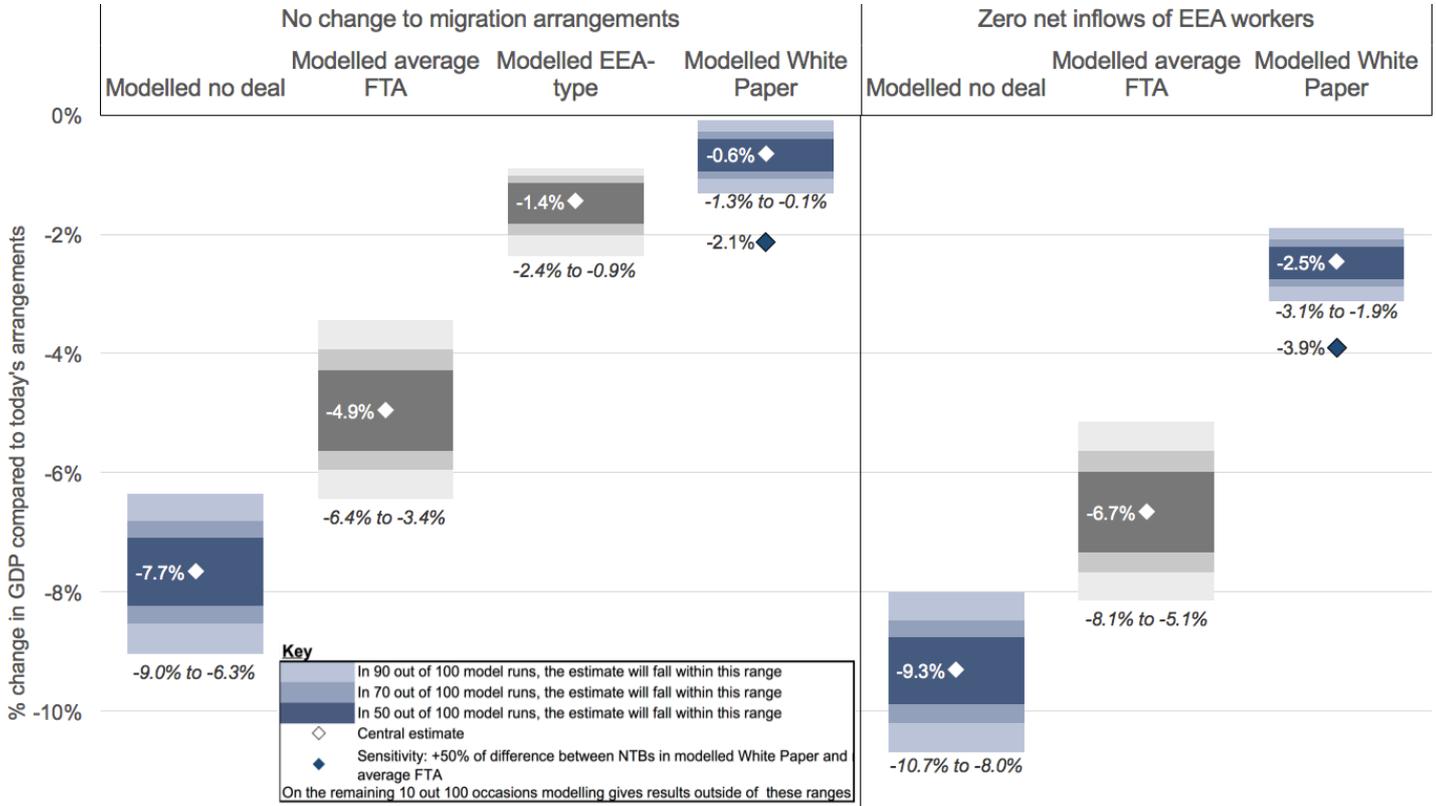
<sup>172</sup> The combined impact on per capita GDP is the sum of per capita GDP impacts from trade and migration scenarios.

<sup>173</sup> Analysis assumes no change to migration arrangements in a modelled EEA-type scenario.

<sup>174</sup> Analysis assumes no change to migration arrangements in a modelled EEA-type scenario.

<sup>175</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

**Figure 4.7: Summary of overall impact on GDP compared to today's arrangements, for the illustrative no change to migration arrangements and the zero net inflows of EEA workers scenarios.**

