

Original Paper

Making Astrology Look Respectable: On the Extraordinary Abuse of Economic Models in the EU Referendum Debate

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Abstract

In June 2016, I released an article entitled: “Measurement without Theory: On the extraordinary abuse of economic models in the EU Referendum debate” in advance of the referendum on 23 June 2016 on whether the UK should leave the European Union. That article heavily criticised two reports that had been released by the UK Treasury on the consequences of Brexit, calling them “dodgy dossiers” for “grossly exaggerating the impact of the economic consequences of Brexit and providing no analysis of the risks from remaining in the EU”. This article reproduces the 2016 article and also provides an update on the state of the UK economy five years after the publication of the reports. It confirms that the only purpose the two Treasury reports was to make astrology look respectable.

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Part 1: The Two Treasury Reports

Key points and implications of the Treasury reports

The Treasury uses a gravity model to predict that GDP per household will be lower by £4,300 by 2030 if the UK votes to leave the European Union.

This is because the Treasury **assumes** that the UK, the fifth largest economy in the world, will be unable to negotiate more favourable trading arrangements than currently exist with either the EU or the rest of the world.

The UK's reduction in its share of exports to the EU from 54% in 2006 to 44% in 2015 is not consistent with the gravity model.

Greenland's economy grew rapidly when it left the EU in 1985 and Ireland's trade with the UK was unchanged by her exit from the sterling area in 1979. This is completely at odds with the gravity model's predictions for the UK leaving the EU.

The same model would predict that the UK would be better off joining the euro and that every country in the world would be better off joining the European Union.

A similar model predicted that if Scotland left the UK, its trade with the rest of the UK would fall by 80%.

The Treasury uses a short-term model called a VAR model to predict an immediate recession if the UK votes to leave the EU. There is no causality in a VAR model—it merely projects forward existing trends in a data set.

The Treasury **assumes**—with no evidence, since there can be no evidence—that voting to leave the EU will constitute an economic shock equivalent to 50% of the shock of the Global Financial Crisis and that this shock lasts for two years. The biggest cause of a shock of this size would be the scare-mongering tone of the two Treasury reports.

The Treasury also **assumes** that there will be no policy response to this shock—unlike in the GFC when the government pumped £375 billion into the economy.

As a result of these two assumptions, the VAR model automatically and mechanically generates a recession that cuts UK GDP by 6% in two years' time (relative to where the economy would be if the UK remained in the EU)—equivalent to 50% of UK trade with the EU—yet we will still be in the Single Market during this period.

The Treasury models assume that the UK's population will not change between 2016 and 2030, despite Office for National Statistics predictions that up to 4 million more people will move to the UK over this period.

Executive summary

The Treasury has published two reports on the economic consequences of a decision by the UK to vote to leave the European Union in the Referendum on 23 June. Together, the reports predict that each household in the UK will be worse off (in terms of a lower gross domestic product) by £4,300 or more by 2030.

This prediction is grossly exaggerated for two main reasons. First, the Treasury **assumes** that the government will not respond to what it calls the “extreme shock” of leaving the EU—a shock that is **assumed** to last for two years, which is longer than that caused by the Global Financial Crisis—and so will stand by while the economy dives into a recession with GDP falling by up to 6% over the next two years (relative to where the economy would be if the UK remained in the EU)—equivalent to losing 50% of our trade with the EU, even though we will still be in the Single Market during this period. This is simply not credible—had the government responded in the same way during the GFC, the consequences for the economy would have been catastrophic.

Second, it **assumes** that the UK, the fifth largest economy in the world, will be unable to negotiate more favourable trading arrangements than currently exist with either the EU or the rest of the world—which has three times the GDP of the EU and nine times its population and is growing much faster than the stagnant EU economy. As a result of this assumption, GDP is predicted to be lower by up to 7.5% p.a. by 2030.

This prediction comes from combining the outcome from a short-term model (called a Vector Autoregressive (VAR) model) which is used for the first two years after leaving with a long-term model (called a gravity model) which is used to project GDP between 2018 and 2030. The reason that the models are switched in 2018 is because this is the maximum time allowed to negotiate an exit from the EU under Article 50 of the Treaty on European Union.

The specific gravity model used by the Treasury is centred on the EU: this model predicts that the UK would actually be better off not only staying in the EU but actually joining the euro—although the Treasury does not acknowledge this. Had the Treasury used a different gravity model centred on the rest of the world—which it certainly should have considered—it might well have found that the UK would be better off leaving the EU.

Most of the other economic models that have examined the economic consequences of Brexit—and which have been entirely ignored by the Treasury—find that it will make little difference to the UK’s economy whether the UK stays in or leaves the EU. This is consistent with both Greenland’s experience of leaving the EU in 1985 and Ireland’s experience of ending currency union with the UK in 1979—neither of which is considered in the Treasury reports.

The Treasury’s long-term economic model—the gravity model

The gravity model is similar to the model that Isaac Newton used to explain the orbit of the planets around the Sun in our Solar System. Think of the EU as the Sun and the different European countries

as planets orbiting the Sun. The model assumes that countries closest to the centre of the EU have the greatest economic benefits—in terms of bilateral trade and foreign direct investment and their subsequent effects on productivity and economic growth—from membership of the EU. This, of course, means the countries in the Euro Area.

The Treasury estimates the consequences of the UK leaving the EU and moving further away: first into the European Economic Area, then into the European Free Trade Area and then into the Rest of the World (ROW) where World Trade Organisation (WTO) rules operate.

The model's predictions are unambiguously clear: the UK will be worse off outside the EU by 2030. There are **no** circumstances in which the UK could be better off outside the EU.

The Treasury's gravity model has some very powerful implications:

- Not only would the UK be better off by staying in the EU, it would be even better off joining the Euro Area—which is closest to the Sun.
- **All** countries in the world would be better off joining the EU and the Euro Area. And this result holds even if the EU collapses into a black hole—which is not an unlikely possibility, certainly in the case of the Euro Area.

What the Treasury's long-term economic model cannot do

The Treasury's gravity model cannot be used to determine with any degree of reliability what the economic consequences of Brexit are, for a very simple reason—there are no data points to calibrate the EU gravity model properly. In the absence of this, the model **assumes** that leaving the EU is the opposite of joining the EU.

But this is not at all valid and the economic consequences cannot be determined as though they are. The relationships already established within the EU will mean that the UK should be able to negotiate a much better mutually beneficial trade deal than a country that never joined the EU, such as Norway or Switzerland.

The gravity model seriously overestimates the costs of Brexit. There are a number of pointers to this in the report:

- The government used a gravity model to assess the economic consequences of Scotland leaving the UK and predicted that cross-border trade between Scotland and the rest of the UK would fall by 80%. Can anyone possibly believe that this figure is plausible, given the previous 300 years of political and economic union, the geographical proximity, the common language and currency, and similarity of the legal systems?
- The UK's recent trading experience with the EU is completely inconsistent with the predictions of the gravity model: the share of UK exports to the other EU countries which has fallen from 54.2% in 2006 to 43.7% in 2015 or by 19%.

All this is pointing to the real possibility that the UK could be much better off if it “jumped” solar systems and joined one centred on the ROW. The Treasury's gravity model could easily have tested

this possibility and certainly should have done—if it were offering a comprehensive analysis and genuinely wanted to examine all possibilities.

The Treasury's short-term economic model-the VAR model

The Treasury's short-term economic model is a Vector Autoregressive (VAR) model. This is a model that (1) merely projects forward the existing trends amongst a series of variables that might or might not be causally related, and (2) is incapable of identifying and predicting the consequences of a structural change that has not been previously observed in the historical data used to calibrate the model.

What the model does is make the **assumption** that a vote to leave the EU on 23 June 2016 would constitute a “severe shock” to the UK and global economies. The shock manifests itself in a 50% increase in a “comprehensive UK uncertainty indicator” on 24 June. The heightened uncertainty lasts for the full two years that the UK has to negotiate an exit under Article 50 of the Treaty on European Union (TEU). The UK's relative GDP falls by up to 6% during this period as businesses and households start to realise they will be “permanently poorer” in the long term.

The VAR model generates what economists call a “sunspot equilibrium”. This is where an extraneous random variable—in this case the level of uncertainty caused by a “shock”—influences real economic activity—in this case by causing a recession—in a way that is unrelated to economic fundamentals, purely because people supposedly believe that this variable matters.

Another problem is that the shock to uncertainty remains constant throughout the two-year period after Brexit. However, not even in the Great Recession of 2008-09 did the shock stay constant for two years.

What the Treasury's short-term economic model cannot do

The main problem with the short-term model is that it cannot be used to estimate the GDP loss from Brexit. There are two reasons for this.

First, the VAR model was calibrated to the sample period 1989-2016. But there was no Brexit during this period. So any attempt to use this period to determine what the appropriate initial size of the shock should be breaks the First Law of Informatics: irrelevant information **cannot** be utilised. The Treasury therefore has to make a **judgement**—that Brexit will be 50% as bad as the Great Recession. There is no evidence for this—it is a pure **judgement**. Nevertheless, the biggest cause of a shock of this size would be the scare-mongering tone of the two Treasury reports.

The second reason is that it ignores the policy response that the government would inevitably implement to manage expectations and so reduce and remove the uncertainty. It assumes that the government does not respond at all and allows the self-fulfilling prophecy to develop and the sunspot equilibrium to emerge.

An appropriate policy response would therefore reduce the initial size of the uncertainty indicator. That, combined with an inappropriately calibrated model, would mean that the VAR model would

make a very poor predictor of what would actually happen during the first two years after Brexit. The report also states on that “no member state has ever left the EU”. But this is not true. Greenland left the European Communities in 1985 without triggering the kind of recession outlined in this report. Indeed, the economy boomed after leaving the EU: the average annual real growth rate was 5.7% in the five years after leaving the EU, compared with 0.7% p.a. in the preceding five years. The report also ignores the fact the when Ireland left the currency union with the UK in 1979 and adopted the Irish punt and later the euro in 1999, there was a negligible effect on trade between the two countries.

So the Treasury is using a short-term model that cannot tell what size shock there should be, has no policy responses, and produces results completely at odds with Greenland’s experience of leaving the EU or with Ireland’s experience of leaving the currency union with the UK. But worse than this, neither the short-term nor the long-term model accounts for the non-economic risks of remaining in the EU.

It’s more than the economy stupid!

The EU is a potentially highly unstable gravitational system. There are a number of reasons for this. The first has to do with the euro. It was quite obvious from the start of European Economic and Monetary Union (between 1999 and 2002) that most of these conditions for the euro to survive would fail to be satisfied in the Euro Area.

But it is not just the economics. A fundamental problem is the democratic deficit in the EU. This is because the EU is a political project and the EU political elite are prepared to ride roughshod over the wishes of its citizens. But this attitude will inevitably bring into question the political and social stability of the EU itself. All these issues are ignored by the Treasury.

Embarrassing for the economics profession

The reports do not consider the alternative economic models that predict that the UK will do well out the EU. **All serious economic studies should report the results of alternative studies.** Most of these models predict that there will be very little difference to GDP by 2030 whether the UK stays in the EU or not.

Finally, the reports do not even consider the **economic** risks of remaining in the EU, never mind the full range of **non-economic** risks. These failures are embarrassing for the economics profession.

The political abuse of the Treasury models

There is doom-mongering on every page of the two reports. It’s no different from the way children are frightened into doing what their parents want. We are all being treated like children.

Both the Chancellor of the Exchequer and the Prime Minister have used the reports to ramp up the scare-mongering.

Even more political abuse

The second report gives the strong impression that we really don’t have a choice—the UK can never

actually leave the EU, because it would be too difficult to unravel and too difficult to negotiate any new trade deal with other countries.

However, international law recognises a “presumption of continuity” and all the parties need to do is sign a documentation of continuation in force. Further, the WTO does not allow tariffs to be raised once they have been lowered between countries.

Conclusion

There was a time when the global plutocracy relied on the mysticism of religion to keep the populace in its place. Now the modern global plutocracy is using the mysticism of economic models. If we fall for this, we will enter a new Dark Age where fear over the size of the EU trade dummy in a gravity model is intended to keep us all under control.

The British Treasury has in effect become a propaganda machine for a political institution led by Jean-Claude Juncker—a man who has declared his hostility to “democratic choice” when it comes to the wishes of the European people. This whole exercise is utterly dangerous for democracy.

The Treasury’s application of gravity and VAR models to assess whether the UK would be better in or out of the EU confirms John Kenneth Galbraith’s dictum that: “The only function of economic forecasting is to make astrology look respectable”.

What is happening is no different from Tony Blair’s “dodgy dossier” on Saddam Hussein’s weapons of mass destruction. These two reports will rightly gain the same status of “dodgy dossiers”.

Introduction

No economic model by itself can be used to determine whether a decision by the UK electorate to leave the European Union will make people better off or worse off. This is because a whole range of factors in addition to economic ones—political, legal, financial, trading, diplomatic, security, military, social, environmental, demographic—will determine whether our individual welfare improves or reduces after leaving. This is because the EU is an institution that embraces all these factors. In addition, when looking across all the people living in the UK, there will be both gainers and losers. This is an inevitable consequence of any change.

Further, it is equally important to take into account the consequences of the status quo, i.e., remaining in the EU. This is because the EU has serious long-term political and economic problems that arise because of a democratic deficit and because of the adoption of the euro by certain member states, problems that are now recognised even by supporters of the EU as well as its detractors.

The Treasury has published two reports on the **economic** consequences of a vote by the UK to leave the European Union in the Referendum on 23 June. The first is a long-term economic model whose results were described in “HM Treasury Analysis: The Long-term Economic Impact of EU Membership and the Alternatives”, published on 18 April 2016. (Note 1) The second is a short-term model whose results were considered in “HM Treasury Analysis: The Immediate Economic Impact of Leaving the EU”, published

on 23 May 2016. (Note 2) Together, the reports predict that each household in the UK will be worse off (in terms of a lower, gross domestic product or GDP) by an average of £4,300 by 2030.

This prediction is grossly exaggerated for two main reasons. First, the Treasury assumes that the government will not respond to what it calls the “extreme shock” of leaving the EU—a shock that is **assumed** to last for two years, which is longer than that caused by the Global Financial Crisis—and so will stand by while the economy dives into a recession with GDP falling by up to 6% over the next two years (relative to where the economy would be if the UK remained in the EU)—equivalent to losing 50% of our trade with the EU, even though we will still be in the Single Market during this period. This is simply not credible—had the government responded in the same way during the GFC, the consequences for the economy would have been catastrophic. Second, it **assumes** that the UK, the fifth largest economy in the world will be unable to negotiate more favourable trading arrangements than currently exist with either the EU or the rest of the world—which has three times the GDP of the EU and nine times its population and is growing much faster than the stagnant EU economy. As a result of this assumption, GDP is predicted to be lower by up to 7.5% p.a. by 2030.

This prediction comes from combining the outcome from a short-term model (called a vector autoregressive (VAR) model) which is used for the first two years after leaving with a long-term model (called a gravity model) which is used to project GDP between 2018 and 2030. The reason that the models are switched in 2018 is because this is the maximum time allowed to negotiate an exit from the EU under Article 50 of the Treaty on European Union.

The specific gravity model used by the Treasury is centred on the EU: this model predicts that the UK would actually be better off not only staying in the EU but actually joining the euro—although the Treasury does not acknowledge this. Had the Treasury used a different gravity model centred on the rest of the world—which it certainly should have considered—it might well have found that the UK would be better off leaving the EU.

Most of the other economic models that have examined the economic consequences of Brexit—and which have been entirely ignored by the Treasury—find that it will make little difference to the UK’s economy whether the UK stays in or leaves the EU. This is consistent with both Greenland’s experience of leaving the EU in 1985 and Ireland’s experience of ending currency union with the UK in 1979—neither of which is considered in the Treasury reports.

I have examined both models and will review the reports in the order they were published.

The Treasury’s long-term economic model—the gravity model

The Treasury’s long-term economic model is actually made up of a number of different models. The principal one used is a “gravity model”. This “allows the analysis to isolate the influence of the different trade relationships from all the other influences that affect bilateral trade and Foreign Direct Investment (FDI) flows such as distance, historical ties, GDP and population. Once the effect of each relationship has been identified, they can be combined with other data, such as for UK goods and services trade, to

estimate the UK specific impacts of moving from one sort of relationship to another, having controlled for all the other influences on bilateral trade and FDI flows” (p. 20).

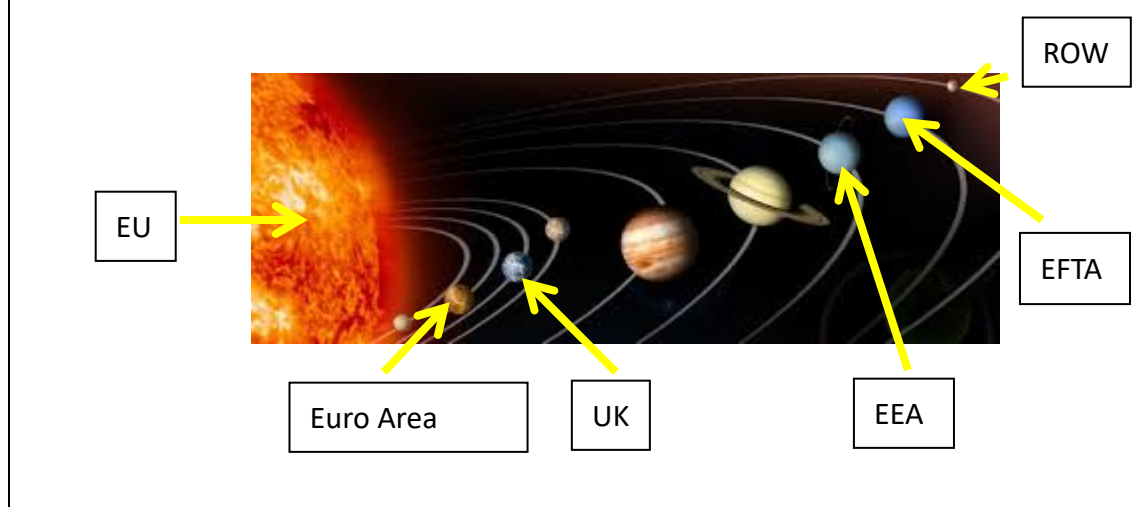
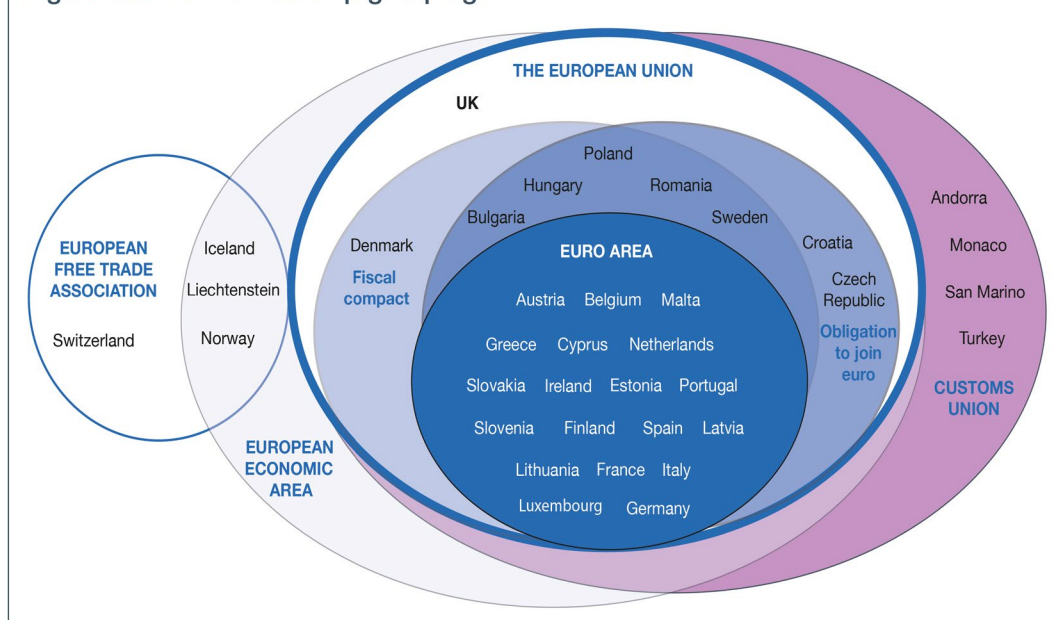
The output from the gravity model is then input into NiGEM, the National Institute of Economic and Social Research’s global macro econometric model to calculate “the consequences for productivity and GDP” (p. 20). NiGEM is a general equilibrium model that examines the overall macroeconomic impact of economic shocks on the dynamic path of the UK economy through various economic channels, such as consumption, investment, net trade, and the labour market. It can also investigate the consequences of policy changes. (Note 3)

The gravity model is similar to the model that Isaac Newton used to explain the orbit of the planets around the Sun in our Solar System. Think of the EU as the Sun and the different European countries as planets orbiting the Sun. The planets closest to the Sun have the strongest gravitational pull from the Sun. Planet size is also important in a gravity model—the biggest countries in terms of GDP and population become the biggest planets in the gravity model. Planet size can therefore help to compensate for a planet’s distance from the Sun.