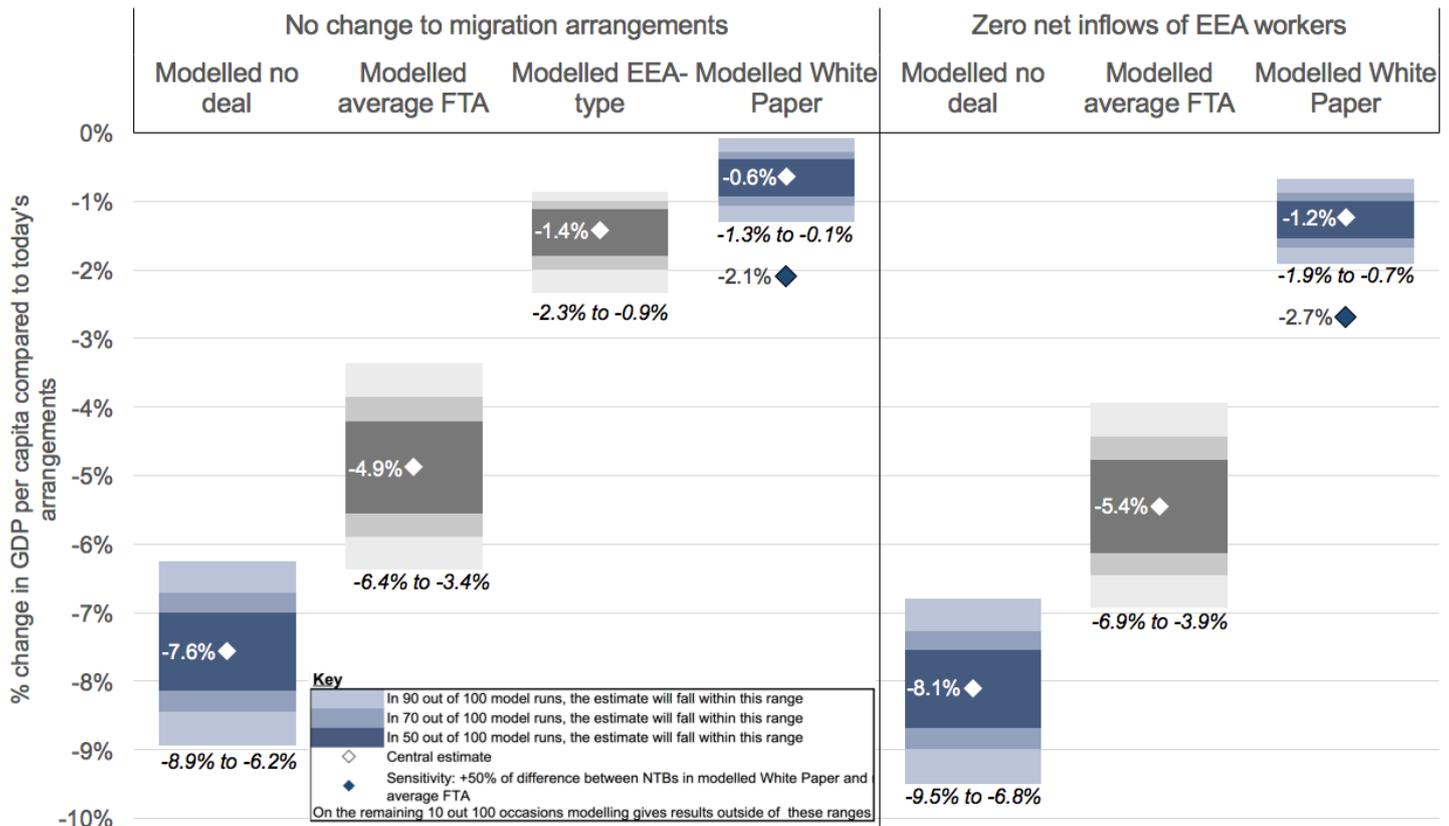


Central estimates and ranges.<sup>176</sup>

Analysis assumes no change to migration arrangements in the modelled EEA-type scenario. As such, they are not shown on the right hand side of the chart above.

<sup>176</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

**Figure 4.8: Summary of overall impact on GDP per capita compared to today's arrangements, for the illustrative no change to migration arrangements and the zero net inflows of EEA workers scenarios.**



Central estimates and ranges.<sup>177</sup>

Analysis assumes no change to migration arrangements in the modelled EEA-type scenario. As such, they are not shown on the right hand side of the chart above.

### Analysis of modelled White Paper scenario

**212.** With no change to migration arrangements, the combined impact of trade, migration and regulation changes in the modelled White Paper scenario leads to a slightly less negative overall range of economic output impacts, compared to the trade only effects, than under today's arrangements, since the small uplift from regulatory flexibility outweighs the small further reduction due to lower induced migration. Assuming zero net inflows of EEA workers leads to the same further reduction in economic output as in the modelled no deal scenario. In GDP per capita terms, the assumption of zero net inflows of EEA workers leads to a further 0.6 per cent reduction in the range of impacts relative to no change in migration.

**213.** The modelled White Paper scenario with additional sensitivity demonstrates lower overall economic output due to the higher levels of NTBs. This in turn leads to the impact of migration increasing slightly.

### Analysis of other scenarios

**214.** As with the trade impacts discussed above, the GDP in the **modelled average FTA scenario** is estimated to be lower than today's arrangements. The impact lies in between the modelled no

<sup>177</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

deal and modelled White Paper scenarios when the combined impacts of trade, migration and regulatory flexibility are considered.

215. A zero net inflows of EEA workers scenario would not apply in the **modelled EEA-type scenario** as this would require continued free movement. Since the induced migration impacts are small and there are no assumed impacts from regulatory flexibility in this scenario, the combined impacts of trade, migration and regulation changes are estimated to be the same as those for trade impacts only, compared with today's arrangements.

### Comparison to modelled no deal scenario

216. Table 4.11 sets out comparisons between the modelled White Paper and modelled average FTA scenarios, and the modelled no deal scenario.

**Table 4.11: Summary of total impact on GDP and GDP per capita compared to the modelled no deal scenario, for the illustrative no changes to migration arrangements and the zero net inflows of EEA workers scenarios.**

Compared to modelled no deal (percentage point difference)		Modelled White Paper		
		Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>178</sup>	Modelled average FTA
No change to migration arrangements	GDP	+7.0	+5.5	+2.7
	GDP per capita	+6.9	+5.5	+2.7
Zero net inflows of EEA workers	GDP	+6.9	+5.4	+2.7
	GDP per capita	+6.9	+5.4	+2.7

Central estimates only.

These figures are similar because the addition of migration and regulatory flexibility effects difference out. These effects are added into both modelled no deal and modelled White Paper scenarios.

Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.

### 4.7.2 Decomposition of the changes in economic output

217. As described above, a range of factors will determine changes in economic output in the modelled scenarios, including both tariff and non-tariff trade barriers, migration, regulation and an independent trade policy. The impact of each factor is set out in Table 4.12 below.
218. The analysis indicates that new trade costs<sup>179</sup> on trade between the UK and EU are the main driver of changes in economic output in all modelled scenarios. Changes in migration make a smaller but significant contribution.
219. The analysis indicates that estimated changes to NTBs represent the largest driver of differences in the GDP impact between the modelled White Paper and the modelled no deal scenarios, followed by tariffs (see Table 4.12).

<sup>178</sup> Sensitivity analysis highlights the impact on GDP if non-tariff barriers are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in non-tariff barriers between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

<sup>179</sup> Including temporary movement of people to supply a service.

Table 4.12: Summary of drivers of the long run aggregate GDP impact, compared to today's arrangements.<sup>180</sup>

Compared to today's arrangements (per cent change in GDP)	Modelled White Paper				
	Modelled no deal scenario	Modelled average FTA scenario	Modelled EEA-type scenario	Modelled White Paper scenario	Modelled White Paper with 50 per cent NTB sensitivity <sup>181</sup>
<b>Trade contribution:</b>					
Tariffs	-1.4	0	0	0	0
NTBs	-6.5	-5.1	-1.5	-0.9	-2.3
New trade deals	+0.2	+0.1	+0.1	+0.2	+0.1
Total Trade impact	<b>-7.6</b>	<b>-4.9</b>	<b>-1.4</b>	<b>-0.7</b>	<b>-2.2</b>
<b>Additional regulation and migration contributions:</b>					
Regulatory flexibility	+0.1	+0.1	0	+0.1	+0.1
Migration (no change to migration arrangements)	-0.2	-0.1	0	0	0.0
Migration (zero net inflows of EEA workers)	-1.8	-1.8	N/A	-1.8	-1.8
<b>Overall combined impact</b>					
<b>UK GDP (no change to migration arrangements)</b>	<b>-7.7</b> <i>(-9.0 to -6.3)</i>	<b>-4.9</b> <i>(-6.4 to -3.4)</i>	<b>-1.4</b> <i>(-2.4 to -0.9)</i>	<b>-0.6</b> <i>(-1.3 to -0.1)</i>	<b>-2.1</b>
<b>UK GDP (zero net inflows of EEA workers)</b>	<b>-9.3</b> <i>(-10.7 to -8.0)</i>	<b>-6.7</b> <i>(-8.1 to -5.1)</i>	<b>N/A</b>	<b>-2.5</b> <i>(-3.1 to -1.9)</i>	<b>-3.9</b>

Central estimates and ranges in brackets.<sup>182</sup> Central estimates only presented for trade and regulatory contributions, noting that an uncertainty range exists around these results.

## 4.8 Fiscal impacts

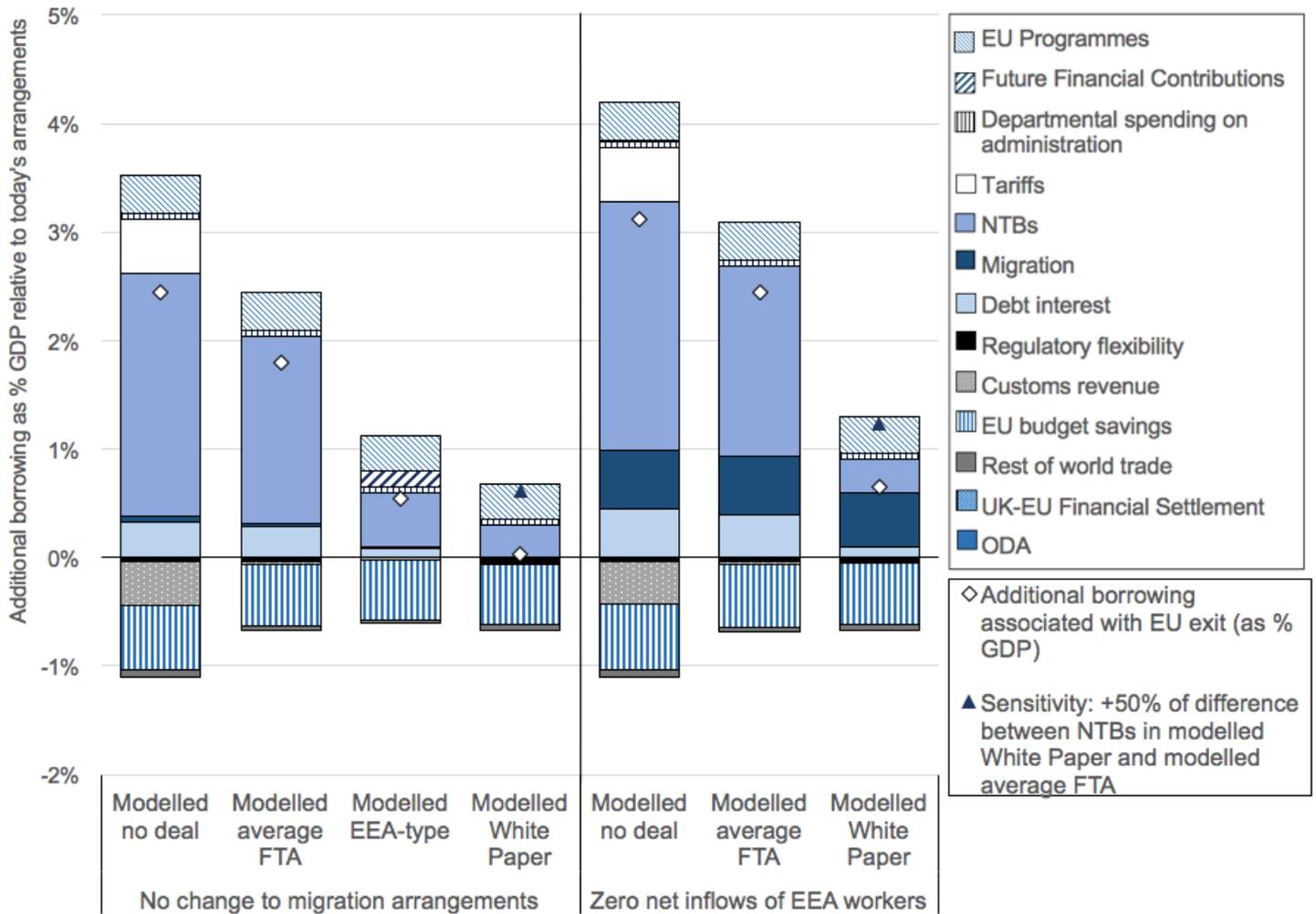
220. The Government has undertaken analysis to understand the impact of different EU exit scenarios on Public Sector Net Borrowing (PSNB), by identifying the indirect and direct costs and savings resulting from leaving the EU. Indirect effects are those related to changes to the size and structure of the economy after the UK leaves the EU, which have implications for tax receipts and welfare spending. Direct effects capture the additional fiscal costs and savings that are not primarily driven by changes in the size of the economy, and include the implications of a new financial relationship with the EU and customs revenue from EU and rest of world trade.
221. The fiscal analysis assumes an end state year of 2035-36, 15 years after the end of the implementation period. Figure 4.9 shows additional borrowing relative to the status quo in each scenario as a per cent of GDP in 2035-36.

<sup>180</sup> Figures may not sum due to rounding.

<sup>181</sup> Sensitivity analysis highlights the impact on GDP if non-tariff barriers are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in non-tariff barriers between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome. Ranges are not estimated for the NTB sensitivity.

<sup>182</sup> The central estimates are not necessarily the midpoint of the range. All ranges have been generated by a Monte Carlo statistical process, which draws several thousand input values from their full distributions.

**Figure 4.9: Impact on public sector net borrowing compared to today's arrangements, per cent of GDP in 2035-36**



The EEA-type scenario has not been modelled with zero net inflows of EEA workers, as EEA membership requires free movement of people. In the modelled EEA-type scenario there are future financial contributions based on Norway's existing precedent. There are no future financial contributions assumed in the other modelled scenarios. The July White Paper set out that the UK will make an appropriate financial contribution where the UK participates in EU programmes or agencies, and this is open to negotiations.

The cost of the financial settlement and ODA in 2035-36 are small and not visible in the chart. The Technical Reference Paper includes a detailed breakdown of the fiscal results.