According to the Treasury’s gravity model, the countries closest to the centre of the EU have the greatest economic benefits—in terms of bilateral trade and FDI and their subsequent effects on productivity and economic growth—from membership of the EU, which it classifies as a RIA (Regional Integration Agreement or Area). This, of course, means the countries in the Euro Area (playing the role of Mercury and Venus in the Solar System analogy).

Orbiting outside the EU are European countries with looser trading connections with the EU. The first group of countries are those in the European Economic Area (EEA), such as Norway (taking on the role of Neptune). And furthest away—acting the part of Pluto—is Switzerland which is only in the European Free Trade Association (EFTA). Outside the EU Solar System altogether is the Rest of the World (ROW). Trading relationships between the EU and the ROW (countries such as the US, Russia and Brazil) are governed by the World Trade Organisation (WTO). The gravity model predicts that this is a place you would not want to be, since it is so far away from the Sun. It is very cold out there and you will be completely isolated from warm inner core that is the Euro Area. See Figure 1 and Figure 1.B on p. 29 of the Treasury’s report, reproduced below.

The Treasury’s gravity model estimates the consequences of the UK (Earth) leaving the EU and moving further away: first into the EEA, then into the EFTA and then into the ROW/WTO. The model uses dummy (or indicator) variables to represent the position of a country in the Solar System. So it switches off the UK’s EU dummy variable (i.e., the variable that is set to unity in the model if you are in the EU and set to zero if you are not in the EU) and switches on, say, the ROW dummy variable to assess what happens when the UK “moves out” to the ROW.

Figure 1 – The Treasury’s gravity model**Figure 1.B: EU membership groupings⁶**

The model’s predictions are unambiguously clear: the UK will be worse off outside the EU by 2030. There are **no** circumstances in which the UK could be better off outside the EU—All the tables presented in the report show negative outcomes. GDP per household by 2030 would be lower by £2,600 per annum if we moved to the EEA, by £4,300 if we moved to the EFTA and by £5,200 if we moved to the ROW. These are equivalent to permanent reductions in GDP of 3.8%, 6% and 7.5% p.a., relative to remaining in the EU.

The Treasury’s gravity model has some very powerful implications:

- Not only would the UK be better off by staying in the EU, it would be even better off joining the Euro Area—which is closest to the Sun. Curiously, the paper does not report how much better off the

UK would be if we did this. Had a gravity model been used in 2000-2002 when the Euro Area was set up, it too would have predicted that we would have been better off joining. Indeed, supporters of UK participation in the euro when it started must have been using a gravity-type model in order to make the statement that it would be a “disaster” for the UK not to join. Equally curiously, the Treasury, then under Gordon Brown, did not report the results of a gravity model, since it did not want the UK to join the Euro Area at that time. Nevertheless in June 2003, the Treasury did report that growth, stability, investment and employment would increase as a result of euro membership, but only if convergence and flexibility were sufficient. (Note 4)

- **All** countries would be better off joining the EU, since, according to the model, Europe is at the centre of the known universe—something which many European leaders have, of course, believed for centuries. The report, for example, claims that Norway’s productivity would be 6% p.a. higher if it had joined the EU (p.140). But not just Norway, **all** the countries in the ROW (such as the US, Russia and Brazil) would be better off if they joined the EU and the Euro Area. And this result holds even if the EU collapses into a black hole—which is not an unlikely possibility, certainly in the case of the Euro Area.

- This is because once you become “trapped” in a particular solar system, you cannot escape and you are “better off” remaining. Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia are former Soviet Bloc countries which are now in the EU. But they used to be in Comecon, the economic trading area centred on the Soviet Union. A gravity model calibrated for the Comecon economies—recognising the importance of common borders and a common language (Russian) and all the other factors justifying an RIA—would have predicted that it would be a “disaster” if any of these countries left Comecon. Yet we know what a black hole the Soviet Union eventually became.

Problems with the Treasury’s long-term economic model

There are two sets of problems with the Treasury’s long-term economic model. The first set relate to the assumptions made concerning key variables in the model, while the second set relate to the incomplete nature of the Treasury’s analysis.

One key variable in the model is productivity—which measures output per worker. This is because trade and net inward investment influence of the level of productivity and hence economic growth. If the true number of workers is higher than official estimates, but output is accurately measured, then true productivity is lower than official estimates. A key problem is accurately measuring the number of workers in an economy when there is worker migration. The government uses the International Passenger Survey (IPS) to estimate the net number of migrant workers. According to the IPS, 900,000 net migrant workers came to the UK between 2011 and 2015. Yet during the same period, 2.4 million National Insurance numbers were issued to migrant workers. This means that the true number of migrant workers could be up to 1.5 million higher than the official estimates which is around 5% of the employed workforce. This would mean that current productivity is actually lower by 5% p.a. and this

would have a consequential effect on economic growth.

Another problem is that the model ignores the effect of future worker migration. But this is not at all clear from the report. On p.136, the report predicts that net immigration will fall from 329,000 p.a. in 2014 to 185,000 p.a. from 2021. This means that the report accepts that there will be a total of 3 million new workers by 2030, the year for which it projects the above reductions in GDP per household. However, the report then goes on to state: “no additional effect from net migration has been assumed in the modelling”. It took a letter from Sir Andrew Dilnot, Chair of the UK Statistics Authority, to Jack Doyle of the *Daily Mail* on 27 May 2016 to clarify what was going on: (Note 5)

You asked about whether 2030 immigration and population growth figures should be used in the Treasury’s estimate of impacts on GDP per household. We understand that HM Treasury has calculated these projections by estimating the annual impact of leaving the EU after 15 years (compared to being in the EU).

HM Treasury has presented these results in a range of ways including the impact on GDP per household. This is expressed in terms of 2015 GDP in 2015 prices, using the population estimates for 2015.

There are a number of ways analyses of the economic impact of leaving the European Union can, and have been conducted, which might produce different results. In general it is not unreasonable to base both the denominator and numerator on the same reference year, in this case 2015; if 2030 population projections were used rather than 2015 population figures, it would also be appropriate to use projections for GDP in 2030, rather than 2015 figures.

Yet the Treasury has made GDP projections for 2030 (although it has reported them in 2015 prices). It should therefore have used 2030 population estimates.

I can understand why the government has avoided projecting the population out to 2030 and that is because of its amazingly poor record of predicting inward migration. In 2004, the government underestimated the number of Polish migrants coming to the UK by a factor of 60 (i.e., the ratio of 800,000 to 13,000). Further, the 3 million figure looks like an underestimate of at least 1 million if we take the Office for National Statistics own projections that the UK population will increase from 65 million to 70 million by 2027 and to 76 million by 2050 and that “About 68% of the projected increase ... is either directly attributable to future migration [51% of projected growth], or indirectly attributable to future migration through its effect on births and deaths [17% of projected growth]”. (Note 6)

Even if we accept the figure of 3 million additional migrant workers by 2030, it is difficult to convert this into numbers of households in order to work out GDP per household in 2030. If the additional migrants are all single, this would add 3 million households by 2030, while if they are typical of the rest of the population, this would add 1.3 million households. (Note 7) So depending on whether and how the additional migrants are counted, the number of households could be higher and the reduction in GDP per household by 2030 could be lower by between 5% and 11% compared with the numbers

reported in the report. (Note 8) If we add the additional 1 million migrants projected by the ONS, the differences could be between 6% and 14%. But this would only be correct if the Treasury's projection of GDP in 2030 included the output of these additional workers which it does not appear to do.

So an appropriate projection of GDP per household in 2030 would require reliable projections of both GDP and the number of households in the UK in 2030 if the UK stays in the EU and reliable projections of both GDP and the number of households in the UK in 2030 if the EU leaves the UK and moves to the EEA, or the EFTA, or the ROW/WTO. And the GDP estimates would, in turn, depend on accurate assessments of the skills and hence productivity of the migrant workers. Further, the larger the number of households and the more children those households contain, the more resources the government needs to devote to providing houses, transport, schools and hospitals, etc. All this will have a major impact on the composition of GDP in 2030 and on the extra taxes or borrowing the government needs to raise—which will be partially offset by the taxes the new migrants pay. None of this is accounted for in the Treasury model. But it does show that any estimate of GDP per household in 2030 should be treated with considerable caution. More on this later.

As an academic economist, I have spent 40 years working with various types of economic model and after this time you get to know many tricks of the trade—such as the small changes in assumptions that lead to very big effects when compounded over long periods—the flapping of the butterfly's wings in Australia that leads to storms over Europe. One such butterfly is the assumption that any temporary uncertainty over Brexit leads to a loss of output that has permanent effects. This is stated without further explanation (p.153 and p.185): “the persistence effect is estimated to be 1% of GDP...and is included as a shock to productivity in long-term scenarios”. This is approximately equivalent of a permanent reduction in GDP growth of 1% p.a. or around £700 per family by 2030, more than a quarter of the loss of £2,600 if the UK left the EU and joined the EEA.

So if you take into account the possibilities that the current size of the working population is underestimated by up to 5%, that the number of households by 2030 could be miscalculated by between 5 and 14% and that a persistence effect equal to 1% of GDP is exaggerated, then it would be hard to tell whether the model's predicted reductions in GDP of 3.8%, 6.2% or 7.5% p.a. by 2030 are actually the result of the UK leaving the EU or whether they could be explained by measurement error or by other noise in the system.

Turning to the incomplete nature of the analysis, the report focuses entirely on the potential negative effects of leaving the EU and promotes only the positive effects of remaining. For example, the report argues on p.8 that: “The new settlement for the UK negotiated by the Prime Minister in February 2016 included an ambitious agenda of economic reform in the EU. This will include the next stage of development of the Single Market, with a focus on bringing down the remaining barriers to trade in services, energy and digital, alongside completing major ongoing trade deals. If the economic benefits of reform are realised, this could increase UK GDP by up to a further 4%—which equates to £2,800 for every household in the UK”.

Had the Treasury done a proper analysis and examined the positive case for Brexit, it would have modelled the UK's position in a different Solar System centred on the ROW. Given that EU GDP is only 25% of world GDP and that the EU population is only 10% of the world's population—as previously mentioned, GDP and population sizes are the two key variables in the gravity model—it is quite clear that it would not take too many trade deals with the ROW (which has 75% of world GDP and 90% of the world's population) for Brexit to make the UK better off—just as joining the EU made the former Soviet Bloc countries better off than staying in Comecon. The Treasury might well have found that UK productivity was enhanced by leaving the EU. One reason for this is the cost of EU red tape in reducing productivity which is ignored by the model. Open Europe states that—according to the UK government's own regulatory impact assessments—the cost of the top 100 EU-derived regulations to the UK economy is around £33.3 billion per year. (Note 9)

Similarly, the Treasury model is asymmetric in its treatment of the UK and the rest of the EU (ROEU). The model assumes that the ROEU is not affected by the UK leaving (p. 186). Yet the ROEU sells to the UK around £291 billion in goods and services p.a., but buys only £223 billion in goods and services p.a. in return. It has a trade surplus with the UK of £68 billion. (Note 10) This gives the UK enormous bargaining power in negotiating a new trade deal with the EU. Any proper economic model of Brexit would take this into account. The fact that the Treasury model does not do so is a serious failure of analysis. (Note 11)

What the Treasury's long-term economic model cannot do

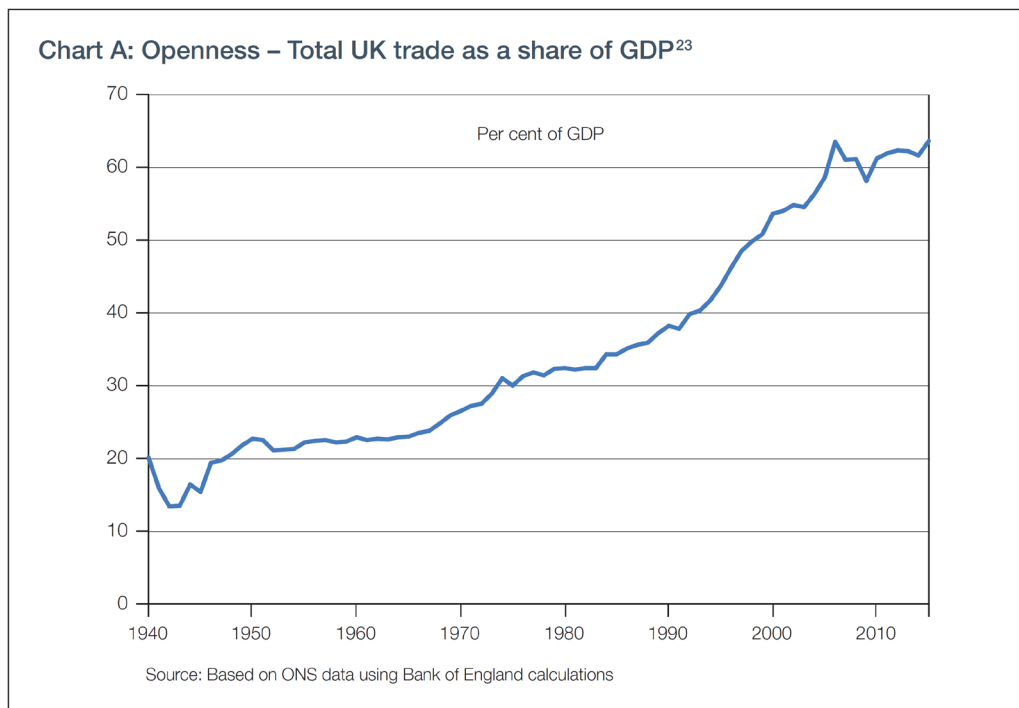
However, the main problem with the Treasury's gravity model is that it cannot be used to determine with any degree of reliability what the economic consequences of Brexit are, for a very simple reason—there are no data points to calibrate the EU gravity model properly. In the absence of this, the model is reduced to measuring the costs of Brexit by switching off the dummy variables for EU membership—in other words, pushing us out further into the Solar System. This is equivalent to assuming that leaving the EU is the opposite of joining the EU.

But this is not at all valid. Leaving the EU is not the opposite of joining the EU and the economic consequences cannot be determined as though they are. To use an aircraft analogy—landing a plane is not the opposite of a plane taking off. A plane takes off with its front wheels leaving the ground first. A model which assumed that a plane lands with its front wheels touching the ground first would predict that the plane would crash. However, we know a plane can land safely if its rear wheels touch the ground first. And the correct model would have predicted this.

The relationships already established within the EU will mean that the UK should be able to negotiate a much better mutually beneficial trade deal than a country that never joined the EU, such as Norway or Switzerland. (Note 12) Any sensible model would reflect this.

This means that the economic consequences of leaving the EU will be much less severe than the model predicts. In other words, the gravity model seriously overestimates the costs of Brexit. There are a number of pointers to this in the report:

- This first is given on p. 156 which discusses the economic consequences of Scotland leaving the UK. The government also used a gravity model to assess this and predicted that cross-border trade between Scotland and the rest of the UK would fall by 80%. Can anyone possibly believe that this figure is remotely plausible, given the previous 300 years of political and economic union, the geographical proximity, the common language and currency, and similarity of the legal systems? The same point has recently been made by Patrick Minford. (Note 13) But why has this figure never been questioned before by anyone else? Is it because we are so bamboozled by the mysteries of econometric modelling that no one dares to question the output of these models—even when it is clearly not plausible?
- The UK's recent trading experience with the EU is completely inconsistent with the predictions of the gravity model: the share of UK exports to the other EU countries which has **fallen** from 54.2% in 2006 to 43.7% in 2015 or by 19%. (Note 14) Now total exports have risen since GDP and populations have risen in both the EU and the ROW over the period—but the share should not have changed in this way if the gravity model is correct.



- The report accepts that the UK is already one of the most open countries in the world in terms of trade (Note 15) which has increased significantly over the past 5 decades—rising from 23% of GDP in 1965 to 64% in 2015 (Chart A, reproduced above). It is also one of the most open in terms of finance with the total size of the UK's foreign assets as a share of GDP the largest of any major advanced economy—at around 530% (p.18). Is it seriously plausible to believe that this would come to an end if

the UK left a relatively small customs union with external trade barriers and began trading freely with the rest of the world?

All this is pointing to the real possibility that the UK could be much better off if it “jumped” solar systems and joined one centred on the ROW. As mentioned above, the Treasury’s gravity model could easily have tested this possibility and certainly should have done—if it were offering a comprehensive analysis and genuinely wanted to examine all possibilities.

The IMF and Bank of England long-term economic models

A number of other important institutions have been making predictions about the consequences of Brexit, such as the International Monetary Fund and Bank of England (and also the OECD). All these institutions are using the same or a similar gravity model (p. 124). So not only are the predictions from these institutions not independent of each other, they suffer from precisely the same problems when making predictions about the consequences of Brexit.

This means that when the IMF’s Managing Director, Christine Lagarde, stated on 13 May 2016 that the UK leaving the EU would have “pretty bad to very, very bad consequences”—that could result in a “sudden stop” in money flowing into the finance sector which would drive down the value of the pound and lead to a sharp rise in interest rates, falling house and commercial property prices and the erosion of London’s status as a global financial centre, all of which would lead to a technical recession (Note 16)—these predictions come from the same model that the Treasury is using. The IMF predicts that UK GDP could fall by between 1.5% and 9.5%.

We should not forget that the IMF’s record of predicting the results of UK economic policy is not especially good. In 2013, the IMF’s chief economist, Olivier Blanchard, predicted that the UK was “playing with fire” with its austerity programme for reducing the government deficit faster than he would have liked. He predicted that this would reduce economic growth, but this did not happen. The UK shortly became one of the fastest growing economies in the EU. The IMF’s predictions were even worse when it came to predicting the outcome of the Greek bail-out in 2010. It said GDP would contract by 2.6% and then recover rapidly. It was out by a factor of 10—Greek GDP declined by 26%.

On May 12, the Governor of the Bank of England, Mark Carney, also said that Brexit could lead to a technical recession. (Note 17) Once again these predictions come from a gravity model similar to the Treasury’s. So the predictions of the Bank and the IMF are not independent of the Treasury’s.

However, the main job of the Bank of England is not to estimate the cost of Brexit, but to set interest rates to control inflation. In 2013, shortly after becoming Governor, Mark Carney introduced “forward guidance”, a policy announcement that interest rates would rise once unemployment fell below 7%. Just six months later, the policy was abandoned because unemployment did fall below 7%, but the Bank judged that economic conditions did not justify raising interest rates. Nevertheless, since then, Mr Carney has confidently predicted that an interest rate rise was just around the corner. Unemployment is currently 5%, but interest rates have still not risen three years after the Bank Governor predicted they would.

Lord Mervyn King, Mark Carney's predecessor as Bank Governor, along with other Bank colleagues, take a much more cautious approach to these matters. In 2011, they wrote: (Note 18)

Self-confidence is infectious. It can also be dangerous. How often have we drawn false comfort from the apparent confidence of a professional advisor promising certain success only to be disappointed by subsequent performance? Uncertainty pervades almost all public policy questions. Economics and many other disciplines are united by a common need to grapple with complex systems. As the crisis of the autumn of 2008 showed, such systems can sometimes be subject to abrupt changes, the precise timing of which cannot easily be identified in advance. But policy-makers are often expected to anticipate the unpredictable. How can they retain the trust of the public while being open about the true degree of uncertainty?

The Treasury's short-term economic model—the VAR model

There was very little economic content in the Treasury's long-term economic model—the gravity model is not an economic model derived from the optimising behaviour of economic agents. (Note 19) However, there is absolutely **no** economic content in the Treasury's short-term economic model. The model used is a vector autoregressive (VAR) model. This is a model that (1) merely projects forward the existing trends amongst a series of variables that might or might not be causally related, and (2) is incapable of identifying and predicting the consequences of a structural change that has not been previously observed in the historical data used to calibrate the model.

What the model does do is make the **assumption** or **judgement** that a vote to leave the EU on 23 June 2016 would constitute a “severe shock” to the UK and global economies that is equivalent to 50% of the size of the shock of the Great Recession in 2008-09. (Note 20) The shock manifests itself in a 50% increase in a “comprehensive UK uncertainty indicator” on 24 June. (Note 21) The report calls this the “uncertainty effect” of a vote to leave, since we will not know on this date the terms of withdrawal from the EU, the new trading relationship with the EU, the new trading relationships with the ROW or the consequential changes to the UK's domestic regulatory and legislative framework. The heightened uncertainty lasts for the full two years that the UK has to negotiate an exit under Article 50 of the Treaty on European Union (TEU). The UK's relative GDP falls by up to 6% during this period.