**Table 4.13a: Summary of impact on public sector net borrowing compared to today's arrangements, for the illustrative no change to migration arrangements scenario.**

Compared to today's arrangements as a percentage of GDP in 2035-36)	Modelled no deal scenario	Modelled average FTA scenario	Modelled EEA-type scenario	Modelled White Paper scenario
<b>Net direct impacts</b>	<b>-0.6</b> (-£22.0bn)	<b>-0.2</b> (-£7.0bn)	<b>0.0</b> (-£0.9bn)	<b>-0.2</b> (-£7.0bn)
<b>Net indirect impacts</b>	<b>+2.7</b> (+£104.2bn)	<b>+1.7</b> (+£67.4bn)	<b>+0.5</b> (+£19.6bn)	<b>+0.2</b> (+£8.9bn)
<b>Debt interest</b>	<b>+0.3</b> (+£12.8bn)	<b>+0.3</b> (+£11.6bn)	<b>+0.1</b> (+£3.8bn)	<b>0.0</b> (-£0.5bn)
<b>Additional borrowing associated with EU exit</b>	<b>+2.4</b> <b>(+£95.1bn)</b>	<b>+1.8</b> <b>(+£72.0bn)</b>	<b>+0.5</b> <b>(+£22.5bn)</b>	<b>0.0</b> <b>(+£1.3bn)</b>

Central estimates only

Direct impacts include departmental spending on administration, the UK-EU financial settlement, future EU financial contributions, spending on EU related programmes, customs revenues and EU Budget savings.

Indirect impacts include migration, NTBs, tariffs, regulatory flexibilities and rest of world trade.

**Table 4.13b: Summary of impact on public sector net borrowing compared to today's arrangements, for the illustrative zero net inflows of EEA workers scenario.**

Compared to today's arrangements (change as a percentage of GDP in 2035-36)	Modelled no deal scenario	Modelled average FTA scenario	Modelled EEA-type scenario	Modelled White Paper scenario
<b>Net direct impacts</b>	<b>-0.6</b> (-£21.2bn)	<b>-0.2</b> (-£6.9bn)	N/A	<b>-0.2</b> (-£7.0bn)
<b>Net indirect impacts</b>	<b>+3.2</b> (+£123.4bn)	<b>+2.2</b> (+£87.2bn)	N/A	<b>+0.7</b> (+£29.7bn)
<b>Debt interest</b>	<b>+0.4</b> (+£16.9bn)	<b>+0.4</b> (+£15.7bn)	N/A	<b>+0.1</b> (+£3.8bn)
<b>Additional borrowing associated with EU exit</b>	<b>+3.1</b> <b>(+£119.1bn)</b>	<b>+2.4</b> <b>(+£95.9bn)</b>	N/A	<b>+0.6</b> <b>(+£26.6bn)</b>

Central estimates only.

Direct impacts include departmental spending on administration, the UK-EU financial settlement, future EU financial contributions, spending on EU related programmes, customs revenues and EU Budget savings.

Indirect impacts include migration, NTBs, tariffs, regulatory flexibilities and rest of world trade.

### Analysis of the modelled no deal scenario

222. In the modelled no deal scenario, borrowing is estimated to be 2.4 per cent of GDP (£95.1 billion<sup>183</sup>) higher in 2035-36 compared to today's arrangements assuming no change to migration arrangements. Under the assumption of zero net inflows of EEA workers, the borrowing impact is estimated to be 3.1 per cent of GDP (£119.1 billion). In both variants of the modelled no deal scenario, the net indirect fiscal impact due to a reduction in the size of the economy, which equates to 2.7 to 3.2 per cent of GDP (no change to migration arrangements – zero net inflows of EEA workers, equivalent to £104.2 to 123.4 billion) outweighs net direct fiscal

<sup>183</sup> £ billion impacts are expressed in nominal terms.

savings of 0.6 per cent of GDP (£21.2 to 22.0 billion). There are additional debt interest costs of 0.3 to 0.4 per cent of GDP (£12.8 to 16.9 billion).

### Analysis of the modelled White Paper scenario

223. In the modelled White Paper scenario, borrowing is estimated to be 0.03 per cent of GDP (£1.3 billion) higher in 2035-36 compared to today's arrangements assuming no change to migration arrangements. Under the assumption of zero net inflows of EEA workers, the borrowing impact is estimated to be 0.6 per cent of GDP (£26.6 billion). In both variants of the modelled White Paper scenario, the net indirect fiscal costs due to a reduction in the size of the economy, 0.2 to 0.7 per cent of GDP (£8.9 to 29.7 billion), outweigh net direct fiscal savings of 0.2 per cent of GDP (£7.0 billion).
224. The long-term borrowing impact of the modelled White Paper scenario is 2.4 per cent of GDP (£93.7 billion) lower compared to the modelled no deal scenario in 2035-36 assuming no change to migration arrangements. The borrowing impact is 2.5 per cent of GDP (£92.5 billion) lower under the assumption of zero net inflows of EEA workers. The main driver of higher borrowing in the modelled no deal scenario comes from the impact of NTBs and tariffs which lead to a larger reduction in the size of the economy and tax receipts in the long run. These negative indirect fiscal impacts outweigh the greater net direct fiscal savings estimated in the modelled no deal scenario.

### Analysis of other scenarios

225. In the **modelled average FTA scenario**, there is additional borrowing of 1.8 per cent of GDP (£72.0 billion) in 2035-36 compared to today's arrangements assuming no change to migration arrangements. Under the assumption of zero net inflows of EEA workers, additional borrowing is 2.4 per cent of GDP (£95.9 billion). The additional borrowing impact in the modelled average FTA scenario is higher compared to the modelled White Paper. This primarily reflects higher indirect fiscal effects due to higher NTBs, which lead to a larger long-term reduction in the size of the economy.
226. In the **modelled EEA-type scenario**, there is additional borrowing of 0.5 per cent of GDP (£22.5 billion) in 2035-36 compared to today's arrangements. Net direct fiscal savings are lower in the **modelled EEA-type scenario**, reflecting an assumption that there are future financial contributions to the EU based on Norway's existing precedent. There is no precedent for estimating any financial contributions under the modelled White Paper scenario. The July White Paper set out that the UK will make an appropriate financial contribution where the UK participates in EU programmes or agencies, and this is open to negotiations. Under the no change in migration arrangements variant, indirect fiscal costs are higher in the modelled EEA-type scenario due to the economic effects of customs barriers. However, these are more than offset by the indirect fiscal cost of restricting inflows of EEA workers in the alternative migration variant of the modelled White Paper scenario.

### Comparison to modelled no deal scenario

227. Table 4.14 sets out comparisons between the modelled White Paper and modelled average FTA scenarios, and the modelled no deal scenario.

**Table 4.14: Summary of impact on public sector net borrowing compared to the modelled no deal scenario, for the illustrative no change to migration arrangements and the zero net inflows of EEA workers scenarios.**

Compared to modelled no deal (percentage point difference as a share of GDP in 2035-36)	Modelled White Paper		
	Modelled White Paper	Modelled White Paper with NTB sensitivity: 50 per cent <sup>184</sup>	Modelled average FTA
<b>No change to migration arrangements</b>	<b>-2.4</b> (-£93.7bn)	<b>-1.8</b> (-£69.7bn)	<b>-0.6</b> (-£23.1bn)
<b>Zero net inflows of EEA workers</b>	<b>-2.5</b> (-£92.5bn)	<b>-1.9</b> (-£69.0bn)	<b>-0.7</b> (-£23.2bn)

Central estimates only.

Comparisons to modelled no deal are calculated as the difference between the scenario and modelled no deal, expressed in percentage points of today's arrangements.

### Sensitivity analysis for fiscal impacts

228. The results described above are central estimates for the long-term borrowing impact in each modelled scenario, under alternative migration arrangements. To reflect the inherent uncertainty associated with this analysis the following tables present upper and lower estimates for the long-term additional borrowing impact. These are based on the ranges of macroeconomic impacts from the Government's macroeconomic modelling.

**Table 4.15a: Summary of impact on public sector net borrowing compared to today's arrangements, for the illustrative no change to migration arrangements scenario.**

Compared to today's arrangements (change as a percentage of GDP in 2035-36)	Modelled average			Modelled White Paper
	Modelled no deal	FTA	Modelled EEA-type	
<b>Low</b>	<b>+1.8</b> (+£72.0bn)	<b>+1.1</b> (+£46.0bn)	<b>+0.4</b> (+£15.8bn)	<b>-0.1</b> (-£5.9bn)
<b>Central</b>	<b>+2.4</b> (+£95.1bn)	<b>+1.8</b> (+£72.0bn)	<b>+0.5</b> (+£22.5bn)	<b>0.0</b> (£1.3bn)
<b>High</b>	<b>+3.1</b> (+£117.8bn)	<b>+2.4</b> (+£94.6bn)	<b>+0.9</b> (+£37.4bn)	<b>+0.3</b> (+£12.5bn)

**Table 4.15b: Summary of impact on public sector net borrowing compared to today's arrangements, for the illustrative zero net inflows of EEA workers scenario.**

Compared to today's arrangements (change as a percentage of GDP in 2035-36)	Modelled average			Modelled White Paper
	Modelled no deal	FTA	Modelled EEA-type	
<b>Low</b>	<b>+2.5</b> (+£96.4bn)	<b>+1.8</b> (+£70.4bn)	N/A	<b>+0.5</b> (+£19.3bn)
<b>Central</b>	<b>+3.1</b> (+£119.1bn)	<b>+2.4</b> (+£95.9bn)	N/A	<b>+0.6</b> (+£26.6bn)

<sup>184</sup> Sensitivity analysis highlights the impact on GDP if the NTBs are higher than estimated in the modelled White Paper scenario. A sensitivity point is measured reflecting 50 per cent of the difference in NTBs between the modelled White Paper and modelled average FTA scenarios. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent.

Compared to today's arrangements (change as a percentage of GDP in 2035-36)	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper
<b>High</b>	<b>+3.8</b> (+£141.5bn)	<b>+3.0</b> (+£118.0bn)	N/A	<b>+0.9</b> (+£37.5bn)

## 4.9 Additional sensitivities

229. The ranges around the central estimates are driven by a variation in NTBs, key model parameters and other assumptions. Additional sensitivities are undertaken around the macroeconomic analysis to clarify areas of uncertainty in the modelling including modelling business investment effects, agri-food tariffs, high ambition rest of the world trade deals, and unilateral tariff liberalisation. The unprecedented nature of the change in the UK's relationship with the EU presents a unique set of challenges and uncertainties. As the details of the UK's future relationship with the EU and independent global trade policy depend on the outcome of future negotiations on the legal text, the modelled scenarios have made assumptions about these outcomes. Sensitivity analysis can illustrate how the results presented above may be affected by different assumptions. Four main sensitivities are considered, summarised in Table 4.16, with further detail provided in the Technical Reference Paper.
230. Sensitivity analysis is of particular importance to considering the unprecedented aspects of the modelled White Paper. Such illustrative sensitivities of different costs are indicative only and do not reflect specific policy expectations.

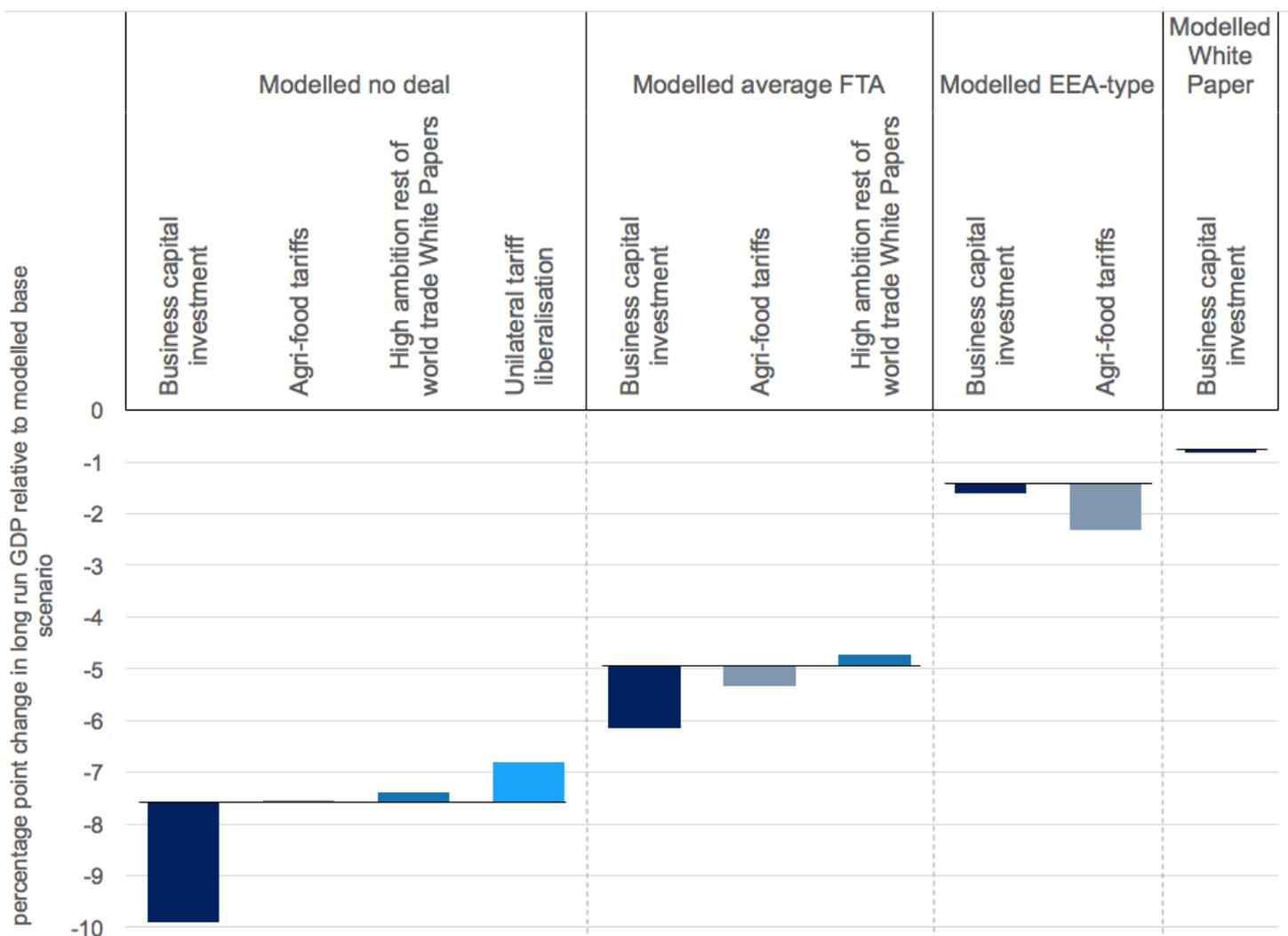
**Table 4.16: Summary of sensitivities results on GDP compared to today's arrangements.**