As a result of this increase in uncertainty about the UK's future trading arrangements with the EU and the ROW, there would, according to the model, be a “damaging effect on both the demand side and supply side of the economy” (p. 7). In particular, the “uncertainty effect would also lower overall demand in the economy in the **immediate aftermath** of a vote to leave” (p. 6).

The report calls this the “transition effect”: the “emerging impact of the UK becoming less open to trade and investment under any alternative to EU membership” and therefore a “less productive and permanently poorer” country in the long term following a vote to leave the EU, resulting in GDP being (using the central estimate) £4,300 lower for each household by 2030 and every year thereafter (Note 22)—as predicted by the Treasury's long-term model.

All businesses will reduce their investment spending and cut jobs until the nature of new arrangements

with the EU became clearer (p. 14):

- *those businesses which are part of international supply chains would be particularly hit by uncertainty over their ability to move products across borders and the increased costs they could face for being part of international supply chains—this would reduce the competitiveness or profitability of UK businesses in the global market place*
 - *businesses that trade with the EU would be uncertain about the UK's access to the Single Market, not knowing what restrictions could be put on their ability to trade, including tariffs, customs costs or non-tariff barriers such as different product standards. Providers of services would not know whether they would have guaranteed non-discriminatory access to the Single Market*
 - *businesses that import from the EU and over 50 non-EU countries would be uncertain about the potential for changes in UK tariffs and other rules to increase the price of imports*
 - *businesses that trade with non-EU countries would not know if and when they would again benefit from the preferential trade deals that UK businesses enjoy as a result of the EU's trade agreements with non-EU countries*
 - *foreign investors in the UK would be uncertain over their access to the European market, a significant driver of foreign investment in the UK, leading them to delay, relocate or cancel investment that otherwise would have come to the UK*
 - *the 1.2 million individuals born in the UK living in other EU member states and others wishing to work, live or travel in other EU member states would not know whether they would continue to have the right to do so*
 - *those that currently benefit from EU funding would not know what support if any they would receive after the UK left the EU. This includes businesses, farmers, fishermen, universities and regions.*
- Apparently, “none of these uncertainties could be resolved easily”. The lower investment spending reduces productivity which, combined with the jobs cuts, reduces real wages.

Similarly, all households will reduce their consumption expenditure. The *Financial Times* explained how this will happen: “people will begin to learn that they have made a decision that will make the UK worse off in the long term, taking the Treasury’s initial long-term calculation that the economy would ultimately be 6% smaller than it otherwise would be. Not only does this shock affect the long term, but if people anticipate this drop in their lifetime incomes, they will understand that they need to tighten their belts straight away so that they do not hit a crisis in their finances by spending as if they were going to be as rich as they previously thought”. (Note 23) This belief will help to cause a recession with relative GDP reduced by 6% and unemployment increased by 800,000 by 24 June 2018. (Note 24) Does this really sound like the “trustworthy British shopaholic”? (Note 25)

There will also be a “financial conditions effect”: the uncertainty effect and the transition effect will lead to a fall in asset prices. “Financial markets would start to reassess the UK’s economic prospects. The UK would be viewed as a bigger risk to overseas investors, which would immediately lead to an increase in the premium for lending to UK businesses and households” (p. 7). The value of UK

personal investments would fall—house prices will fall by 18% and equities by 29%—and the value of sterling would fall by 15%, raising inflation by 2.7 percentage points.

Turning to the international sector, “after a period, exports would then begin to fall, reflecting the weaker outlook for productivity, driven by the transition effect, which would more than offset the impact of the fall in sterling” (p. 47). A 15% fall in sterling would normally be expected to boost exports significantly, but not in this model apparently. The fall in sterling leads to an increase in the price of imports that would immediately be passed on in terms of higher consumer prices. The fall in sterling happens to be a “**modelling assumption**” that “reflects the views of Citi, Commerzbank, Credit Suisse, Deutsche Bank, Nomura, Oxford Economics, HSBC, JP Morgan, NIESR and the OECD” (p. 42). (Note 26)

Turning to the government accounts, “net borrowing in 2017-18 would be around £39 billion higher and debt would be around £54 billion higher than under a vote to remain [due to] the fiscal deterioration and the lower level of nominal GDP. This fiscal deterioration would put at risk the government’s fiscal deficit reduction plan and the aim for debt as a share of GDP to be falling in each year until 2019-2020” (p. 52).

The Treasury does not, however, believe it will be possible for the UK to agree the terms of withdrawal from the EU, a new trading relationship with the EU, new trading relationships with the ROW, and change the UK’s domestic regulatory and legislative framework all within this two-year period. As a result of this, the uncertainty would be larger and could last up to a decade or more: “A period of persistent uncertainty about the UK’s economic policy, regulatory and legislative regime in the event of a decision to leave the EU would therefore be unavoidable” (p. 7).

So it could get worse (p. 9 and p. 43):

- *First, these scenarios do not allow for so-called “tipping points”, such as the crystallization of financial stability risks. Nor do they incorporate the risk of a “sudden stop” in financial inflows, reflecting concerns about the size of the current account deficit*
- *Nor has the impact of a sharp tightening of fiscal and monetary policy to restore credibility been modelled. In both scenarios monetary policy is held fixed. Fiscal policy is assumed to support the economy through the operation of the “automatic stabilisers”. The analysis does not make any assumption about what policy decisions might be taken to contain the resulting increase in borrowing, but these would need to be significant as net government borrowing would increase by around £24 billion in the shock scenario, and by around £39 billion in the severe shock scenario, compared with a vote to remain.*
- *Moreover, if negotiations took longer than two years to conclude, or if the outcome were to be less favourable than expected, the UK economy could be subject to repeated and persistent rises in uncertainty which would depress further economic prospects.*
- *A vote to leave the EU could have knock-on effects for the global economy. A weaker UK economy would have implications for the UK’s closest EU trading partners, including Ireland. An*

economic deterioration in foreign economies would mean the UK's trade with them would suffer even more, which would, in turn, weigh on UK growth. To err on the side of caution, the shock scenario does not make any allowances for economic contagion from a UK vote to leave the EU impacting on other countries, beyond the reduction in trade.

- In practice, the impact of UK economic instability and disruption would, at least in part, extend beyond UK borders—both directly through lower spending, and also through increased financial risk premia. To test this assumption, the severe shock scenario assumes an element of financial contagion with EU economies. This has been modelled by assuming EU term premia for government debt and the corporate borrowing premium increase according to the historical relationships with UK financial conditions. The equity risk premium in EU countries is assumed to increase by the same level as in the UK. After two years, modelling these foreign financial stresses leads to a reduction in euro area GDP of around 1% relative to a UK vote to remain in the EU. This would weaken external demand for UK exports and weigh on UK growth.*

The report concludes that “a vote to leave the EU would result in a marked deterioration in economic prosperity and security..... In contrast, a vote to remain in the EU would see uncertainty fall back rapidly with little lasting impact on the economy”.

How does all this happen? The report models the economic impact of uncertainty shocks using a vector autoregression (VAR) model (p. 39). The model uses 25 years of data from 1989 to 2016 to estimate the relationship between the uncertainty indicator, overall economic activity and financial market conditions. The uncertainty indicator is then elevated to isolate the impact of an uncertainty shock on key economic and financial variables.

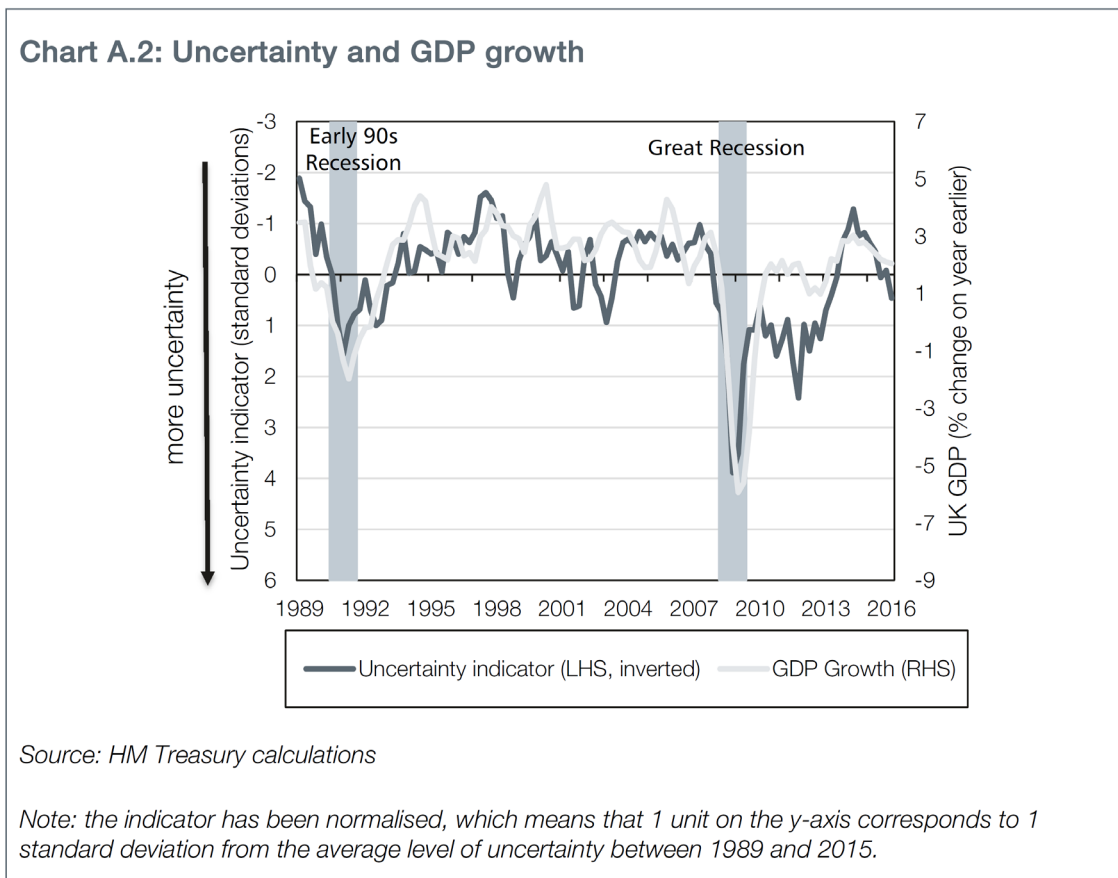
The VAR model is given on p. 66:

$$(A.1) \quad \begin{bmatrix} \text{uncertainty}_t \\ C_t \\ I_t \\ P_t \\ R_t \\ hhprem_t \\ corpprem_t \\ equityprem_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} \text{uncertainty}_{t-1} \\ C_{t-1} \\ I_{t-1} \\ P_{t-1} \\ R_{t-1} \\ hhprem_{t-1} \\ corpprem_{t-1} \\ equityprem_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} \text{uncertainty}_{t-2} \\ C_{t-2} \\ I_{t-2} \\ P_{t-2} \\ R_{t-2} \\ hhprem_{t-2} \\ corpprem_{t-2} \\ equityprem_{t-2} \end{bmatrix} + \varepsilon_t$$

where *uncertainty* is the level of the uncertainty indicator; *C*, *I* and *P* are consumption, business investment and the GDP deflator, all in log differences; *R* is Bank Rate, *hhprem* is the household borrowing spread, *corpprem* is the corporate borrowing spread and *equityprem* is the equity risk premium, all in differences. A_0 is a vector of constants and ε_t is a vector of residuals. (Note 27)

The model has to determine the size of the uncertainty shock that would be generated by a vote to leave the EU. Chart A.2 (on p.65 and reproduced below) shows the relationship between the uncertainty indicator and GDP growth between 1989 and 2016. During this period, there were two big shocks: the recession of 1991-92 and the Great Recession of 2008-2009 which was caused by the Global Financial

Crisis (GFC). As mentioned earlier, the Treasury **assumes** that voting to leave the EU will be equivalent to an increase in the uncertainty indicator that is 50% of the size of that in the Great Recession. (Note 28) This elevated value for the uncertainty indicator is then put into the VAR model above and the model is allowed to run—the dynamics of the VAR model are driven by the size and persistence of the uncertainty shock. The output from the VAR model is then put through NiGEM to find out what the implications for the rest of the economy would be, and, in particular, future GDP. The results discussed above are the output from NiGEM. (Note 29)

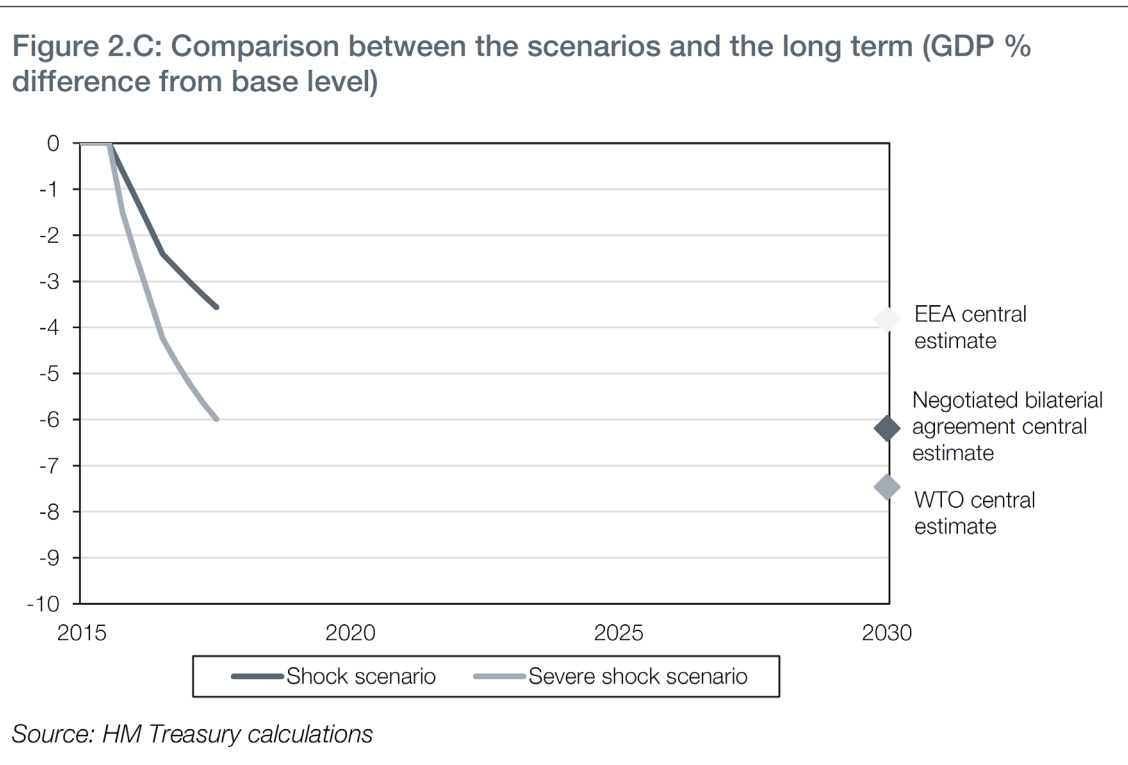


Problems with the Treasury's short-term economic model

There are a number of problems with the VAR model and also with how it is implemented. These relate to how the Treasury assumes businesses and households respond to the “shock” of leaving the EU, how long that “shock” is assumed to persist, and, finally, to the assumption made by the Treasury about how government policy will react to the way that businesses and households are predicted to behave.

The VAR model generates what economists call a “sunspot equilibrium”. (Note 30) This is where an extraneous (or extrinsic) random variable—in this case the level of uncertainty caused by a “shock”—influences real economic activity—in this case by causing a recession—in a way that is unrelated to economic fundamentals, purely because people supposedly believe that this variable

matters. It then becomes a self-fulfilling prophecy. This phenomenon has been recognised for some time. The economist Arthur Pigou argued that “The varying expectations of business men and nothing else, constitute the immediate cause and direct causes or antecedents of industrial fluctuations”. (Note 31) Keynes later coined the term “animal spirits” to describe this phenomenon. (Note 32)



The self-fulfilling prophecy in the Treasury’s short-term model is that Brexit will lead to such uncertainty that it will set off a chain reaction that leads to a recession which makes the uncertainty worse and which, in turn, leads to the recession getting deeper. This results in a never-ending downward spiral in GDP—through a positive feedback loop (Note 33)—as shown in Figure 2. C of the report on p.57 and reproduced above. The lines on the chart stop two years after Brexit, but there is nothing to stop those lines falling to -100%. In other words, UK GDP will eventually become zero—see the box below headed “Create your own sunspot equilibrium”.

Create your own sunspot equilibrium

It is easy to create a sunspot equilibrium and generate a recession. Suppose we have the following simple VAR model linking GDP and an Uncertainty Indicator (UI): (Note 34)

$$GDP_t = GDP_{t-1} - 0.5UI_{t-1}$$

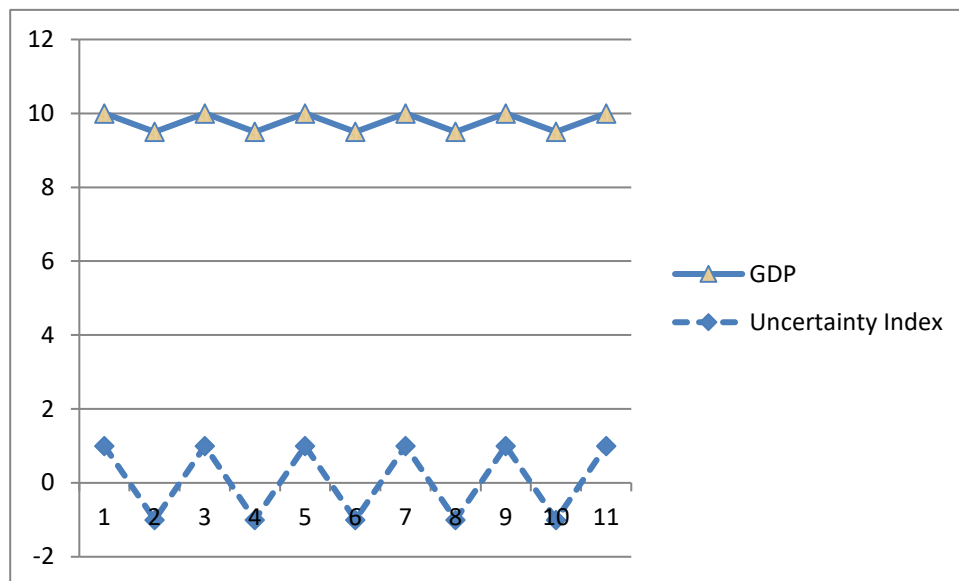
$$UI_t = -UI_{t-1}$$

with $GDP_0 = 10$ and $UI_0 = 1$.

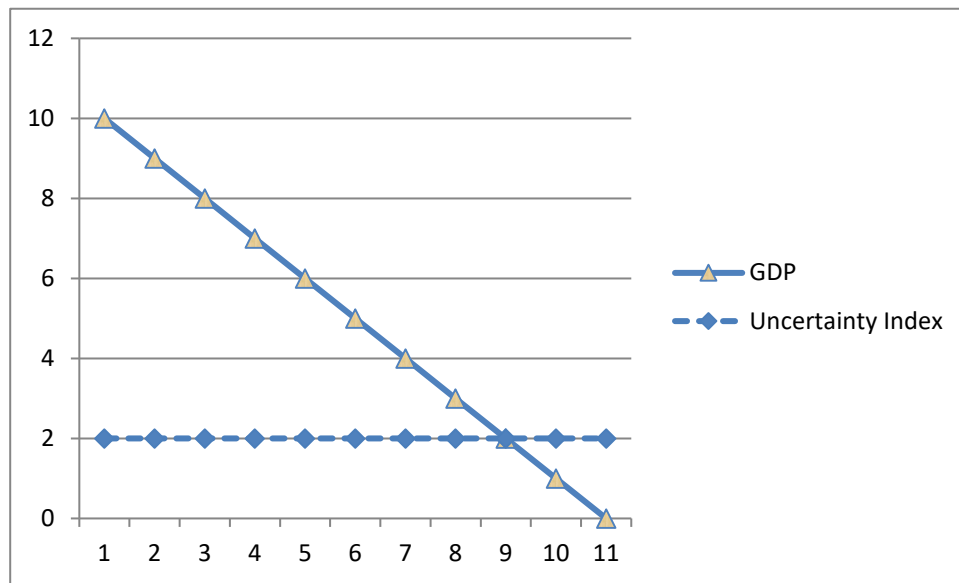
This shows that GDP in quarter t is equal the previous quarter's GDP less 50% of the previous quarter's value of the uncertainty indicator. In addition, the value of the uncertainty indicator in quarter t is the negative of its value in the previous quarter. In other words, the economy exhibits, over the relevant data period, a regular two-quarter bi-polar cycle of “bear” (depression) and “bull” (elation) animal spirits.

Figure 2 shows this bi-polar pattern of the uncertainty indicator and the response of GDP. GDP responds with a one-quarter lag. The uncertainty indicator has a value of 1 in quarter 1 and this leads to a mini recession in quarter 2, with GDP falling from 10 in year 1 to 9.5 in quarter 2. However, the uncertainty is reversed in quarter 2 and the uncertainty indicator takes a value of -1 in that quarter. This generates a mini boom the following quarter and GDP rises to 10.5 in quarter 3. This pattern repeats itself over the next 8 quarters. Suppose that during the previous 25 years, the same pattern in the data was observed and this data had been used to estimate the parameters of the VAR model.

Figure 2—VAR model of GDP and the uncertainty indicator: recent history



While this is a simplified and stylised version of the VAR model used by the Treasury, it is perfectly acceptable to use it to show how the Treasury demonstrates that Brexit would be a disaster for the UK. Suppose the Treasury assumes that the uncertainty indicator following Brexit rises to 2 and stays there. Figure 3 shows the result of projecting with the above VAR model—we can destroy the economy in less than 3 years. But there is no economics in this at all—it purely arises from the mechanical operation of the model.

Figure 3—VAR model of GDP and the uncertainty indicator: the effect of Brexit

Another problem is that the shock to uncertainty remains constant throughout the two-year period after Brexit (p. 40). However, Chart A.2 in the report shows that not even in the Great Recession did the shock stay constant for two years: the heightened uncertainty when the Great Recession started only lasted for one year before falling back to one quarter of its peak level for the next four years. The persistence of uncertainty in the model helps to explain why the relative fall in GDP after two years (with the extreme shock) is 6%, one percentage point more than in the Great Recession, despite the initial shock being only 50% of the size generated by the GFC. Holding the level of uncertainty constant for two years certainly speeds up the self-fulfilling prophecy in a VAR model.

A VAR model simply projects forward existing trends. If a variable has been increasing in the past, the model will project that it continues to increase. If a variable has been declining in the past, the model will project that it continues to decline. Similarly, if, over a particular historical sample, the model has estimated a negative relationship between two variables—such that when one rises, the other falls—then, if during a projection simulation, one variable is arbitrarily increased, the model will project that the other variable will fall. Depending on the sizes and signs of the parameter estimates, the second variable can continue to fall without limit, even if the increase in the first variable is reversed. In other words, the increase in the first variable sets off a chain reaction that moves the system from a state of rest onto a perpetual downward trajectory. The system will only stop when a boundary condition is reached—such as when the second variable hits the floor with a zero value. If the first variable happens to be an extraneous random variable like the degree of “uncertainty”, the chain reaction that is set off becomes a self-fulfilling prophecy that ends in a “sunspot equilibrium”.

However, there is no causality in any of this. It is simply the mechanical structure of the model that drives the outcome. Any increase in the uncertainty indicator for any reason drives the result. Further, the same increase in the uncertainty indicator will give the same result whatever the cause. Take a look again at Chart A.2 and the relationship between the uncertainty indicator and GDP changes. Start by looking around the time of the two recessions. The downward co-movement between the two variables at the start of each recession is almost instantaneous—with the uncertainty indicator taking a short lead. Yet GDP is a slowly moving juggernaut compared with the uncertainty indicator which can change on a daily or hourly basis. The uncertainty indicator might well be elevated at the same time that GDP is falling, but it takes a leap of faith to then say that the heightened level of uncertainty “causes” GDP to fall almost instantaneously. (Note 35)

A key fault with Newton’s theory of the gravity was that signals could cross instantaneously from one end of the universe to the other. It took another two centuries for Einstein to tell us that no signal can travel faster than the speed of light. The VAR model used by the Treasury has a similar defect. Further, if you ignore the periods around the two recessions, can you see much of a relationship between the two variables? Take the period following the Great Recession—GDP recovers more rapidly than the uncertainty indicator is reduced. The relationship between GDP and the uncertainty indicator could be almost entirely spurious—but that, of course, is entirely consistent with a “sunspot equilibrium”.

One of the most serious deficiencies of the model is that there is no policy response by the government to the developing recession generated by the model. The report explicitly states that the model holds monetary and fiscal policy fixed for the whole period. It justifies this on the grounds that it would be too hard to know what to do (p. 42):

Monetary policy

2.33 The Bank of England’s Monetary Policy Committee (MPC) has noted that it would be likely to face a trade-off following a vote to leave. In particular, the MPC set out that it “would face a trade-off between stabilising inflation on the one hand and stabilising output and employment on the other. The implications for the direction of monetary policy would depend on the relative magnitude of the demand, supply and exchange rate effects”.

2.34 As there are two opposing forces on domestic inflationary pressure, the direction of the policy response would not be clear. Rather than attempt to anticipate how the MPC would react, the shock and severe shock scenario assume for the purposes of the model that the MPC holds Bank Rate unchanged although market rates tighten. The impact on GDP could be worse under an alternative assumption. In reality, the MPC would operate consistent with its remit.

Fiscal policy

2.35 In the shock and severe shock scenario it is assumed for the purposes of the model that in response to the impact of a vote to leave the EU, fiscal policy would support the economy in the short term via operation of the “automatic stabilisers” and the deficit would be higher. These are the non-discretionary response of tax receipts, welfare and interest payments to changes in the economic

cycle. For example, higher unemployment would result in greater welfare spending, through benefits such as Jobseeker's Allowance.

2.36 The automatic stabilisers support the economy in a cyclical downturn but would lead to higher borrowing and debt. The analysis does not assume what policy decisions might be taken to contain borrowing. Departmental spending which is not part of the automatic stabilisers is assumed to stay fixed in nominal terms as set out in HM Treasury's Budget 2016, and tax and welfare policy remains unchanged.

Compare that with the £375 billion that the Treasury poured into the banking system to end the GFC. This lack of policy response also helps to explain why the relative fall in GDP after two years (with the extreme shock) is 6%, **one percentage point more** than in the Great Recession, despite the initial shock being only 50% of the size generated by the GFC. Holding policy constant for two years also speeds up the self-fulfilling prophecy in a VAR model.

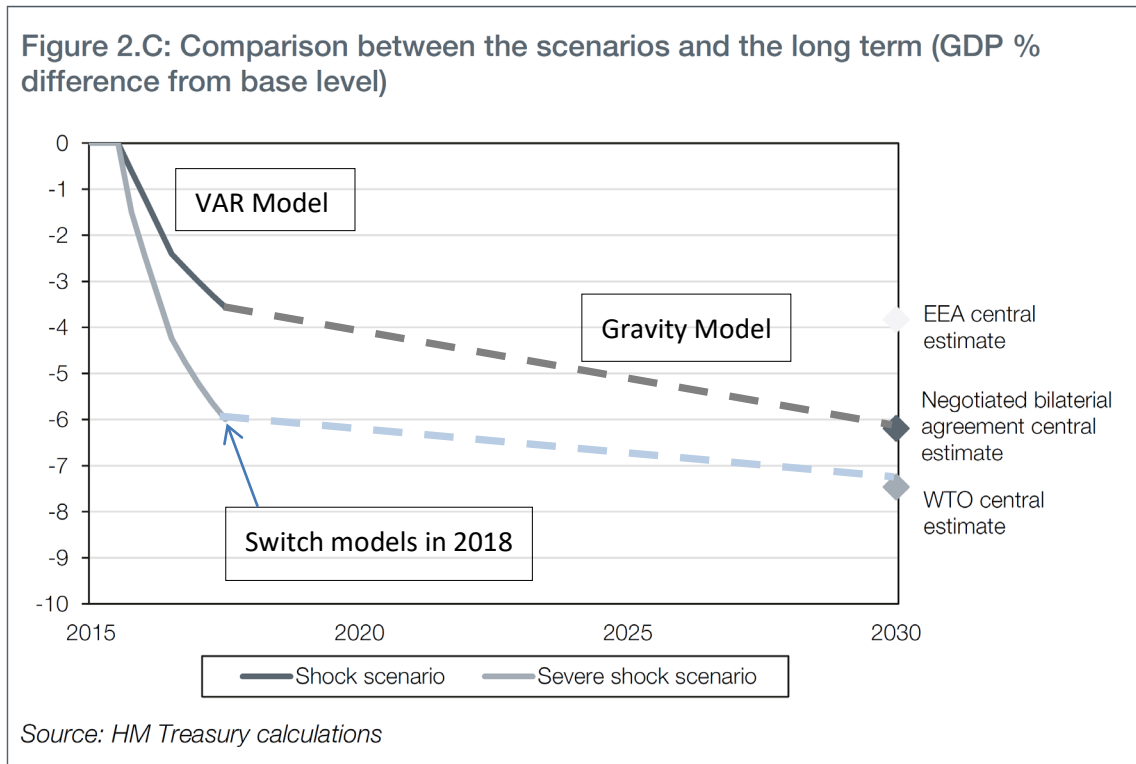
Finally, in this section, let us pause for a reality check. UK exports as a share of UK GDP is around 28% and UK exports to the EU as a share of UK GDP is around 12.5%. (Note 36) So the 6% relative fall in GDP after two years is equivalent to almost 50% of our trade with the EU. Is this plausible? Not according to the following:

- Mervyn King: “One should be very cautious of precise, numerical estimates of what the consequences would be...EU membership is a big, big question that cannot be reduced simply to the simple-minded level of a cost-benefit analysis...I'm old enough to remember the referendum in Britain in 1975 on exactly the same issue. The one thing that both sides of the argument then were wrong about was that it would make a dramatic difference. It didn't”. (Note 37)
- Lord Stuart Rose, former chief executive of M&S and chairman of Britain Stronger in Europe: “Nothing is going to happen if we come out of Europe for the first five years, probably. There will be absolutely no change”. (Note 38)
- Michael O'Leary, chief executive of Ryanair and a Remain supporter, said that Brexit would “not be the end of the world”. (Note 39)
- Willy Walsh, chief executive of British Airways, said that Brexit would not have a “material impact” on BA. (Note 40)

Linking the Treasury's short-term and long-term economic models

It is clearly absurd that a Brexit will eventually lead to the UK's GDP vanishing—as in Figure 2.C and Figure 3. This is why the Treasury abandons the short-term VAR model after two years and switches to the long-term gravity model which moves the economy to a long-term equilibrium by 2030. The economic rationale used by the Treasury for switching models after two years is that the UK's trading position with the EU will have by then become clear, since two years is the maximum period to negotiate an exit under Article 50 of the TEU. Apparently, UK businesses and consumers will suddenly realise what a bad deal has been negotiated and so will switch to the gravity model and move to one of the three “permanently poorer” equilibria (EEA, EFTA or ROW/WTO) by 2030 where GDP is reduced

by 3.8%, 6% or 7.5% p.a., respectively. This is shown in a modified version of Figure 2.C below.



However, the two models used by the Treasury—the VAR model and the gravity model—are completely different and indeed completely inconsistent with each other. Yet they need to be linked together to produce a coherent explanation of the trajectory of the economy between 2016 and 2018 and between 2018 and 2030. This is achieved by setting the initial shock in the VAR model at a level that generates just the right fall in GDP after two years (as shown in Figure 2.C) that is consistent with the additional fall in GDP predicted by the gravity model after 14 years, i.e., by 2030. In other words, the short-term model has been calibrated to be compatible with the long-term model, conditional on switching models after two years. This implies that the Treasury backed out the required size of the initial shock in the short-term model—50% of that in the Great Recession—once it knew what results the long-term model generated.

This is confirmed on p. 11 of the short-term report in the following way: “The first effect of a vote to leave the EU would be that businesses and households would start to make decisions consistent with the transition to becoming permanently poorer in the long term” in line with the predictions of the Treasury’s long-term economic model. For the two models to be consistent with each other, the size of the initial shock—the elevation of the uncertainty indicator—is determined by the long-term model, rather than how economic agents would actually respond on the day after a vote to leave the EU. We consider this point in more detail in the next section.

What the Treasury's short-term economic model cannot do

The main problem with the short-term model is that it cannot be used to estimate the GDP loss from Brexit. There are two reasons for this.

First, the VAR model was calibrated to the sample period 1989-2016. But there was no Brexit during this period. The only extreme events were the recession of 1991-92 and the Great Recession of 2008-09. The VAR model was calibrated to take into account these two events and so would be able to project what would happen if either of these two events took place again **and** the same policy responses were implemented. But a Brexit is completely different from the ERM which caused the first recession and the GFC which caused the second. So there is no way that the VAR model, calibrated to the sample period 1989-2016, can be used to project the consequences of a Brexit. So any attempt to use this period to determine what the appropriate initial size of the shock should be breaks the First Law of Informatics: irrelevant information **cannot** be utilised, or equivalently, **never** use a data set other than for the purpose for which it was originally collected.

The Treasury therefore has to make a **judgement**—that Brexit will be 50% as bad as the Recession. There is no evidence for this—it is a pure **judgement**. (Note 41)

This was confirmed by Jack Meaning, a Research Fellow at the National Institute for Economic and Social Research where some of the models used by the Treasury were developed. In an interview with Martha Kearney on BBC Radio 4's World at One on 23 May 2016, he said: (Note 42)

One of the key aspects is that when you look at the analysis that has been done by the OECD, by the Treasury, by ourselves at the National Institute, we are all using the same or a very similar structure of model—at lot of it is hinged on the same model. The differences in results as they stand come from judgement. The downside is that there is an element of judgement by the model user into what goes in—and obviously with models used just being a tool—what goes in affects what comes out. (Note 43)

The second reason is that, as previously mentioned, it ignores the policy response that the government would inevitably implement to manage expectations and so reduce the level of uncertainty. It assumes that the government does not respond at all and allows the self-fulfilling prophecy to develop and the sunspot equilibrium to emerge. **This simply would not happen in the real world.** It would be similar to the government standing by while the whole banking system and the economy collapsed during the Great Recession. Yet the policy response in the UK (and the US—but not the EU) was broadly very successful—the Treasury managed expectations by saying it “would do whatever it takes” to save the economy and backed that up with a policy of quantitative easing that provided sufficient liquidity to the banking system to provide the necessary confidence to prevent a bank run—it had learned the lessons of the 1930s.

An appropriate policy response would therefore reduce the initial size of the uncertainty indicator. That, combined with an inappropriately calibrated model, would mean that the VAR model would make a very poor predictor of what would actually happen during the first two years after Brexit. (Note 44)

The report also states on p. 24 that “no member state has ever left the EU”. But this is not true.

Greenland left the European Economic Community (the predecessor to the EU) in 1985 without triggering the kind of recession outlined in this report. Indeed, the economy boomed after leaving the EU.

Table 1 shows that the average annual real growth rate was 5.7% in the five years after leaving the EU, compared with 0.7% p.a. in the preceding five years. And this is despite the fact that more than 90% of Greenland's exports go to the EU, e.g., 92.7% in 2010. (Note 45)

Table 1. Gross Domestic Product in Greenland 1980-1989

Year	US dollars (bn)		Per capita (\$)		Growth (%)
	Current prices	Real 1970 prices	Current prices	Real 1970 prices	
1980	0.47	0.13	10363		8.7
1981	0.43	0.13	9332		0.67
1982	0.40	0.12	8290		-4.4
1983	0.41	0.13	8661		3.5
1984	0.37	0.12	7662		-5.2
1985	0.41	0.13	8194		3.7
1986	0.59	0.14	12004		7.1
1987	0.77	0.14	15380		5.5
1988	0.88	0.15	17393		5.6
1989	0.91	0.16	17704		6.7

The report also ignores the fact the when Ireland left the currency union with the UK and adopted the Irish punt in 1979 and later the euro in 1999, there was a negligible effect on trade between the two countries. (Note 46)

So the Treasury is using a short-term model that cannot reliably tell what the initial size of the shock should be, has no policy responses to manage expectations, and produces results completely at odds with Greenland's experience of leaving the EU or with Ireland's experience of leaving the currency union with the UK. But worse than this, neither the short-term nor the long-term model accounts for the non-economic risks of remaining in the EU.

It's more than the economics stupid!

The EU is a potentially highly unstable gravitational system. There are a number of reasons for this.

The first is economic and has to do with the euro. As every second-year economics undergraduate student knows, a single currency will only survive in a specific geographical area if that area satisfies the four conditions laid out by Nobel prize winning economist Robert Mundell in his Theory of the Optimal Currency Area: (1) sufficient wage and labour mobility to eliminate unemployment quickly, (2) sufficient price and capital flexibility to remove trade imbalances, (3) all parts of the area having

similar business cycles, so that a single monetary policy in the form of a single area-wide interest rate will be effective across the whole area—with the interest rate raised in a boom to reduce inflation and reduced in a slump to stop deflation, and (4) a system of regional redistribution whereby regions with trade surpluses redistribute them to regions with trade deficits. (Note 47)

It was quite obvious from the start of European Economic and Monetary Union (EMU) (between 1999 and 2002) that most of these conditions would fail to be satisfied in the Euro Area. There is not sufficient labour market flexibility. The different regions of the Euro Area do not have similar business cycles, so when the European Central Bank, which is located in Frankfurt, initially set a low European-wide interest rate to suit the economic conditions in the core Euro Area countries, in particular Germany, this led to an unsustainable boom—especially a property boom—in peripheral countries, such as Ireland and Spain. Both countries experienced a construction-related economic collapse that destroyed their banking systems when the Great Recession started in 2008. This contributed to the European sovereign debt crisis which started in 2009 and has not finished. Most significantly, the original EMU agreement had a no-bailout clause—in other word, there was going to be **no** system for redistributing trade surpluses and deficits within the Euro Area. The intention was to force the peripheral countries to become as efficient as Germany through labour and capital market reforms alone.

Today, the peripheral countries in the Euro Area are still in economic crisis. For example, Greece, Spain and Portugal have unemployment rates of 24%, 20%, and 12%. The corresponding youth unemployment rates are even worse at 51%, 52% and 33%. Greece has lost 26% of national output since 2007 and has a national debt of £228 billion or 175% of its GDP. (Note 48) One key reason for these disastrous figures is that although these countries are in the Euro Area, they are not sufficiently close—in terms of distance, GDP or population—to the centre of the Euro Area which is Germany. In other words, the Euro Area has its own mini Solar System within the EU. Germany is now the Sun with countries like Holland and Belgium taking the role of Mercury and Venus, while Greece, Spain and Portugal are right out there alongside Pluto.

Yet despite being peripheral in the Euro Area, the gravity model predicts that it would be catastrophic for these countries to leave the Euro Area. Once trapped, like the Comecon countries in a lousy solar system, you cannot escape. Another type of economic model would predict that if only these countries could leave the Euro Area and devalue their currency, they could reduce the international price of their exports and grow their way out of what would otherwise be a perpetual recession.

A second-year economics undergraduate student could tell you all this—it doesn't take Milton Friedman to confirm that: (Note 49)

Europe exemplifies a situation unfavourable to a common currency. It is composed of separate nations, speaking different languages, with different customs, and having citizens feeling far greater loyalty and attachment to their own country than to a common market or to the idea of Europe.

But it's not just the economics. A fundamental problem is the democratic deficit in the EU. Here are

four quotes—the first from a former British politician, the second from the Founding Father of the EU, the third from the current President of the European Commission, and the fourth from the current German Chancellor:

- “No government dependent upon a democratic vote could possibly agree in advance to the sacrifice which any adequate plan must involve. The people must be led slowly and unconsciously into the abandonment of their traditional economic defences, not asked, in advance of having received any of the benefits which will accrue to them from the plan, to make changes of which they may not at first recognise the advantage to themselves as well as to the rest of the world” (Peter Thornycroft, *Design for Europe*, 1947).
- “Europe’s nations should be guided towards the super-state without their people understanding what is happening. This can be accomplished by successive steps, each disguised as having an economic purpose, but which will eventually and irreversibly lead to federation” (Jean Monnet, letter to a friend, 30 April 1952).
- “There can be no democratic choice against the European Treaties” (Jean-Claude Juncker in ‘Greece: The dangerous game’, *Le Figaro*, 1 February 2015).
- The UK’s EU referendum is a “completely unnecessary risk” (Angela Merkel, quoted in *The Sunday Times*, 15 May 2016)

These quotes quite clearly demonstrate that the EU is a political project and the EU political elite are prepared to ride roughshod over the wishes of its citizens. Those who genuinely believe in “ever closer union”, because it will stop future European wars, will only ever be able to see problems, such as the Greek debt crisis, as an opportunity for “more Europe” and faster. This means that the EU is incapable of being reformed to make it more democratic and accountable, because this might slow down the progress to “ever closer union”. Immediately after the UK Referendum, the European Commission will release plans for a joint EU budget which is the first step to a fiscal union to match the monetary and banking union in the Euro Area. (Note 50) Similarly, Federica Mogherini, High Representative of the Union for Foreign Affairs and Security Policy, will announce plans to establish an EU Army immediately after the Referendum; apparently, the EU “can manipulate the Lisbon Treaty in order to bypass the UK’s traditional veto on defence matters”. (Note 51)

But this type of attitude and behaviour will inevitably bring into question the political and social stability of the EU itself. The democratic deficit is not just a concern for citizens of the UK. According to an Ipsos Mori poll reported on 10 May 2016, more than 50% of Italian and French citizens wanted a vote on EU membership, with 48% of the former and 41% of the latter saying that they would vote to leave. Clearly, Europe’s people are no longer prepared to fall for the political con trick underlying the EU.