Compared to today's arrangements (per cent change)	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	
				Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>185</sup>
<b>UK GDP central estimate</b> ( <i>trade policy impacts only</i> )	<b>-7.6 per cent</b>	<b>-4.9 per cent</b>	<b>-1.4 per cent</b>	<b>-0.7 per cent</b>	<b>-2.2 per cent</b>
<b>Modelling Sensitivity:</b>	<b>Additional sensitivity impact:</b>				
<b>Business investment model extension</b>	-2.3 percentage points	-1.2 percentage points	-0.2 percentage points	-0.1 percentage points	-0.5 percentage points
<b>Tariff and NTB Sensitivities:</b>	<b>Additional sensitivity impact:</b>				
<b>Agri-food tariffs</b>	+0.05 percentage points	-0.4 percentage points	-0.9 percentage points	<i>Not modelled</i>	<i>Not modelled</i>

<sup>185</sup> Sensitivity analysis highlights the impact on GDP non-tariff barriers are higher than estimated in the modelled White Paper scenario. The sensitivity reflects 50 per cent of the difference in non-tariff barriers between the modelled White Paper scenario and modelled average FTA scenario. Implicitly, the modelled White Paper scenario represents zero per cent on this range, and the modelled average FTA scenario represents 100 per cent. This midpoint is illustrative only and does not represent an expected outcome.

Compared to today's arrangements (per cent change)	Modelled White Paper				
	Modelled no deal	Modelled average FTA	Modelled EEA-type	Modelled White Paper	Modelled White Paper with 50 per cent NTB sensitivity <sup>185</sup>
<b>High ambition rest of world trade deals</b>	+0.2 percentage points	+0.2 percentage points	<i>Not modelled</i>	<i>Not modelled</i>	<i>Not modelled</i>
<b>Unilateral tariff liberalisation</b>	+0.8 percentage points	<i>Not modelled</i>	<i>Not modelled</i>	<i>Not modelled</i>	<i>Not modelled</i>

Figure 4.10: Summary of sensitivities results on GDP, compared to today's arrangements.



231. Figure 4.10 illustrates the impact of varying the modelling assumption on business investment, as well as of varying some of the tariff and NTB assumptions. The sensitivity analysis considers the following:

- Business investment:** It is possible to extend the Government's macroeconomic model to capture how business investment responds to changes in trade policy. In this extension, a change in trade policy means the insertion of EU-UK trade barriers; therefore a change in trade policy resulting in lower productivity is associated with lower returns to capital and

lower incentives to invest. This leads to a lower aggregate business capital stock and in turn, lower productivity and output. Including these business investment effects amplifies the effects of trade policy on GDP, particularly in the modelled no deal, in which estimated GDP would be a further 2.3 percentage points lower than in the modelled base scenarios. In the modelled White Paper scenario the central GDP impact would be a further 0.1 percentage points lower, while in the modelled average FTA and modelled EEA-type scenarios estimated GDP would be an additional 1.2 and 0.2 percentage points lower than the base case respectively. External evidence reviewed in the Technical Reference Paper suggests that the impact of trade policy on investment and capital accumulation can be substantial, even when taking into account these transition effects. Nonetheless investment has been modelled here as a sensitivity rather than in the core modelling, as it represents an upper bound of the long-term impact on investment in this model.

- b. **Agri-food tariffs:** Given that many trade agreements do not eliminate agri-food tariffs, this set of sensitivities considers the impact of agri-food tariffs remaining at EU MFN levels for new rest of world trade deal partners across all modelled scenarios, except the modelled White Paper scenario, as well as for the EU in the modelled average FTA and modelled EEA-type scenarios. The higher tariffs would generally lead to a downward effect on economy-wide GDP. This lowers estimated GDP in the modelled average FTA scenario by 0.4 percentage points, and in the modelled EEA-type scenario by 0.9 percentage points.
- c. **High ambition rest of world trade deals:** In addition to the ambitious set of new deals included in each policy scenario, a sensitivity is considered which further reduces non-tariff barriers with potential rest of world trade deal partners. The sensitivity illustrates a doubling in the reduction in NTBs with rest of world trade deal partners, relative to the estimates in the modelled base scenarios. The additional reduction of NTBs, when compared to the NTB reductions with the EU in the modelled average FTA, could be seen as large. This sensitivity is applied to the no deal and FTA scenarios, as elements of the modelled White Paper or the modelled EEA-type scenario could constrain the UK's ability to further reduce NTBs beyond the base scenario. This additional reduction in NTBs is estimated to result in higher GDP of 0.2 percentage points in the no deal and modelled average FTA scenarios compared to the modelled base scenarios.
- d. **Unilateral tariff liberalisation:** In this sensitivity all UK import tariffs and associated Rules of Origin costs are set to zero for all countries in the world in a modelled no deal scenario. This is estimated to partly offset the GDP reduction (by +0.8 percentage points) in the modelled no deal scenario.<sup>186</sup> The long-term effects are modelled here purely to illustrate the potential benefits, and to enable a comparison to external literature which estimates the impact of unilateral liberalisation scenarios.

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<sup>186</sup> A study by Oxford Economics looks at a broader set of policies including unilateral tariff liberalisation, tax cuts, deregulation and some changes to migration arrangements, and finds somewhat larger GDP gains. Some studies (Open Europe, 2018 and Economists for Free Trade, 2018) which find larger gains also make assumptions about the UK's ability to reduce NTBs unilaterally.