One key factor responsible for EU-wide discontent with the EU is the refugee crisis. Around 1.1 million people from Syria and elsewhere entered Germany in 2015. In February 2016, the Cologne Institute for Economic Research reported that it will cost around £19 billion (€25 billion) per year to

house and feed these migrants and educate their children. If the asylum claim of a migrant is rejected, it might cost up to £6,666 (\$10,000) to deport each migrant if estimates from the US are anything to go by. (Note 52)

The plight of refugees escaping war deserves not only our sympathy, but also our economic support. Some go further and argue that the refugees provide a timely solution to Europe's joint demographic crises of an ageing population and declining fertility. On 18 May 2016, the Tent Foundation and Open Political Economy Network published a report entitled "Refugees Work: A Humanitarian Investment that Yields Economic Dividends". (Note 53) The report argues that the refugees will create more jobs, increase demand for goods and services, and fill gaps in European workforces—while their wages will help finance pensions and public services. While the report accepts that supporting the refugees will increase public debt by almost €69 billion (£54 billion) between 2015 and 2020, it argues that, during the same period, refugees will help GDP grow by €126.6 billion—a ratio of almost two to one, so "investing one euro in welcoming refugees can yield nearly two euros in economic benefits within five years".

For this to work, employability is crucial, according to the report (p. 9):

On arrival—or even beforehand, if resettled from camps—refugees' education level and skills should be assessed to identify and provide for their training needs and better match them to employment opportunities. Literacy training should be provided to those that need it. Language training should be tailored to refugees' workplace needs. Job training and skills development can enable refugees to find higher-skilled and better-paid work in the longer term. The recognition and conversion of foreign qualifications should be streamlined. It costs only £25,000 (\$35,750) to train a refugee doctor to practise in the UK, compared with over £250,000 (\$357,500) for a new British one.

Skills aren't much use without job opportunities. Refugees should be resettled in areas where there are jobs, not in areas where cheap housing is available and jobs aren't. Governments should vigorously enforce anti-discrimination laws. Making it easier for refugees to find work is yet another reason why countries with rigid labour markets that privilege insiders at the expense of outsiders should open them up. Enabling refugees to start businesses is a further reason why governments should cut through red tape that stifles enterprise. While government assistance for refugees ought to be generous, prompt and wide-ranging initially, open-ended welfare provision can have a negative impact. Looking to the future, ensuring refugee children don't get left behind at school is vital.

At the same time, the report argues that refugees are unlikely to decrease wages or raise unemployment for native workers, on the basis of earlier studies by labour economists. (Note 54)

Others see the refugee crisis turning out in a different way. For example, Sir Richard Dearlove, former head of MI6, speaking at the BBC's "World on the Move" conference on migration warned that "If Europe cannot act together to persuade a majority of its citizens that it can gain control of its migratory crisis, then the EU will find itself at the mercy of a populist uprising which is already stirring". (Note 55)

Either way, the UK will be unable to escape the consequences of the migrant crisis, according to eight

German lawyers and economics professors writing in *The Sunday Times* on 15 May 2016.(Note 56) They argue that the UK government's renegotiation deal with the EU to prevent "ever closer union" is virtually worthless and will do nothing to protect the UK from further EU integration or immigration. This is because of the "future judicial activism" of the European Court of Justice. There is nothing in the EU-UK agreement that can offer the UK permanent legal safeguards against being dragged along the path of further integration. The agreement cannot do so, because it does little to reform the EU and does not exempt Britain from the jurisdiction of the ECJ. They also argue that the measures to deter immigration by cutting benefits will also fail. Once the million-plus asylum-seekers "are naturalised in Germany (and elsewhere), there is nothing to prevent them from exercising their right to free movement and cross the Channel legally. The UK may not be part of the EU's common asylum policy, but no country will be able to escape its consequences".

One way or another, the migrants will affect both labour supply and labour productivity in the EU. The same will be true when the five candidate countries for EU accession join: Albania (population: 2.7m, average net monthly wage: €357), Macedonia (2.1m, €358), Montenegro (0.6m, €488), Serbia (7.2m, €366) and Turkey (75m, €584). (Note 57) By comparison, the average net monthly wage in the UK is €2,330, while in Germany, it is €2,225. (Note 58) These wage differences will encourage labour migration from the new accession states to the higher paid parts of the EU as they did when Poland, for example, joined the EU in 2004.

The Treasury model does not factor in the costs of this on the UK's economic and social infrastructure: houses, schools, GPs, hospitals, transport, energy, local authorities, the care system, and the police, courts and prison system. The government's cuts to funding of these resources in order to balance the Budget by 2020 have already put them under an increasingly intolerable strain. Everyone who uses these services today can observe this quite clearly.

It is not just the EU's citizens who are showing discontent with the EU project, some of the leaders of the Eastern European accession states, such as Hungary and Poland, are showing it too. Guy Verhofstadt, the former Belgian prime minister and leader of the Group of the Alliance of Liberals and Democrats for Europe in the European Parliament, wrote on 11 April 2016: (Note 59).

From the rubble of two world wars, European countries came together to launch what would become the world's largest experiment in unification and cooperative, shared sovereignty. But, despite its impressive achievements over the decades, the European project now risks disintegration.

An unresolved financial crisis, a refugee crisis, a deteriorating security environment, and a stalled integration process have created throughout Europe a toxic, unstable political environment in which populism and nationalism thrive. Perhaps the clearest manifestation of this is the erosion of the rule of law in the European Union.

Two EU members in particular, Hungary and Poland, are now jeopardising hard-won European democratic norms—and thus undermining the very purpose of European integration.

In Hungary, liberal-democratic values have come under systematic attack from Prime Minister Viktor Orbán's government. Since his return to the premiership in 2010, Orbán has committed Hungary to an authoritarian nationalist path, and he has exploited the refugee crisis to cement a "siege mentality" that helps him sustain popular support.

In the process, fundamental rights have been ignored, media freedom has been curbed, refugees have been demonised, and Orbán is doing everything in his power to weaken the EU. Attempts by EU institutions to convince Orbán to change course have only emboldened him to commit further outrages against democratic norms.

Meanwhile, a democratic crisis has emerged in Poland as well, starting last October, when the Law and Justice (PiS), a Eurosceptic party that also opposes immigration, secured an outright parliamentary majority by promising to implement populist economic policies and "put Poland first". Yet, since the election, PiS has launched a series of attacks on the Polish constitution itself.

Government legislation aimed at reforming Poland's Constitutional Court has been condemned by the Court itself and the European democracy watchdog, the Venice Commission. The government has effectively precluded the Court from ruling on the constitutionality of legislation. This weakens a key pillar of the democratic rule of law—and thus is highly problematic for Poland and Europe alike.

Hungary and Poland are the leading edge of a far-right agenda that has taken hold throughout Europe, pursued by parties that are exploiting the political vacuum created by the EU's failure to address the financial and refugee crises.

Mr Verhofstadt claims that neither Hungary nor Poland would be admitted to the EU today. His solution is for "the United States and other NATO allies [to] speak out now and insist that functioning democratic checks and balances are safeguarded", otherwise "Russian President Vladimir Putin [will continue to actively] divide and weaken the EU and NATO".

I am sure that I do not need to remind everyone that economics is a social science—not only does it take into account economic factors, it also properly takes into account social, political and legal factors. No economic model that is used to conduct a cost-benefit analysis of whether the UK is better off staying in or leaving the EU can ignore the above issues. They will affect the safety, security and quality of life of the citizens of the UK and other European countries for generations to come.

The Sun at the centre of the EU Solar System has the very real potential to blow up into a large red giant by expanding uncontrollably and then collapsing into a black hole and doing so very rapidly—in much the same way that the Royal Bank of Scotland expanded uncontrollably before collapsing a black hole in 2008 and requiring a bail out by the UK taxpayer of £37 billion. **Just four years before**, Fred Goodwin, the chief executive of RBS, was awarded a knighthood for "services to banking".

Embarrassing for the economics profession

The two Treasury reports continually repeat the point that other organisations, like the IMF and Bank of England, have models which lead to the same dire predictions. Well this is because they are using the **same** models—which the reports also acknowledge. So the Treasury is saying "we are using the same

widely accepted models as all major respectable organisations and all these organisations are predicting a calamity if the UK leaves the EU which confirms and reinforces our own findings”. Well—to repeat—that is **because** they are using the **same** model—these predictions are **not** independent of each other. If ten organisations are using the **same** model to make the **same** predictions, this does not mean that the weight of evidence is ten times that of the case when only one organisation is using an alternative model.

The projections in both studies are also reported with a very high degree of confidence—almost with the status of facts. While there is some sensitivity analysis at the end of the documents, no serious economic study should be making predictions out to 2030 on the basis of models like the VAR and gravity models without admitting that there can be very little confidence about these predictions. I was going to suggest that we should all come back in 2030 and assess the accuracy of the models’ predictions. But, of course, we can’t do that, because the studies do not report the projected **levels** of GDP and GDP per household in 2030 under the two scenarios of stay or leave. All that is reported is the projected **difference** between the two. It will be impossible to tell in 2030 what the difference is because only one of the scenarios will have been realised—it could only be assessed if 50% of the UK population left the EU, while 50% remained. In addition, the Brexit outcome is reported as an annual **loss of GDP per household** of £4,300 in 2015 terms. This is likely to confuse many people, since it gives the impression that household incomes will be reduced by £4,300 p.a. if the UK leaves the EU. All this is deliberate obfuscation and the Treasury must be fully aware of this.

The reports do not consider the alternative economic models that predict that the UK will do well out the EU. **All serious economic studies should report the results of alternative studies**, such as:

- Open Europe’s model which predicts that “the more realistic range is between a 0.8% permanent loss to GDP in 2030—where the UK strikes a comprehensive trade deal with the EU but does nothing else; and a 0.6% permanent gain in GDP in 2030—where it pursues free trade with the rest of the world and deregulation, in addition to an EU Free Trade Agreement”. (Note 60)
- Business for Britain’s model which shows that, because the EU failed to reform, Britain would gain influence and prosper outside an unreformed EU. (Note 61)
- Centre for Economics and Business Research (CEBR) accepted that Brexit would lead to two years of turmoil while any new trading arrangements are negotiated. Sterling could fall by 10-15%, investment would reduce and growth could be negative in 2017. But following this, the lower exchange rate would make the UK a more attractive place to invest. Most of the lost GDP would be recovered and the economy could start growing at a faster rate. Although the outcome is highly uncertain, the CEBR believes that it is more likely that GDP would be higher by 2030 after Brexit than lower. (Note 62)
- PwC, in a report commissioned by the pro-EU Confederation of British Industry, predicted that UK GDP per capita in 2030 would be between 25% (WTO) and 28% (EEA) higher in 2030 than in 2015 in the same EU exit scenarios used by the Treasury, compared with an estimated 29% increase

with continued EU membership (i.e., the economy continues to grow at a long-run trend rate of 2.3% p.a.). (Note 63)

- Capital Economics' model commissioned by Woodford Investment Management: (Note 64)

Although the impact of Brexit on the British economy is uncertain, we doubt that Britain's long-term economic outlook hinges on it. Things have changed a lot since 1973, when joining the European Economic Community was a big deal for the United Kingdom. There are arguably much more important issues now, such as whether productivity will recover. The shortfall in British productivity relative to its pre-crisis trend is still over 10%, so regaining that lost ground would offset even the most negative of estimates of Brexit on the economy. Based on assessing the evidence, we conclude that:

- *The more extreme claims made about the costs and benefits of Brexit for the British economy are wide of the mark and lacking in evidential bases*
- *It is plausible that Brexit could have a modest negative impact on growth and job creation. But it is slightly more plausible that the net impacts will be modestly positive. This is a strong conclusion when compared with some studies*
- *There are potential net benefits in the areas of a more tailored immigration policy, the freedom to make trade deals, moderately lower levels of regulation and savings to the public purse. In each of these areas, we do not believe that the benefits of Brexit would be huge, but they are likely to be positive*
- *Meanwhile, costs in terms of financial services, foreign direct investment and impacts on London property markets are more likely to be short-term and there are longer-term opportunities from Brexit even in these areas*
- *It is not likely that any particular region or regions of the country would be more adversely affected by Brexit than the country overall. Likewise, we do find support for the notion that Brexit would benefit some sectors more than others, but the range of outcomes for production / manufacturing industries is probably wider than for services*
- *We continue to think that the United Kingdom's economic prospects are good whether inside or outside the European Union. Britain has pulled ahead of the European Union in recent years, and we expect that gap to widen over the next few years regardless of whether Brexit occurs.*

- Patrick Minford's model. (Note 65)

• Economists for Brexit who argue that the UK does not need to do a trade deal to trade. It already trades extensively with many countries across the globe under the rules of the WTO and can continue to do so with EU countries in the future (in the same way that the US, Japan and China does). Leaving the EU will decrease prices and boost GDP. They use Patrick Minford's model to show that on leaving the EU: (Note 66)

- Output grows 2%
- Competitiveness rises 5%
- Real disposable wages up 1.5%

- Exchange rate falls 6%
- Inflation and interest rates rise to the 2-3% range
- Current account improves to -1.5% of GDP
- Unemployment reduces by 0.2% (75,000 on benefit count).

Finally, the Treasury reports do not even consider the **economic** risks of remaining in the EU, never mind the full range of **non-economic** risks discussed in the previous section. According to Gertjan Vlieghe, an external member of the Monetary Policy Committee, the economy would face problems whatever the outcome of the Referendum. He said that the Bank of England must stand ready to cut interest rates towards zero if the economy does not bounce back quickly from its current malaise. He also said he would vote for more stimulus even if the UK voted to remain in the EU and he did not see “convincing evidence” of a rapid improvement in the economy. (Note 67) This only reflects the immediate problems with the EU. In December 2015, the Centre for Economic and Business Research forecast that the EU would be the world’s slowest-growing region over the period to 2030, with its share of the world economy falling by 42% and with countries such as Italy and France likely to fall out of the G8 and potentially even the G20 groups. (Note 68)

It is very interesting to note that the economists who wrote the Treasury papers do not identify themselves. The authors of the reports are not acknowledged. I am not at all surprised by this. I would not wish to put my name to such a report. Nevertheless, the reports—written in the alarmist style they have been and deliberately prepared for the tendentious purposes to which they have been subsequently put—are highly embarrassing to the economics profession. Professor Minford goes further: “The Treasury has become so politicised that it is reduced to rationalising the views of George Osborne. The modelling methods it has used to do Osborne’s bidding are the ones anyone would employ to rubbish Brexit. By leaving the EU, we go to global free trade and we rid ourselves of the intrusive EU regulation that bears down most heavily on our smaller firms who cannot afford huge HR and compliance departments. The gains to our economy from this are huge, as anyone would readily expect. The trade gain amounts to 4 per cent of national income, directly enjoyed by our voters even after spending some of it helping out those affected producers, including our farmers. The gain from getting out of the heavy-handed regulation of our whole economy by the EU is more again, and a boost to our growth rate. The Treasury report gets it precisely the wrong way round”. (Note 69) This view is also shared by Lord David Owen, the former Foreign Secretary: “You rig the [economic] model by what you put into it. If the Chancellor tells the Treasury to put in the following parameters, you get one kind of result. They have admitted they have not seen it necessary to present a model of what would be the benefits of going out of the EU. So we hear a lot about the risks of leaving, but nothing about the risks of remaining, which I believe are infinitely greater”. (Note 70)

One economist is however named in the second report and that is Charlie Bean. He is thanked by the Chancellor, George Osborne, in the Forward to the short-term report:

I am grateful to Professor Sir Charles Bean, one of our country’s foremost economists and a former

Deputy Governor of the Bank of England, who has reviewed this analysis and says that:

“While there are inevitably many uncertainties—including the prospective trading regime with the EU—this comprehensive analysis by HM Treasury, which employs best-practice techniques, provides reasonable estimates of the likely size of the short-term impact of a vote to leave on the UK economy”.

I am a great admirer of Charlie Bean but he is in no better position to judge the likely size of the short-term impact of a vote to leave on the UK economy than I am. How can he possibly know this as there has been no previous exit of an economy of the size of the UK? Also he says nothing about the policy response to Brexit—and it is on policy matters—especially monetary policy matters—that he has spent most of his career. Further, he did not declare his view on Brexit.

The political abuse of the Treasury models

The two reports—especially the second one dealing with the immediate impact of Brexit—are two of the most ridiculous and excruciatingly awful official documents I have ever read. There is doom-mongering on every page. In fact, the more you read, the more hilarious it gets.

British consumers would be so shocked by the size of the shock they had created by a vote to leave the EU that they would not be able to get out of bed in the morning to consume. British investors, anticipating what was happening to British consumers, would be trapped like rabbits in a car’s headlights and be incapable of investing. British workers, fully predicting the behaviour of consumers and investors, would be too scared to go to work. This would immediately have global spillover effects. German workers, recognising that no one was going to buy their cars, would decide to go fishing instead. American investment bankers, realising that London was finished as a financial centre, would move their offices to the Cayman Islands, only to find themselves flooded out by a rising sea level caused by a new burst of global warming—brought on by the Brexit vote. Global policy makers would have no idea how to respond—and instead devote the rest of their lives to working out why their gravity models weren’t scary enough. Within three years, the global economy would be in tatters—and civilised life as we know it would come to an end. You have been warned!

It’s no different from the way children are frightened into doing what their parents want. We are all being treated like children.

Just listen to George Osborne, the Chancellor of the Exchequer of this country (pp. 3-4 of the short-term report):

The analysis in this document comes to a clear central conclusion: a vote to leave would represent an immediate and profound shock to our economy. That shock would push our economy into a recession and lead to an increase in unemployment of around 500,000, GDP would be 3.6% smaller, average real wages would be lower, inflation higher, sterling weaker, house prices would be hit and public borrowing would rise compared with a vote to remain....

[However,] the shock could be much more profound, meaning the effect on the economy would be worse still. The rise in uncertainty could be amplified, the volatility in financial markets more tumultuous, and the extent of the impact to living standards more acute. In this severe scenario, GDP

would be 6% smaller, there would be a deeper recession, and the number of people made unemployed would rise by around 800,000 compared with a vote to remain. The hit to wages, inflation, house prices and borrowing would be larger. There is a credible risk that this more acute scenario could materialise.

My first duty as Chancellor is to seek to deliver economic security and higher living standards for the people of Britain. We already **know** the long-term effects of a vote to leave: Britain **would** be permanently poorer. Now we **know** the short-term shock too: an economy in recession, major job losses and a self-inflicted blow to living standards and aspirations of the British people.

A vote to remain in the EU, however, **would** be the best way to ensure continued growth and safeguard jobs, providing security for working people now and opportunity for the next generation.

This document provides the **facts** that I hope the people of Britain will consider when they make this historic decision one month from today.

But there are **no** facts in these reports. As Roger Bootle, managing director of Capital Economics, said: “The fact of the matter is there aren’t facts. There are assumptions, there are views, there are factoids you can push or bend in a certain direction, but this is not something where you are going to get the objective truth”. Capital Economics’ own analysis of different models revealed a 22% difference in projected GDP between the most extreme views. (Note 71)

Speaking on BBC News on 16 May, Mr Osborne said the “the economic argument is **beyond doubt**: leaving the EU is a one-way ticket to a poorer Britain”. (Note 72) This is an exceedingly unwise statement to make—no economic argument can be beyond doubt and the VAR and gravity models used by the Chancellor to make that statement provide a woefully incomplete analysis of the economic implications for the UK of either staying in or leaving the EU. We should not forget that Mr Osborne makes revisions at least every six months to his projections of GDP over the near term, never mind out to 2030.

Fraser Nelson, editor of the Spectator, goes further: (Note 73)

Sometimes, George Osborne’s dishonesty is simply breathtaking. Let’s set aside the way he has positioned himself over the years (if he believed that leaving the European Union “would be the most extraordinary self-inflicted wound” he might have told us—and his constituents—earlier, rather than proceeding with the farce of renegotiation). But it’s his maths, today, which shames his office—and his use of this maths to make the entirely false suggestion that the Treasury thinks Brexit would make you £4,300 worse off. For anyone who cares about honesty in politics, and the abuse (and reporting) of statistics, this is an interesting case study.

His chosen date is 2030. By then, the UK economy is expected to have grown by around 37 per cent, but the HM Treasury document claims that this would be closer to about 29 per cent growth after Brexit. A fairly straight situation, which Osborne fundamentally misrepresented using two techniques.

Deception 1. Osborne falsely claims that people would be “permanently poorer” when he’s talking about the difference between 29pc GDP **growth** and 37pc GDP **growth**. The most he can claim is that they won’t be as much better off as they would otherwise be.

Deception 2. Osborne then translates this reduction in potential GDP to household income. But they are two fundamentally different things. This is Osborne’s crowning deception, to allow him to conjure up his headline figure of £4,300. This is what he wants households to remember, and is as intellectually dishonest as any manoeuvre ever attempted by Gordon Brown. The Treasury and the OBR discuss GDP all of the time: never do they convert it into a per-household cash figure because (unlike debt, tax etc) it’s meaningless. GDP contains measures like the operating surplus of corporations; and all manner of other measurements. GDP per household, this bogus invention, bears no relation to household income. If GDP is divided by households (Note 74) it’s £68,000: nothing like they average disposable income (£18,600 per head, (Note 75) or £45,400 per household (Note 76).

Deception 3. To arrive at the £4,300 figure, the Treasury divided GDP in 2030 by the number of households **today**. Arguably the most dishonest trick of the lot because, with all that immigration, there’ll be plenty more households by 2030. The DCLG projection (Note 77) reckons 31.2 million, vs 27 million now. So Osborne’s (bogus) £4,300 figure would be more like £3,700, accounting for the extra households.

So having established (1) a means of dressing up an increase as a decrease and (2) a bogus conflation of GDP with household income and (3) a way of covering up the immigration-driven surge in households, Osborne comes up with his grand deception: “Britain would be permanently poorer if we left the European Union, to the tune of £4,300 for every household in the country. That’s a fact everyone should think about as they consider how to vote.”

It’s not a **fact**, it’s an **invention**. If you assume that disposable income (Note 78) grows in line with GDP, then he’d be arguing that there would be a £5,400 rise outside the EU by 2030 instead of £6,880 inside the EU—so the “cost” of spurning EU membership would be £1,480. Which could be alleviated with a modest tax cut.

I’m a Europhile, but these are the kinds of tactics that make me want to vote “out”—the appalling level of dishonesty with which the government is making the case...

If the case for “in” really was as strong as the Chancellor suggests, why would he need to mislead? Perhaps the reason is that he can get away with it: he can cook up a £4,300 figure (a quarter of the average person’s disposable income) and have it repeated enough times for voters to remember.

This technique—to present a rise as a fall—is the closest you can get to statistical alchemy. It was actually pioneered by Gordon Brown in 2005 when he was breaking new ground in the abuse of statistics. Labour campaigned against “Tory cuts” but the Tories attempted to circumvent it by pledging to actually outspend Labour: there would be no cuts. So what could Brown do? His answer was brazen, but effective. He worked out that Labour would spend £27 billion more than the Tories, so used this to claim that they would—ergo—impose a £27 billion “cut”. The technique was politically successful

insofar as the public just remember the Big Scary Figure. And here's a picture with Osborne at his press conference with his prized, concocted £4,300 figure.

The Prime Minister is also at it. In a letter written with the Chancellor, he writes: (Note 79)

In exactly one month's time, Britain will vote in a referendum to decide whether to remain in the EU or leave it.

It will almost certainly be the biggest economic and political decision the British people will make in our lifetimes.

It is a question about the sort of country Britain wants to be in the world, and will affect families, jobs and the future of our country for decades to come.

We know many people are sceptical about the EU. That's why any government either of us is a part of will always keep Britain out of the euro and the EU's free border area.

But as Prime Minister and Chancellor, our first duties are to keep the country secure and do what we think is right for working people's jobs, aspirations and living standards.

We know many people want more information before they make their minds up about how to vote.

One thing that is now clear, because Leave campaigners freely admit it, is that they want Britain to exit not just Europe but the Single Market.

That would mean turning our backs on the largest marketplace in the world—something Margaret Thatcher helped to create and Britain has championed ever since.

The evidence is unequivocal: *that would put our economy in serious danger and make the country permanently poorer.*

When this is being backed up by the International Monetary Fund, the OECD, the London School of Economics, eight former US Treasury secretaries, the President of the United States of America, businesses big and small, every one of our allies and trading partners and the Governor of the Bank of England, it isn't a conspiracy but a consensus.

A few weeks ago, the Treasury published analysis which shows Britain would be worse off to the tune of £4,300 for every household every year by 2030.

Today, we are setting out our assessment of what would happen in the weeks and months after a vote to Leave on June 23.

It is clear that there would be an immediate and profound shock to our economy.

*The analysis produced by the Treasury today shows that a vote to leave **will** push our economy into a recession that would knock 3.6 per cent off GDP and, over two years, put hundreds of thousands of people out of work right across the country, compared to the forecast for continued growth if we vote to remain in the EU.*

In a more severe shock scenario, Treasury economists estimate that our economy could be hit by 6 per cent, there would be a deeper recession and unemployment would rise by even more.

As the Bank of England has said, as the IMF has underlined, and now as the Treasury has confirmed: the shock of walking out of Europe would tip the economy into reverse.

*This would be, for the first time in our history, a recession brought on ourselves: a DIY recession. Under all scenarios, the economy shrinks, the value of the pound falls, inflation rises, unemployment rises, wages are hit, and as a result - government borrowing goes up. Sterling is projected to fall by 12 per cent, consistent with a range of studies, and could fall by 15 per cent in the event of a more severe shock. Not only will holidays abroad be more expensive (Note 80) but because the pound would be worth less everything we import would become more expensive, increasing inflation and hurting family budgets. House price growth would be hit by at least ten per cent and as much as 18 per cent, making homeowners poorer. There wouldn't be good news for young people trying to get on the housing ladder, though, because mortgages would be harder to get and more expensive. The shock would persist because the UK would become less open and less productive—cutting itself off from that free trade Single Market. We can see that even the possibility of a Leave vote has already caused uncertainty in the economy. If we do vote to leave, that uncertainty **will** redouble. It won't be easy to negotiate a new relationship with the EU, since that will require the approval of all other 27 member states. France and Germany have already been clear that the UK could not expect a deal better than they themselves have inside the EU and, like Norway and Switzerland, would have to accept free movement of people and pay in to the EU budget in order to access the free trade we need. We will also have to try to reach new agreements with over 50 other countries we currently enjoy trade deals with through the EU. It will take years—meaning years of uncertainty for our economy. Economic uncertainty means businesses would reduce investment and cut jobs in the short term, which would mean households spending less too. We are clear, as is the vast majority of the Conservative Cabinet: this is simply a price that is not worth paying. Let's not forget, it was only eight years ago that Britain entered the deepest recession our country had seen since the Second World War. People suffered in every part of the country. The British people have worked so hard to get things back on track. The UK has been forecast to grow faster than any other G7 economy this year; we have the most competitive rate of corporation tax in the G20, and the employment rate has never been higher. Why would we risk throwing it all away? A vote to Leave is a vote for recession. Do we really want that DIY recession? Because that's what's in prospect if we vote to leave the EU. And if we vote to Remain? Yes, there are improvements to make to the EU—but we know what they are and we'll be at the top table fighting Britain's corner. If we remain, British car manufacturers will go on selling hundreds of thousands of cars to Europe tariff-free.*

Farmers can go on selling over 150,000 tonnes of beef and lamb to Europe tariff-free.

Our economy won't see hundreds of thousands of unnecessary job losses, but instead we'll add a million or more jobs over the coming years.

So our message to Daily Telegraph readers is clear: vote Remain on June 23 to ensure security and prosperity for this generation, and opportunity for the next.

It's a brighter future on offer.

Today's Treasury analysis shows once and for all that Britain will be stronger, safer and better off if we remain in the EU.

Again from the Prime Minister: (Note 81)

Add those things together—the shock impact, the uncertainty impact, the trade impact—and you put a bomb under our economy. And the worst thing is—we have lit the fuse ourselves.

As if this ridiculous statement is not enough, the political rhetoric gets even more bizarre when the Prime Minister mentions the moral case for remaining. Speaking at a B&Q Store Support Office on 23 May 2016, the Prime Minister argues:

The economic case is the moral case—for keeping parents in work, firms in business, Britain in credit, the moral case for providing economic opportunity rather than unemployment for the next generation.

Where is the morality for putting that at risk for some unknown end? It would be like surviving a fall then running straight back to the cliff edge. It is the self-destruct option.

Mr Osborne, standing next to the Prime Minister, then criticised the Tory Brexiteers:

To those fellow politicians who say we should vote to leave I'd say this: you might think the economic shock is a price worth paying.

But it's not your wages that will be hit, it's not your livelihoods that will go, it's not you who'll struggle to pay the bills. It's the working people of Britain who will pay the price if we leave the EU.

A more measured response came from Andrew Tyrie MP, Chair of the Treasury Select Committee, speaking on The World at One on BBC Radio 4 on 27 May 2016: “The consensus of evidence is that there will be a shock to the economy in the short term. It is difficult to say how big it will be. But the economy will probably shrink somewhat. And this will carry a short-term economic cost. In the longer term, we need to know much more information about what the trade relationships will be before we can assess whether there will be an economic cost and if so how much. ...The balance of evidence we have taken as a committee is that there will be a cost, but it is difficult to assess how big it will be”.

Even more political abuse

The second report gives the strong impression that we really don't have a choice—the UK can never actually leave the EU, because it would be too difficult to unravel.

For example, on p. 24:

The rules for exit are set out in Article 50 of the TEU. This is the only lawful way to withdraw from the EU. It would be a breach of international and EU law to withdraw unilaterally from the EU (for example, by simply repealing the domestic legislation that gives the EU law effect in the UK). Article

50 has never been tested and there is uncertainty about how it would work. It would be a complex negotiation requiring the involvement of all remaining 27 EU member states and the European Commission. It would mean unravelling all the rights and obligations that the UK has acquired during its accession to the EU and over 40 years of membership.

Again on p. 32:

1.53 As set out above there is no requirement for the process to agree any new arrangement with the EU to be concluded at the same time as leaving the EU. Indeed, the remaining EU member states could insist that the terms of the UK's withdrawal are agreed before starting negotiations on the new relationship.

1.54 There would be a trade-off between securing a deal as quickly as possible to reduce uncertainty in the short term and securing the best possible deal for the UK to minimise the economic costs of exit over the long term. Figure 1.B [reproduced below] sets out the interactions between the four processes. Case 1 of Figure 1.B shows completing the withdrawal agreement and agreeing the new EU relationship before the end of the two-year period.

1.55 In the circumstances where it was not possible to conclude a new agreement with the EU within the two-year period, the UK would have to decide whether to seek to extend UK membership of the EU until a new agreement had been reached, or to accept exit at that point.

And again on p. 30:

Changing the UK's domestic regulatory and legislative framework

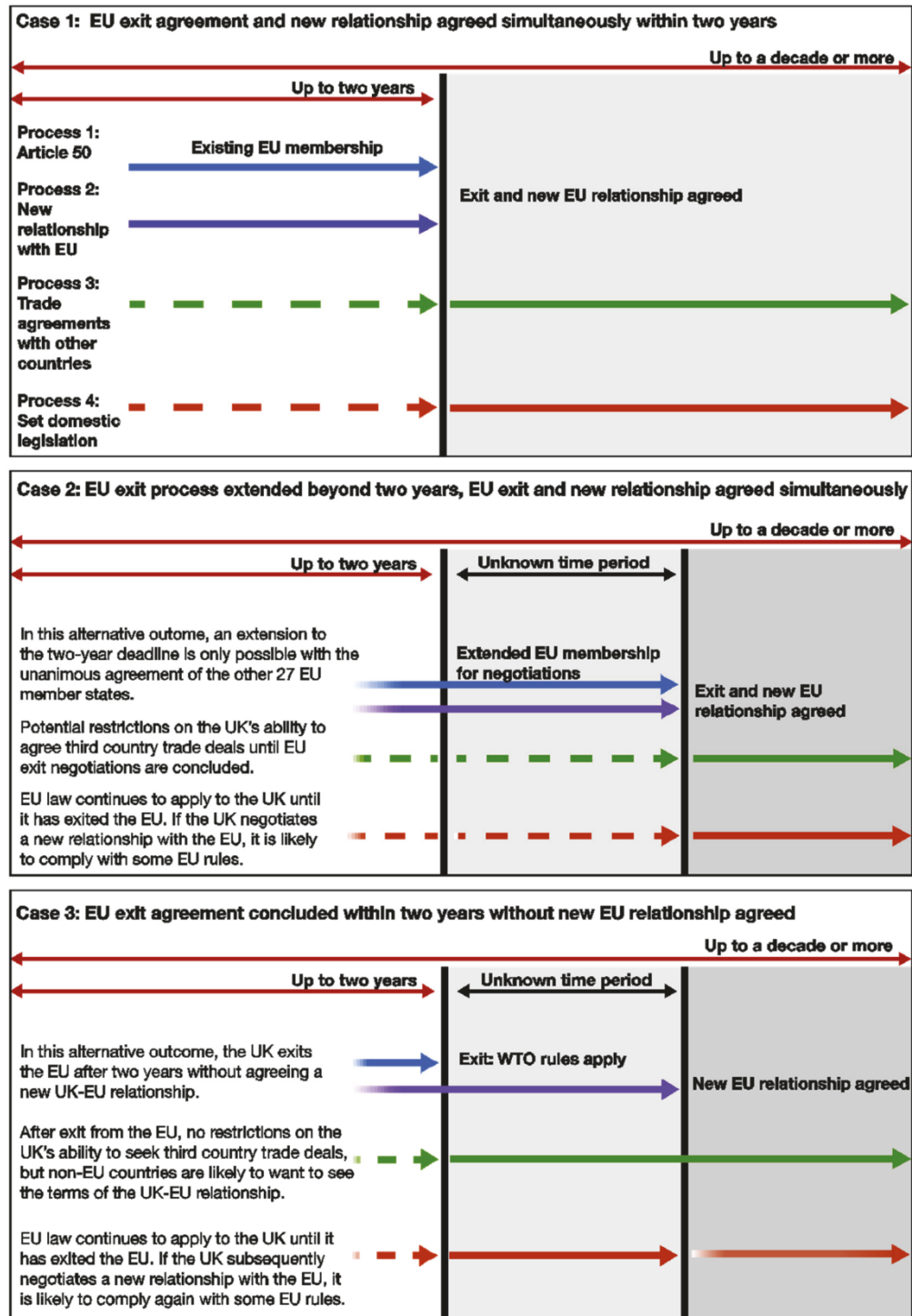
1.50 The UK's economic policy, regulatory and legislative framework would need to reflect the outcome of all of the processes discussed above. Withdrawal from the EU would involve considerable implications for UK domestic legislation. The UK Parliament and devolved administrations would need to consider how to replace EU laws, including how to maintain a robust legal and regulatory framework where that had previously depended on EU laws.

1.51 A recent House of Lords European Union Committee report on the process for withdrawing from the EU concluded this would be a lengthy process: "Domestic disentanglement from EU law would require a review of the entire corpus of EU law as it applies nationally and in the devolved nations. Such a review would take years to complete".

This view was reinforced by the IMF which stated that any new trade deal with the UK would require the unanimous consent of all EU countries, raising "considerable political risks". The IMF also stated that the UK's trading arrangements with around 60 non-EU countries that were agreed with the EU would automatically lapse and would have to be renegotiated.

The WTO also waded in to make the same point. In an interview with the *Financial Times*, Roberto Azevêdo, its director-general, said that Britain would face tortuous negotiations to fix the terms of its membership of the WTO if it voted to leave the EU's Single Market and instead looked to WTO rules to access European and other markets. According to Mr Azevêdo, pretty much all of the UK's trade with the world would have to be negotiated on everything from the thousands of tariff lines covering its

Figure 1.B: The interdependencies of the four processes triggered by a vote to leave the EU



Source: HM Treasury

entire trade portfolio to quotas on agricultural exports, subsidies to British farmers and the access to other markets that banks and other UK services companies now enjoy. An exit from the EU would cause the UK to lose the preferential access to other markets covered by 36 trade agreements with 58 countries negotiated by the EU. As a result, to remain compliant with WTO rules, the UK would have to impose higher “most favoured nation” tariffs on imports from those 58 countries, while they would have to levy their own surcharges on British exports. A WTO analysis had calculated the cost of the additional tariffs on goods imports to British consumers at £9 billion, while British merchandise exports would be subject to a further £5.5 billion in tariffs at their destination. Mr Azevêdo said that “The consumer in the UK will have to pay those duties. The UK is not in a position to decide ‘I’m not charging duties here’. That is impossible. That is illegal”, before adding that “It is a very important decision for the British people. It is a sovereign decision and they will decide what they want to decide. But it is very important, particularly with regard to trade, which is something very important for the British economy, that people have the facts and that they don’t underestimate the challenges”. (Note 82)

However, Ambrose Evans-Pritchard, the international business editor of *The Daily Telegraph*, points out that all this is simply not true, since international law recognises a “presumption of continuity” and all the parties need to do is sign a documentation of continuation in force. He adds that these organisations’ “mask(s) of objectivity have fallen” and that they are “playing politics with the democratic self-determination of this country”. (Note 83) Further, the WTO does not allow tariffs to be raised once they have been lowered between countries.

In a letter to the *Financial Times*, Economists for Brexit point to other alternatives that avoid the WTO altogether: (Note 84)

Sir, Roberto Azevêdo, the Brazilian head of the World Trade Organisation, has given his views to your newspaper about Brexit (“UK would face tortuous trade talks in event of Brexit, says WTO”, May 26). However, he does not seem to realise that the UK’s best “WTO option” on Brexit is to get rid of all the EU’s tariffs and trade barriers unilaterally.

This greatly reduces prices to consumers and businesses and would, based on our Economists for Brexit calculations, boost gross domestic product in the long term by 4 per cent. This requires no negotiations with anyone.

As for all those trade agreements the EU has negotiated with small countries around the world, they have no effect on our total trade or GDP; they simply divert trade to preferential markets away from other world markets, with no effect on world prices of our products.

Again no negotiations are needed to keep these unnecessary agreements. There are countless countries, including many much smaller than the UK, that have no trouble trading freely in this way and there is no reason to believe the UK cannot do the same.

Economists for Brexit:

Roger Bootle

Ryan Bourne

Professor Tim Congdon

Warwick Lightfoot

Dr Gerard Lyons

Neil MacKinnon

Professor Kent Matthews

Professor Patrick Minford

Figure 4 shows the alternative gravity model that the Treasury did not consider.

Figure 4 – The alternative gravity model the Treasury did not consider

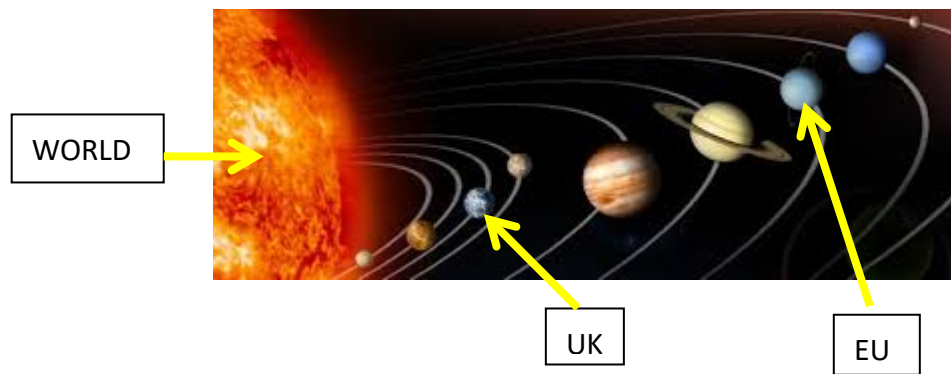


Figure 5 (Note 85) shows that if the full set of alternative models had been considered, then a very different picture emerges about the consequences of Brexit.