## Section 5 - Wider external economic analysis

*The Government's analytical approach has sought to incorporate the best external thinking, evidence and modelling into the analysis. Therefore, it is useful to view the results alongside the wide range of external assessments of the potential impact of exiting the EU. The variation in results stems from differences in assumptions and approaches, and illustrates the inherent uncertainty around trade modelling. A more detailed summary of this analysis can be found in the Technical Reference Paper.*

**232. The Government's results lie within the ranges of estimates from external studies considering similar scenarios.** There are a number of external assessments which model comparable scenarios to the ones modelled by the Government. External studies deploy a range of approaches to estimating non-tariff barriers (NTBs) and gross domestic product (GDP) impacts associated with EU exit. Few studies have sought to model the stated government policy.<sup>187</sup> Most studies typically consider no deal, Free Trade Agreements (FTAs), or EEA-type scenarios. The Government's modelled precedent scenario estimates are within the range of estimates from external analyses.

### 5.1 External analysis and evidence on potential changes to the costs of trade

**233.** Like many external studies the Government's analysis uses real world data to estimate changes to the costs of trade.<sup>188</sup>

**234. The Government's analysis of NTBs is within the range of estimates from external institutions.** External estimates of NTB costs in a no deal scenario include a range between 6 per cent<sup>189</sup> to 20 per cent<sup>190</sup> for goods and 6 per cent<sup>191</sup> to 34 per cent<sup>192</sup> for services.<sup>193,194</sup> The Government's analysis of a modelled no deal scenario estimates average NTBs of 10 per cent for goods and 11 per cent for services, which is within this range of external estimates.<sup>195</sup>

<sup>187</sup> ['How much would a 'White Paper Brexit' cost the UK economy?'](#), National Institute of Economic and Social Research, August 2018.

<sup>188</sup> A study by the Economists for Free Trade (['Alternative Brexit Economic Analysis: Assessing the Economic Impact of Brexit'](#), 2018) is one of the few to use a different methodology. The study attempts to estimate directly the changed cost arising from NTBs rather than use trade data to infer these. It assumes that there would be no increase in the NTBs with the EU, and do consider the potential for lowering NTBs with the rest of the world.

<sup>189</sup> ['Brexit – an economy-wide Impact Assessment looking into trade, immigration, and Foreign Direct Investment'](#), University of Bonn, June 2017. This paper assumes half of the NTBs that EU membership eliminated will be reintroduced in a no deal scenario.

<sup>190</sup> ['Selected Issues: Britain'](#), IMF, 2018. The study by CEPII could be interpreted as leading to goods NTBs consistent with 21 per cent AVE but further calculations are required.

<sup>191</sup> ['Brexit – an economy-wide Impact Assessment looking into trade, immigration, and Foreign Direct Investment'](#), University of Bonn, June 2017. See footnote 114 for a description of the methodology.

<sup>192</sup> ['Brexit through the lens of new quantitative trade theory'](#), CESifo, 2018.

<sup>193</sup> See section 2.7 in the Technical Reference Paper for a more detailed summary of external estimates of NTBs.

<sup>194</sup> Studies which do not separate NTBs from tariff costs find that costs in goods could be larger than this range.

<sup>195</sup> Goods are defined as the manufactured goods and agri-food meta-sectors, as well as the energy component of the networks meta-sector. Services include financial services and other services meta-sectors, alongside the services components of the networks meta-sector.

235. Differences in NTB estimates are largely driven by the varying data sources, assumptions and methodology used. Nevertheless, external studies provide a range of credible estimates and literature against which to compare the Government's analysis.

## 5.2 External analysis on long term economic outcomes of changes to trade and market access

236. There are a range of studies that model the overall long term economic impact of EU exit on the UK economy.<sup>196</sup> Many of these studies use a broadly similar approach to the Government's analysis to capture the economic impacts of various EU exit scenarios to the economy. Their results differ depending on which impact channels they capture and their input assumptions. Models allowing for a wider range of impact channels, including dynamic effects, typically find larger negative effects as Figure 5.1 below demonstrates.
237. **The Government's analysis of GDP impacts is within the range of estimates from external institutions.** External estimates of a WTO scenario range between -1.5 per cent<sup>197</sup> and -18 per cent<sup>198</sup> GDP change, compared to what it otherwise would have been. Considering only trade effects the Government analysis of the modelled no deal scenario results in GDP that is estimated to be between 6.3 and 9.0 per cent lower in the long run.
238. Some models focus on a limited set of effects.<sup>199</sup> These studies ("static" models) find central GDP or welfare impacts of a WTO scenario ranging from -1.5 per cent<sup>200</sup> to -4.9 per cent<sup>201</sup>.
239. Other studies allow for a wider range of trade impact channels, including at least one of productivity, foreign direct investment or capital accumulation. These studies ("dynamic" models) find results lying between -4.6 per cent<sup>202</sup> and -18.0 per cent<sup>203</sup>.

<sup>196</sup> These studies and the assumptions driving their results are discussed in section 6 of the Technical Reference Paper.

<sup>197</sup> ['Costs and benefits of a United Kingdom exit from the European Union'](#), Global Economic Dynamics, April 2015.

<sup>198</sup> ['Assessing the economic impact of Brexit'](#), Rabobank, October 2017.

<sup>199</sup> Studies included in the 'static' category are, broadly defined, macroeconomic modelling or based on a dynamic model such as NiGEM with the key dynamic effects turned off. Studies include macroeconomic modelling and reduced form representations (['New Trade Models, Same Old Gains?'](#), American Economic Review, 2012) as well as new quantitative trade modelling (NQTM) approaches.