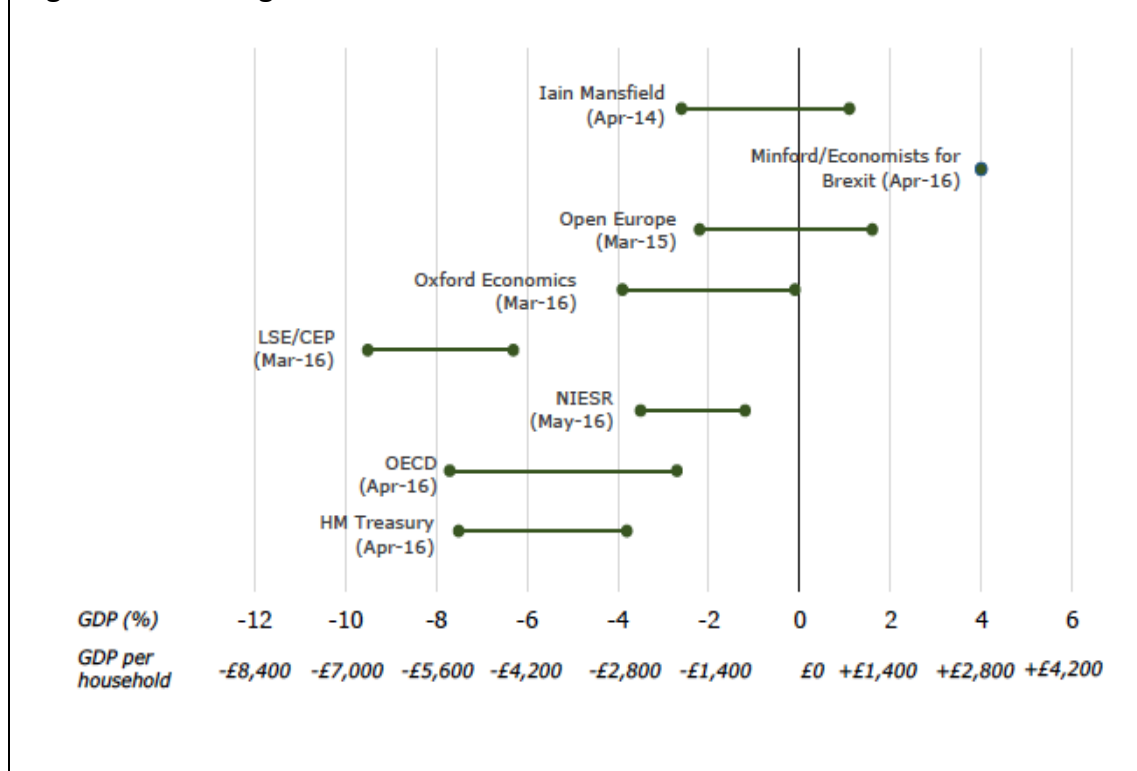
Conclusion

The Treasury has produced two reports which use two types of economic model to assess the consequences of Brexit. There is no balance in either report: the two models used—the VAR model and the gravity model—unambiguously predict that the consequences would be dire for households in the UK. The Chancellor has described anyone who disagrees with these reports as “economically illiterate”. (Note 86)

The two reports have been seized upon—in a carefully planned and coordinated campaign—by the IMF, the OECD, the WTO, the World Bank, every major global bank (Note 87), G20 finance ministers, 13 former US secretaries of state and defence, eight former US Treasury secretaries, five former heads of NATO, two former heads of MI5 and MI6, the chair of the US Federal Reserve, (Note 88) the Chinese president, and leaders of the G7 countries as far apart as the US and Japan, as well as leaders of Commonwealth countries to pressurise the British people to remain in the EU because they would be “better off” by doing so. But can it really be the case that all these organisations only have our best interests at heart? Or is it more likely to be the case that it is more convenient for them to have us

neatly locked up in a Regional Integration Area called the European Union. It was the former US secretary of state Henry Kissinger who famously asked: “Who do I call if I want to speak to Europe?” I suspect that the answer that all these organisations and individuals really want to hear is Jean-Claude Juncker, the unelected president of the European Commission—someone that the British Prime Minister David Cameron desperately tried but failed to stop getting the presidency.

Figure 5—The range of outcomes from alternative models



There was a time when the global plutocracy relied on the mysticism of religion to keep the populace in its place. Now the modern global plutocracy is using the mysticism of economic models. The wrath of God has been replaced by the wrath of a gravity model. If we fall for this, we will enter a new Dark Age where fear over the size of the EU trade dummy in a gravity model is intended to keep us all under control.

The British Treasury has in effect become a propaganda machine for a political institution led by Jean-Claude Juncker—a man who has declared his hostility to “democratic choice” when it comes to the wishes of the European people. This whole exercise is utterly dangerous for democracy. Let us suppose the Treasury, the IMF and the Bank of England adopted the same approach and used models like these to evaluate the economic policies of British political parties at the time of a General Election and pronounced that the policies of a particular political party would have “pretty bad to very, very bad consequences”—that would result in a “sudden stop” in money flowing into the finance sector which would drive down the value of the pound and lead to a sharp rise in interest rates, falling house and

commercial property prices and the erosion of London's status as a global financial centre, all of which would lead to a technical recession—but it is, of course, up to the electorate to decide how they vote. The Nobel Prize winning economist Tjalling Koopmans wrote a review paper in 1947 called “Measurement without Theory”. It spends some time discussing the roles of Tycho Brahé and Johannes Kepler in collecting empirical observations on the motion of planets that proved to be so useful to Isaac Newton when he developed his theory of gravity. But it was a correct theory in the end that was important in explaining the elliptical orbit of the planets around the Sun. By projecting these observations on the basis of a false theory—namely that the Earth was at the centre of the Universe—it was possible to predict that planets would suddenly and sharply change their direction of travel when viewed from Earth. The Treasury's application of gravity and VAR models to assess whether the UK would be better in or out of the EU is also an exercise in “Measurement without Theory”. The models confirm John Kenneth Galbraith's dictum that: “The only function of economic forecasting is to make astrology look respectable”. But it is far more insidious. The two models have been deliberately engineered to produce the result that the government and the rest of the global plutocracy want. And the fact that fellow economists have drafted reports like these that are being used by politicians to frighten the British electorate into staying an institution as precarious as the EU is both intellectually dishonest and deeply shaming. Do you think economists like John Maynard Keynes and Milton Friedman would have allowed themselves to be used in this way?

The two Treasury reports are two of the most dishonest and deceptive public documents I have ever read. The whole exercise should therefore be seen for what it is—an elaborate charade. What is happening is no different from Tony Blair's “dodgy dossier” on Saddam Hussein's weapons of mass destruction. These two reports will rightly gain the same status of “dodgy dossiers”.

However, the reports do serve one useful purpose—they tell you precisely how you would **not** handle a Brexit. First, the UK should not trigger Article 50 until all new trade arrangements have been agreed. Begin discussions with Germany—they sell us £70 billion in goods and services p.a. and we sell them £45 billion, a deficit of £25 billion, the largest amongst member states. (Note 89) Everyone else will soon line up. (Note 90) Second, manage expectations. There is absolutely no rational economic reason why a UK decision to leave the EU should cause a recession of the depth outlined above or a permanent reduction in GDP. A sensible strategy for negotiating exit and timing—including not triggering Section 50 until an appropriate time—and an appropriate monetary policy could prevent all this. However, you wouldn't want any of the people involved with preparing these reports to be involved in these negotiations.

Appendix: Lord Mervyn King's interview with Martha Kearney

The scaremongering tone of the Treasury reports contrasts markedly with the calm assessment about Brexit made by Mervyn King in his interview with Martha Kearney on BBC Radio 4's “World at One” programme on Monday 27 June 2016 (four days after the Referendum on 23 June).

Martha Kearney: [T]he former Governor of the Bank of England Mervyn King, Lord King is here, and

if I can begin by getting your response to the Chancellor's statement, many people are drawing a contrast between the tone of what he was saying today and what was said during the Referendum campaign

Mervin King: Well we heard a measured statement by George Osborne this morning, and I agree with everything that he said. We equally heard a measured statement by the Prime Minister last Friday, but it does contrast very significantly and notably with the slightly hysterical tone of some of the arguments that were put forward during the campaign. And I think that the big mistake was not to say to people "look both sides of this case has good arguments, we should listen to them", but in my case, or in your case we might disagree, but let's agree to differ on that; not regard it as a situation where it was obvious what the right answer was. Only half of the people thought that it was one answer namely *remain* and the other half *leave*.

Martha Kearny: And what kind of impact do you think it had on voters?

Mervin King: I think they resisted this very strongly. I have been going around the country a lot in the last couple of months, talking about my book, and I've been struck, even when I did not speak about the campaign—and I quite carefully stayed out of that—that people would ask questions, and the one word they used more than any other was "scaremongering". They didn't want to be treated like fools. They could have listened to a rational argument, and there's no doubt that leaving, creates uncertainties—that was a powerful argument. But it didn't help, to exaggerate that argument, by turning what were inevitably, very speculative forecast into facts, like £4,300 is the amount by which every household would be worse off, or that we would have an emergency budget, which will inevitably have to raise taxes and cut spending. The one thing that you do not need, if you believe that you are headed into a recession—and we don't know that, we may, we may not—but if it turns out that the economy is turning down, the last thing we would want is an emergency budget to raise taxes and to cut spending. And whether or not we would need to do so in the longer run, will depend upon the long run impact of the new situation with the UK outside the EU, and we have no idea what that would be.

Martha Kearny: So where does this leave the Chancellor?

Mervin King: Well I don't know, that's for him to decide. I think we desperately need someone who is going to put together a team of people now to do the preparations before the negotiations start in earnest, in the autumn.

Martha Kearny: But you could look at what's been happening in the markets today and the falling price of sterling down to a 31-year low, banking shares suspended and saying actually, there are problems, perhaps there was some truth in Project Fear?

Mervin King: No, I think that Project Fear went over the top. Sterling today, even after the fall, is roughly at the same level as it was in the middle of 2013 at a level which the Bank of England and the Treasury then thought was necessary to enable the UK economy to rebalance. We have a very large trade deficit on most trade and overseas income. Sterling could not be at the levels at which it reached

on Thursday night at midnight when people were speculating on the result and hope to rebalance the UK economy. Some fall in sterling at some point was inevitable.

Martha Kearny: But if there are problems as some suggest, with foreign direct investment, isn't that likely to make the trade deficit worse?

Mervin King: Well I think that foreign direct investment, undoubtedly, will probably fall, or be on hold for a period, and that was the largest, likely, short term economic pact of leaving the EU. But that reflects the uncertainty, and at some point that uncertainty will disappear, when the negotiations are completed, and then we will be in a different world again. So there are short term uncertainties, but I don't think that people should automatically translate that into deeply pessimistic views into the longer term.

Martha Kearny: Well it wasn't only the Chancellor who was as you say "deeply pessimistic", it was also the man who took over your job, Mark Carney. In May, he warned that the risks of leaving could possibly include a technical recession.

Mervin King: That was a short term statement and the Bank had no choice but to make a judgment about the short term. We don't know whether that is true or not, but even if it were true, that tells you very little about the long-term impacts and the Bank was very careful not to get involved in the speculative judgements to which the government fell prey to make. I think very confident statements about the damage that would be done in the long term about which the honest answer is we simply don't know. My own guess, and it's no more than that, is that the long term effects maybe much smaller than either side claimed.

Martha Kearny: But again, the Governor of the Bank of England found himself in the centre of the political fray, he was criticised for having demonstrated a fundamental misunderstanding of central bank independence—was he wise to get involved in that way?

Mervin King: I don't think that he had any choice but to comment on the current state of the economy, where it might go in the next 6 to 9 months. Central bank governors are always criticised, I don't think that means to say they are wrong.

Martha Kearny: Now Simon Jack is sitting here very keen to ask you something

Simon Jack (BBC News Business Editor): I do want to ask something. So if you look at the RBS and Barclay share price they are down 35% since last Thursday night, they have lost a third of their value. The Italian banks look rather vulnerable as well. Are you honestly saying that there is nothing to worry about here?

Mervin King: No, I am not saying there is nothing to worry about, [but] there is no reason to extrapolate this into a mindless panic. One of the things that is interesting about this is that the countries that may well suffer more are not the UK, but the rest of the European Union; because what this will do is to reinforce the impotence behind political parties in Europe who would like to get out of the Euro Area and what this will do, I think more than anything else, is to create further serious doubt about whether the Euro Area is a likely to be a successful long term project. That's the thing that is

going to damage the economies on the continent and, of course, many of our banks here are heavily exposed to Europe.

Martha Kearny: Now it's very interesting that you've expressed your concerns about the future of the Euro Project. Do you think it is unsustainable?

Mervin King: In its present form it is clearly unsustainable, and the person who said that most clearly is indeed Mario Draghi, the President of the European Central Bank. He wants to create a finance minister for the Euro Area to go forward. Unfortunately, the peoples of Europe don't want to have a political union with that consequence.

Martha Kearny: So you think it's doomed?

Mervin King: I don't know what will happen to it. I think they face a massive problem and their problem in this respect is far greater than ours now.

Martha Kearny: That suggests to me that the way you're talking now, that you might have leaned towards the Brexit arguments during the campaign?

Mervin King: I lean towards neither. In fact I was rather put off by both campaigns and quite deliberately didn't enter the campaign beforehand and I'm not going to do it now.

Martha Kearny: So what kind of action do you think you should be taken by either by the Chancellor or by the Bank of England, in order to calm both the short term turbulence and the possible longer term risks?

Mervin King: Well the Bank of England is ready to do whatever it feels it needs to do—it's not clear to me that it does need to do anything. Financial markets will always move up and down as they try to discover a new price, whether it's for sterling or bank shares and so on. That will, over the coming days, start to steady down.

Martha Kearny: Are you sure it will steady down though, because we have often seen with markets—well Lehman Brothers is a case in point—they can start relatively small and then escalate?

Mervin King: Well that was one big shock. Of course, there was a lot of volatility immediately after that, but it did steady down after that, and I think that the other thing that needs to be done by the government is to try and put together a team of people. I think it can hardly be our major politicians who seem to be embroiled in which ever party you look at—and major leadership contests which are going to absorb their energy for 3 months. We need a team of people who will be able to work together to set out a strategy for the negotiation. I don't think Article 50 could be invoked until there is a new Prime Minister, but nevertheless a lot of preparatory work can and should be done and I would like to see it done on a cross-party basis. Many of those who contributed to the campaign are on both sides, ought to be involved. People like Gisela Stuart ought to be given a chance to play a role here. And I think that we should look at a cross-party approach in the next 3 months before we have another Prime Minister to take the actual negotiations forward.

Martha Kearny: And what about interest rates?

Mervin King: Well, if anything, if the Bank of England's own forecasts are correct and we are moving

towards at least a slow down in the economy, then they will leave interest rates lower for longer. And I think it will be a peculiar reaction at this juncture to raise interest rates despite the fall in sterling. The Bank of England has been trying to push up inflation for a while, without a lot of success—this will help it in its cause.

Martha Kearny: But, of course, a rise in inflation because of goods being imported will be more expensive—that's hard for families.

Mervin King: Indeed, but that change in exchange rate and the rise of prices in imported goods was going to have to happen anyway at some point.

Martha Kearny: And final verdict overall on how you think the campaign was handled?

Mervin King: I think it was the most dispiriting and depressing campaign on both sides. I don't think many people will go out of this feeling that they performed as well as they could or should have done.

Martha Kearny: Mervin King, Lord King, thank you very much indeed for joining us.

Part 2: The State of the UK Economy Five Years after the Publication of the Treasury Reports

In this part of the paper, we review the state of the UK economy five years after the publication of the two Treasury Reports.

Economist Harry Western has looked at some of the claims made in mid-2016 and compared them with the outcome in mid-2021. (Note 91) The key economic claims made in 2016 were:

1. *The Treasury claimed that the short run impact of a "leave" vote would include an immediate year-long economic recession, a sharp drop in house and stock prices, rising unemployment and a "punishment" budget designed to fill a fiscal "black hole".*
2. *The Treasury claimed UK exports to the EU would collapse, falling by as much as 40% over the longer term due to the appearance of massive trade barriers between the UK and EU.*
3. *Based on these trade predictions and other factors, it was claimed UK productivity growth would weaken dramatically. Largely as a result, it was claimed that the UK economy might be as much as 8-10% smaller in the long term compared to a no-Brexit scenario. Households would be £4300 per year worse off.*
4. *It was claimed that a trade deal with the EU to replace EU membership might take a decade or more to agree, and that the UK would similarly take many years to replicate the EU's trade deals with third countries. It was even claimed the UK would not be able to easily join the World Trade Organisation.*
5. *It was repeatedly claimed ...that the UK's exit from the Customs Union and Single Market would lead to "border chaos" with huge queues at UK ports, leading to widespread shortages of key goods including food and medicines.*
6. *The UK financial sector would decamp en masse to the EU as a result of leaving the Single Market and the loss of "passporting" rights. (Note 92) Tens of thousands of highly paid bankers would*

move to Paris and Frankfurt, causing a massive decline in UK tax revenue. Financial sector job losses might run into the hundreds of thousands.

Western then compared these claims with the outcomes in 2021:

1. ***There was no recession after the Brexit vote.*** The UK economy grew 1.7% in 2016, 1.7% in 2017, 1.3% in 2018 and 1.4% in 2019. (Note 93) House prices grew 7% in 2016 and have grown by over 20% since 2016. Stock prices grew over 10% in the second half of 2016 (i.e., after the Referendum) and are now 18% higher than in the second quarter of 2016. Unemployment declined after the Referendum, to just 3.8% by end-2019. There was no “punishment budget” and the UK government’s budget deficit declined between 2016 and 2019—from 3.3% of GDP to 2.4% of GDP.
2. ***There was no collapse in exports.*** After an initial decline in January 2021, UK exports to the EU have recovered strongly and are now at similar levels to where they were before the UK left the EU Customs Union and Single Market. Even sales of sensitive items like food and fish have largely rebounded after initial problems adjusting to the new systems. It is obviously too early to fully assess claims that UK exports would collapse over a 15-year horizon but five years in there are no signs of this (and note, if firms had really believed trade would collapse like this, they would have started shifting production or curtailing business with the EU long before 2021).
3. ***No productivity slump, no crash in living standards.*** With no trade slump, the claimed collapse in productivity due to Brexit is also obsolete (as it was based on a contentious link between trade intensity and productivity). UK productivity growth remained positive from 2016-2019. Similarly, claims that households would be thousands of pounds a year worse off have not materialised and look unlikely to. Household real incomes are 4% higher today than at the start of 2016. Wage growth has also picked up, including in sectors where it previously was held down by an abundance of cheap EU labour.
4. ***Trade deals have been successfully negotiated.*** The UK and the EU agreed the Trade and Cooperation Agreement (TCA) in late 2020 after starting negotiations in March of that year. The UK has also successfully rolled over almost all of the trade deals with third countries that it was previously party to as a result of EU membership. Rolled-over deals covered some £182 billion of trade in 2020. The UK has also expanded the trade deal with Japan and agreed a completely fresh trade deal with Australia. None of this took a decade.
5. ***No border queues.*** The predicted tailbacks of thousands of trucks at UK ports completely failed to materialise, either at the start of 2021 or since. Cross-channel traffic has instead run smoothly and at similar levels to those prevailing before the UK left the EU Customs Union and Single Market.
6. ***Minimal impact on financial services.*** Predictions of massive relocations of financial sector activity and jobs have proved laughably wide of the mark. Industry estimates suggest just a few thousand jobs have moved to the EU or been created there due to Brexit—and that this process has largely run its course. Actual UK employment data shows total jobs in finance and insurance have risen by 21,000 (or 1.9%) since Q2 2016. Exports of financial services have risen by 11.6% since then.

London has maintained—even strengthened—its position as one of the world’s leading centres for financial services (including an over 40% global market share in foreign exchange trading). Unsurprisingly, over 1,000 EU financial services firms have applied or plan to open offices in the UK.