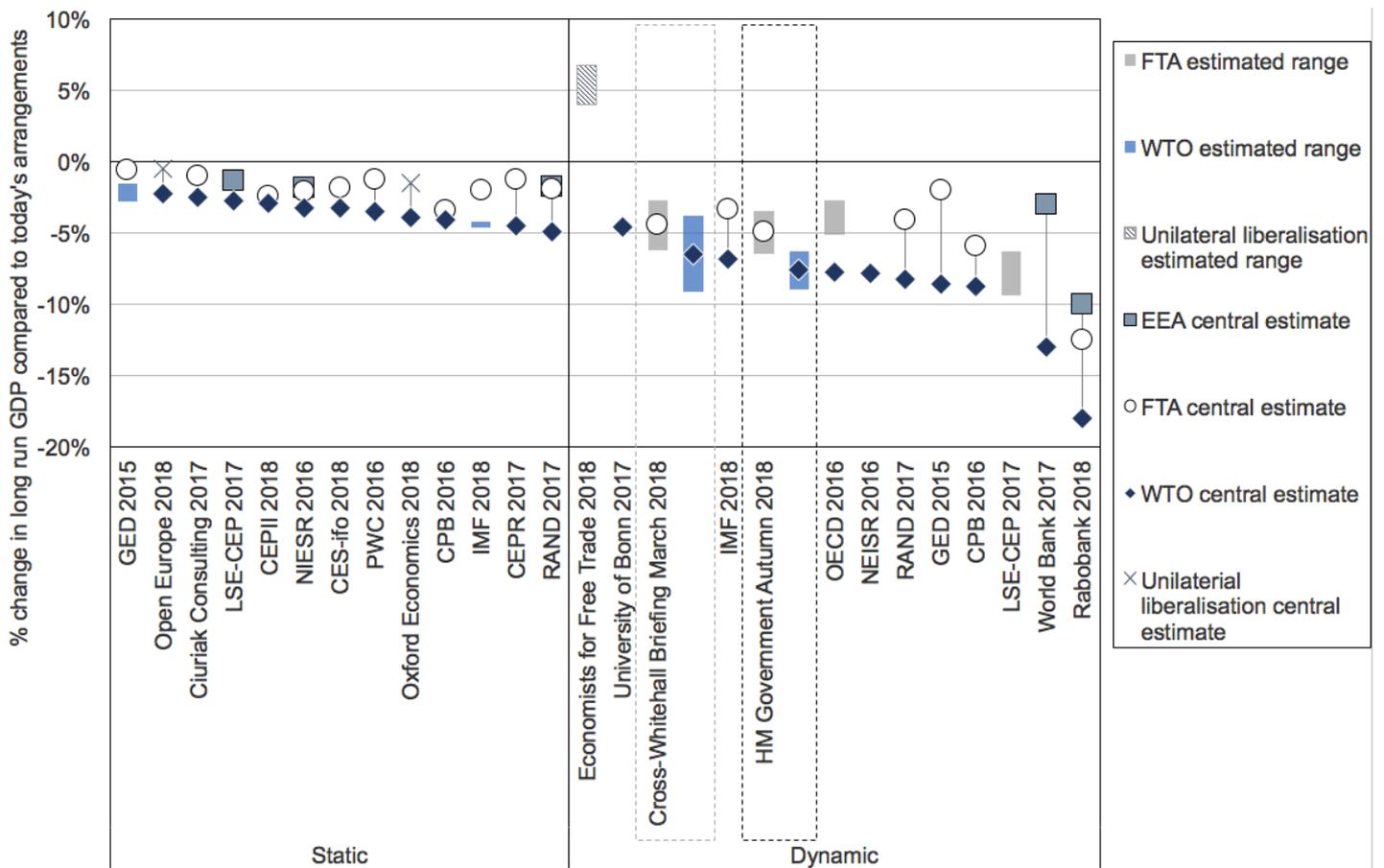
<sup>200</sup> ['Costs and benefits of a United Kingdom exit from the European Union'](#), Global Economic Dynamics, April 2015.

<sup>201</sup> ['After Brexit: Alternate forms of Brexit and their implications for the United Kingdom, the European Union and the United States'](#), RAND Corporation, 2017.

<sup>202</sup> ['Brexit – an economy-wide Impact Assessment looking into trade, immigration, and Foreign Direct Investment'](#), University of Bonn, June 2017.

<sup>203</sup> ['Assessing the economic impact of Brexit'](#), Rabobank, October 2017.

Figure 5.1: Summary of total impacts on GDP from external trade modelling compared to Government analysis.



The Government estimates relate to the GDP impacts from trade only.

240. Many of these same studies also analyse the impacts of moving to an FTA scenario. These studies find a long-term effect on GDP that ranges from -0.6 per cent<sup>204</sup> to -12.5 per cent<sup>205</sup>, which is broadly consistent with the Government's findings of -3.4 to -6.4 per cent<sup>206</sup>. Some of this range can be explained by the fact that different studies make different assumptions about the scope of the modelled average FTA and its implications for the UK economy. For example, some model an FTA similar in scope to EU-Korea<sup>207</sup>, others do so in line with the terms of the European Free Trade Association (EFTA)<sup>208</sup>, while some consider an average over a larger group of FTAs.

<sup>204</sup> 'Costs and benefits of a United Kingdom exit from the European Union', Global Economic Dynamics, April 2015.

<sup>205</sup> 'Assessing the economic impact of Brexit', Rabobank, October 2017.

<sup>206</sup> This range reflects only the impact of changed trade costs.

<sup>207</sup> 'Brexit through the lens of new quantitative trade theory', CES-ifo, March 2018.

<sup>208</sup> The dynamic estimates in 'The costs and benefits of leaving the EU: Trade effects', Centre for Economic Performance, April 2017.

241. Fewer studies model the GDP impact of moving to an EEA-type scenario. Those that do find central estimates that range from -1.3 per cent<sup>209</sup> to -10.0 per cent,<sup>210</sup> which is broadly consistent with the Government's estimates of -0.9 to -2.3 per cent.<sup>211</sup> One reason for the wide range is the difficulty in estimating EEA trade costs based on precedents.<sup>212</sup>

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<sup>209</sup> ['The costs and benefits of leaving the EU: Trade effects'](#), Centre for Economic Performance, April 2017.

<sup>210</sup> ['The costs and benefits of leaving the EU: Trade effects'](#), Centre for Economic Performance, April 2017.

<sup>211</sup> This range reflects only the impact of changed trade costs.

<sup>212</sup> The non-EU EEA members are Norway, Iceland and Liechtenstein.

## Glossary of Terms

<b>EEA</b>	European Economic Area
<b>EFTA</b>	European Free Trade Association
<b>FEP</b>	Future Economic Partnership
<b>FF</b>	Future Framework
<b>FTA</b>	Free Trade Agreement
<b>GDP</b>	Gross Domestic Product
<b>GVA</b>	Gross Value Added
<b>GVC</b>	Global Value Chains
<b>IMF</b>	International Monetary Fund
<b>MAC</b>	Migration Advisory Committee
<b>MFN</b>	Most Favoured Nation
<b>NBER</b>	National Bureau of Economic Research
<b>NIESR</b>	National Institute of Economic & Social Research
<b>NTB</b>	Non-Tariff Barrier
<b>OBR</b>	Office for Budget Responsibility
<b>OECD</b>	Organisation for Economic Co-operation & Development
<b>RoO</b>	Rules of Origin
<b>RoW</b>	Rest of World
<b>WTO</b>	World Trade Organization





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