Western concluded:

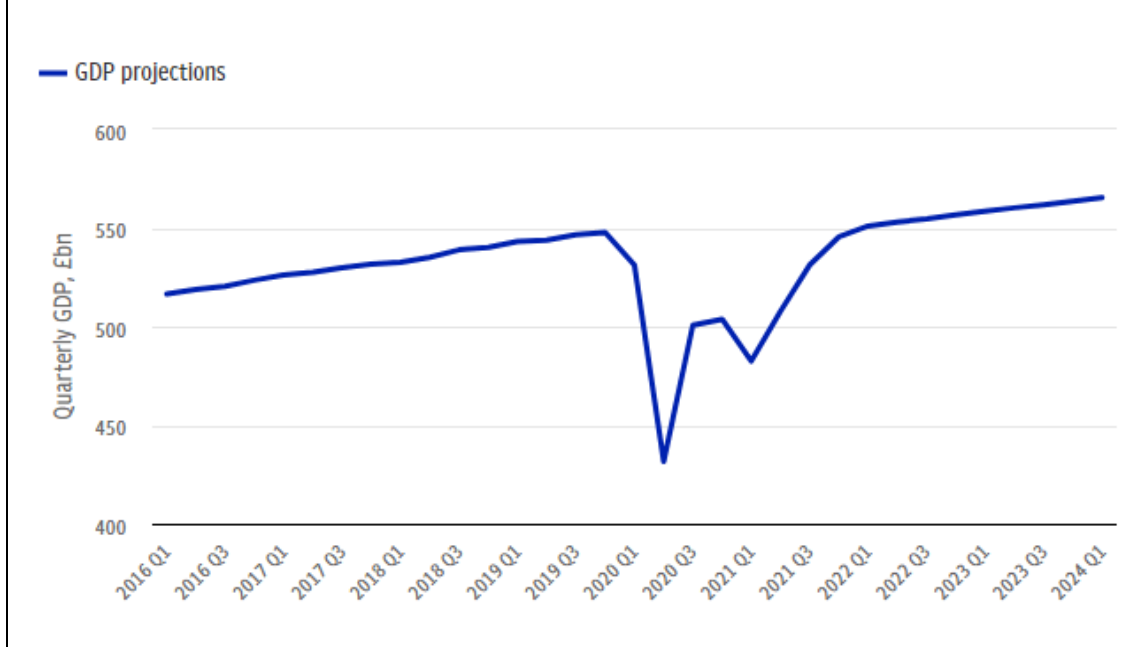
With more than five years having passed since the Brexit Referendum, the widespread predictions of economic chaos and collapse have failed to materialise. The UK economy has continued to grow, wages have risen, huge queues at borders have not appeared and the UK has successfully embarked on an independent trade policy. These outcomes provide a salutary lesson for the public. Not only should they ignore the claims of obviously partisan observers about key policy matters like Brexit, but they should also be wary of claims made by their own governments and supposedly independent “experts” in academia and international bodies.

In the run-up to the UK’s Brexit Referendum, the Minister for Europe, David Lidington, said to the House of Commons that “It is important that this key decision by the British people should be made on the basis of the facts”. But from the outset there was no attempt to provide the public with an even-handed assessment of the costs and benefits of EU membership.

Instead, the government, along with a wide range of academics, charities, industry lobbyists and international institutions such as the IMF and OECD fed the voters a relentless diet of exaggerated and misleading economic scare stories. Five years on, the extent of the disinformation is increasingly clear and provides a salutary if depressing lesson on how modern government works.

The UK economy was, of course, badly damaged by the Coronavirus Pandemic. Gross Domestic Product (GDP) fell by around 10% in 2020, the largest fall in 300 years. However, the UK Office for Budget Responsibility in its “Economic and Fiscal Outlook—October 2021” argued that “The successful vaccine rollout has allowed the economy to reopen largely on schedule, despite continuing high numbers of coronavirus cases. The vaccines’ high degree of effectiveness, combined with consumers’ and businesses’ surprising degree of adaptability to public health restrictions, has meant that output this year has recovered faster than we expected. ...The economy is now expected to grow by 6.5% in 2021 ...and unemployment to rise only modestly to 5.25%....Over the medium term, we have revised up real GDP as we now expect post-pandemic scarring of potential output to be 2%”. Figure 6 predicts that the economy will have fully recovered from the pandemic by the end of 2021 or the first quarter of 2022. Thereafter the GDP is predicted to growth along a trendline that is 2% lower due to “post-pandemic scarring”.

A final point to note is the implied criticism of the Treasury models made by Lord David Frost, the UK’s Chief Negotiator for Exiting the European Union and later co-chair of the Joint Committee monitoring the UK-EU Withdrawal Agreement and TCA, in a lecture at the Institute for European Studies in Brussels in February 2020. He criticised not only the structure of the Treasury models and the exaggerated size of the some of the key model parameters, but also the direction of causation of some of the key relationships in the models:

Figure 6. Projections of GDP following the Covid Pandemic

Source: Office for Budget Responsibility (2021) Economic and Fiscal Outlook—October 2021; <https://obr.uk/efo/economic-and-fiscal-outlook-october-2021/>

...these studies exaggerate—in my view—the impact of non-tariff barriers, they exaggerate customs costs, in some cases by orders of magnitude. Even more importantly, they also assume that this unproven decline in trade will have implausible large effects on Britain's productivity. Yet there is at least as much evidence that the relationship is the other way around—that it is actually productivity which drives trade. The claims that trade drives productivity are often in fact based on the very specific experience of emerging countries opening up to world markets, beginning to trade on global terms after a period of authoritarian or communist government—these are transitions that involve a huge improvement in the institutional framework and which make big productivity improvements almost inevitable. And I think the relevance of such experiences drawn from that for the UK, a high-income economy which has been extremely open for over a century, seems highly limited to me.

I also note that many Brexit studies seem very keen to ignore or minimise any of the upsides, whether these be connected to expanded trade with the rest of the world or regulatory change—often assuming the smallest possible impacts from such changes while insisting on the largest possible effects through changes in our relationship with the EU.

Finally, all of these studies imply to me a fantastic ability to predict the micro detail of the economy over a long period which I simply just don't buy. There is obviously a one-off cost from the introduction of friction at a customs and regulatory border, but I am simply not convinced it is on anything like the scale or with the effects these studies suggest. In any case, we aim to manage it down as far as we can through modern customs facilitation arrangements—and I am convinced that other factors will

outweigh it.

Indeed, if we have learned anything on economics from the last few years, and in particular from the British economy's refusal to behave as people predicted after the Referendum, it is that modern advanced economies are hugely complex and adaptive systems, capable of responding in ways which we do not foresee, and finding solutions which we did not expect.

The literature review in Wales et al. (2018) (Note 94) suggests that the weight of empirical evidence supports Frost's conjecture that productivity drives trade, rather than trade driving productivity. The Treasury had relied on a study by Frankel et al. (1999) (Note 95) to support its hypothesis that trade determines productivity. But this study acknowledges that its results are "not very precisely estimated" and only marginally statistically significant.

All this provides further confirmation that the two Treasury reports were indeed very "dodgy dossiers". Combining this with the evidence from Harry Western and the Office for Budget Responsibility on how successful the UK post-Brexit economy has been compared with the dire warnings in the Treasury reports confirms that the only purpose these two reports was to make astrology look respectable. And this needs to be placed on public record.

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Notes

Note 1.

<https://www.gov.uk/government/publications/hm-treasury-analysis-the-long-term-economic-impact-of-eu-membership-and-the-alternatives>

Note 2. <https://www.gov.uk/government/publications/hm-treasury-analysis-the-immediate-economic-impact-of-leaving-the-eu>

Note 3. NiGEM is used by over 40 organisations including the IMF, the Bank of England, the OECD, and the European Central Bank.

Note 4.

http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/documents/international_issues/the_euro/assessment/report/euro_assess03_repintro.cfm

Note 5.

<https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/05/Letter-from-Sir-Andrew-Dilnot-to-Jack-Doyle.pdf>

Note 6. <http://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2015-10-29#tab=Main-points>

Note 7. There were 26.7 million households and 64.6 million people in the UK in 2014, giving an

average household size of 2.3

http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/dcp171778_393133.pdf

<http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/mid-2014/sty---overview-of-the-uk-population.html>

Note 8. That is, $3000000/(64600000)$ and $3000000/(64600000/2.3)$, respectively.

Note 9. <http://openeurope.org.uk/today/blog/whats-best-way-cutting-33-3bn-burden-eu-red-tape/>

Note 10. House of Commons Library Briefing Paper, *UK-EU Economic Relations*, Number 06091, 13 April 2016.

Note 11. In fact, the report goes out of its way to diminish this bargaining advantage. On p. 11, it says: “less than 8% of EU exports come to the UK while 44% of UK exports go to the EU. Only 3.1% of the rest of the EU’s GDP is dependent on exporting to the UK, compared to 12.6% of the UK’s GDP dependent on EU-UK trade”.

Note 12. That is, of course, if people are being rational. Of course, people might turn nasty – but then you have to ask why you would want to have every closer union with people who will turn nasty whenever they don’t get their way.

Note 13. Patrick Minford (2016), *The Treasury Report on Brexit: A Critique*, Economists for Brexit, 10 May.

Note 14. House of Commons Library Briefing Paper, *UK-EU Economic Relations*, Number 06091, 13 April 2016.

Note 15. Defined as total trade (exports plus imports) as a share of UK GDP.

Note 16. Two quarters of negative GDP growth.

Note 17. The same is true for the OECD. So when the OECD’s chief economist, Catherine Mann, says that “we have done a lot of work on what a hard landing in China would mean. It is in the same ball park as Brexit”, this prediction comes from a similar gravity model to that used by the Treasury (reported in OECD’s Brexit warning dents pound and FTSE, *Citywire*, 1 June 2016).

Note 18. David Aikman, Philip Barrett, Sujit Kapadia, Mervyn King, James Proudman, Tim Taylor, Iain de Weymarn and Tony Yates (2011) Uncertainty in Macro-economic Policy-making: Art or Science?, *Philosophical Transactions of the Royal Society*, 369, 4798-4817.

Note 19. Although the output from the gravity model was then fed into the NiGEM model.

Note 20. This is the middle case between a “shock” and “contagion”.

Note 21. The comprehensive UK uncertainty indicator is constructed by averaging six measures of uncertainty in order to estimate the size of uncertainty shocks in past episodes (p. 39 and p. 64). The uncertainty indicator is constructed by averaging the following normalised measures: Baker-Bloom-Davis policy-related uncertainty; FTSE 100 implied volatility; sterling implied volatility; CBI Industrial Trends uncertainty measure; European Commission consumer uncertainty measure; and

GfK unemployment expectations. See *The Impact of Uncertainty Shocks on the UK Economy*, Denis and Kannan (2013); *Measuring Economic Policy Uncertainty*, Baker, Bloom and Davis (2015); and *The Short-term Economic Impact of Leaving the EU*, National Institute of Economic and Social Research (2016).

Note 22. Measured in 2015 terms.

Note 23. Chris Giles (2016) Charlie Bean gives seal of approval to Brexit analysis, *Financial Times*, 23 May.

Note 24. Note the IMF and Bank of England forecasts discussed above and only made a few weeks before that the UK “could” lead to a recession are already wrong—this new Treasury report says that there “will” definitely be a recession.

Note 25. A phrase used by Kit Juckes of Société Générale in *The Daily Telegraph*, 20 May 2016.

Note 26. These banks predicted a 12% fall in sterling and the Treasury has raised this to 15% for the “extreme shock” case.

Note 27. For a reason unexplained in the report, it excludes exchange rates.

Note 28. There is no supporting evidence for this, since there can be no supporting evidence. However, the size of the increase was chosen to make the predictions of the short- and long-term models consistent with each other, as we will shortly see.

Note 29. It is interesting to recall that the recession of 1991-92 was primarily caused by high interest rates and an overvalued exchange rate induced by the UK’s membership of the Exchange Rate Mechanism (ERM, 1990-1992). The Treasury at the time said it would be a disaster for the UK to leave the ERM. But this happened on 16 September 1992, following which inflation fell, interest rates were cut and the economy recovered (Roger Bootle, Yes, the IMF and 200-plus economists can be wrong, *The Daily Telegraph*, 15 May 2016).

Note 30. David Cass and Karl Shell (1983) Do Sunspots Matter? *Journal of Political Economy*, 91(21), 193-228. The term comes from economist William Stanley Jevons’ attempt to see if there was a causal relationship between the pattern of sunspots and the business cycle. No such relationship has been found (William Stanley Jevons (1878) Commercial crises and sunspots, *Nature*, 19, 33-37).

Note 31. Arthur Pigou (1927) *Industrial Fluctuations*, Macmillan, London.

Note 32. John M. Keynes (1936) *The General Theory of Employment, Interest and Money*. London. Macmillan, 161-162.

Note 33. This is where the effect of a small shock to a system is magnified over time.

Note 34. Note that I use a VAR model that directly links GDP and the uncertainty indicator as in Chart A.2. By contrast, the VAR model used by the Treasury links the uncertainty indicator to the components of GDP and other macroeconomic variables. The output from the Treasury’s VAR model then needs to pass through NiGEM in order to derive the impact on GDP. The Treasury could have avoided that by using the same direct model as I use here.

Note 35. The report states that “periods of increased uncertainty have been associated with lower GDP

growth” (p.13). Yes, but that does not imply any causality. Nor does it imply that you can use this association to arbitrarily increase the level of uncertainty and hold it there for two years to trigger a recession.

Note 36. <http://data.worldbank.org/indicator/NE.EXP.GNFS.ZS>

Note 37. Quoted in Economic threat of Brexit is being “exaggerated”, says former Bank of England chief, *The Daily Telegraph*, 20 April 2016.

Note 38. Quoted in *The Times*, 17 October 2015.

Note 39. Quoted in *The Financial Times*, 24 February 2016.

Note 40. Quoted in the *Evening Express*, 26 February 2016.

Note 41. Nevertheless, the biggest cause of a shock of this size would be the scare-mongering tone of the two Treasury reports.

Note 42. <http://www.bbc.co.uk/programmes/b07btgtl>

Note 43. The same point was made somewhat less kindly by Ryan Bourne (2016) *The Treasury's new Brexit paper: Rubbish in, rubbish out*, Institute for Economic Affairs, 24 May; <http://www.ica.org.uk/blog/the-treasurys-new-brexit-paper-rubbish-in-rubbish-out>

Note 44. This, of course, is nothing more than Goodhart's Law as any second-year economics undergraduate student will tell you (Charles Goodhart (1975) *Problems of Monetary Management: The U.K. Experience*. Papers in Monetary Economics, Reserve Bank of Australia).

Note 45. http://www.kushnirs.org/macroeconomics_/en/greenland__gdp.html

Note 46. Rodney Thom and Brendan Walsh (2002) The Effect of a Currency Union on Trade: Lessons from the Irish Experience, *European Economic Review*, 46, 1111-1123.

Note 47. Robert, A. M. (1960) The Monetary Dynamics of International Adjustment under Fixed and Flexible Exchange Rates, *Quarterly Journal of Economics*, 74, 227-57.

Note 48.

http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment_statistics;

<http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00115&plugin=1>

Note 49. *The Times*, 19 November 1997.

Note 50. <https://gefira.org/en/2016/06/03/after-the-brexit-referendum-a-fiscal-union-will-be-brussels-surprise/>

Note 51. The secret EU army is a dangerous delusion, *The Daily Telegraph*, 28 May 2016; <http://www.telegraph.co.uk/opinion/2016/05/28/the-secret-eu-army-is-a-dangerous-delusion/>. This is particularly concerning, given the EU's history of foreign policy failures: e.g., not intervening in the Balkan wars in the 1990s and stepping on Russia's toes by getting too close to the Ukraine and then doing nothing when President Putin reacted by annexing the Crimea in 2014.

Note 52. <http://www.bbc.com/news/world-us-canada-34789502>

Note 53. <http://www.tent.org/refugees-work/>

Note 54. Giovanni Peri (2012) The Effect of Immigration on Productivity: Evidence from US States, *The Review of Economics and Statistics*, 94(1), 348-358; Francesc Ortega and Giovanni Peri (2014), Openness and Income: The Roles of Trade and Migration, *Journal of International Economics*, 92, 231-251.

Note 55. BBC News, 16 May 2016.

Note 56. Gunnar Beck, Charles Blankart, Gerd Habermann, Dietrich Murswiek, Alfred Schüller, Joachim Starbatty, Roland Vabel, and Hans-Olaf Henkel.

Note 57. David Cameron is a keen supporter of Turkey joining the EU. On his first trip to Turkey as Prime Minister in 2010, he said he wanted to “pave the road for Turkey to join the EU, saying the country was ‘vital for our economy, vital for our security and vital for our diplomacy’. Without Turkey at its heart, the EU was ‘not stronger but weaker... not more secure but less... not richer but poorer. I’m here to make the case for Turkey’s membership of the EU. And to fight for it.... It makes me angry that your progress towards EU membership can be frustrated in the way it has been... So I will remain your strongest possible advocate for EU membership and greater influence at the top table of European diplomacy” (Cameron “anger” at slow pace of Turkish EU negotiations, BBC News, 27 July 2010, www.bbc.co.uk/news/uk-politics-10767768).

Note 58. Eurostat data; https://en.wikipedia.org/wiki/List_of_European_countries_by_average_wage

Note 59. “Europe’s Rule-of-Law Crisis”;

<https://www.project-syndicate.org/commentary/rule-of-law-crisis-hungary-poland-by-guy-verhofstadt-2016-04>

Note 60. Stephen Booth, Christopher Howarth, Mats Persson, Raoul Ruparel and Pawel Swidlicki (2015) *What if...? The Consequences, Challenges & Opportunities facing Britain outside EU*, Open Europe.

Note 61. Business for Britain. (2015). *Change, or Go: How Britain Would Gain Influence and Prosper outside an Unreformed EU*; <http://businessforbritain.org/change-or-go/>

Note 62. CEBR: Brexit but staying in the Single Market could leave UK GDP higher by 2030, *City A.M.*, 20 April 2016.

Note 63. PwC (2016) *Leaving the EU – Implications for the UK Economy*.

Note 64. Woodford Investment Management (2015) *The Economic Impact of “Brexit”*.

Note 65. Patrick Minford, Sakshi Gupta, Mai Le, Vidya Mahambare and Yongdeng Xu (2015) *Should Britain leave the EU?*. Edward Elgar, Cheltenham.

Note 66. <http://www.economistsforbrexit.co.uk/>

Note 67. Quoted in *The Daily Telegraph*, 20 May 2016 (Bank “must be ready” to cut rates even if UK stays in EU).

Note 68. <http://www.cityam.com/231501/world-economic-league-table-uk-could-overtake-germany-and-japan-to-become-worlds-fourth-biggest-economy>

Note 69. <http://www.cityam.com/239128/the-treasury-has-it-entirely-wrong-the-british-economy->

would-gain-from-brexit

Note 70. Lord Owen: “There is no need to be afraid of leaving the EU”, *The Daily Telegraph*, 28 May 2016.

Note 71. What would a Brexit mean for investors?, *portfolio international*, May 2016.

Note 72. He added that this view was shared by the International Monetary Fund and the Bank of England.

Note 73. The deceptions behind George Osborne’s Brexit report, 18 Apr 2016;

<http://blogs.spectator.co.uk/2016/04/the-deceptions-behind-george-osbornes-brexit-report/>

Note 74. <http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2015-11-05>

Note 75. <http://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/ihxv>

Note 76. <http://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/rphq>

Note 77. <https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections>

Note 78. <http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2015provisionalresults>

Note 79. David Cameron and George Osborne, Brexit would put our economy in serious danger, *The Daily Telegraph*, 22 May 2016.

Note 80. By £230 and new limits on duty free.

Note 81. ITN News, 6 June 2016.

Note 82. UK would face tortuous trade talks in event of Brexit, says WTO, *Financial Times*, 26 May 2016.

Note 83. *The Daily Telegraph*, 14 May 2016.

Note 84. Bypassing tortuous trade talks in event of Brexit, *Financial Times*, 26 May 2016.

Note 85. Institute for Fiscal Studies; <http://www.niesr.ac.uk/sites/default/files/images/chadhafig1.png>

Note 86. This would include five of his Conservative predecessors as Chancellor or shadow Chancellor (Lawson, Lamont, Howard, Lilley and Portillo). Quoted in Ryan Bourne (2016) The Trouble with the economic consensus against Brexit, 2 June; <http://capx.co/the-trouble-with-the-economic-consensus-against-brexit/>. Even Jeremy Corbyn, the Labour leader and a new convert to remaining in the EU, has described the Treasury predictions as “histrionic hype” and “myth-making” (quoted in Corbyn accused of sabotaging the Remain case – Labour leader stuns some colleagues with attack on Treasury Brexit forecast, *Financial Times*, 3 June 2016).

Note 87. On 3 June 2016, Jamie Dimon, J.P. Morgan chief executive, speaking alongside the Chancellor at J.P. Morgan’s Bournemouth office, said that leaving the EU would be a “terrible deal” for the UK economy and warned that he might have to cut as many as 4,000 jobs in the UK if Britain votes to leave the European Union on 23 June (BBC News).

Note 88. Dr Janet Yellen said: “There would be potentially significant economic repercussions if the

UK votes to leave the EU. It would likely shift investor sentiment” (BBC World Service, 6 June 2016).

Note 89. House of Commons Library Briefing Paper, *UK-EU Economic Relations*, Number 06091, 13 April 2016.

Note 90. Lord Owen agrees: “Companies like Mercedes and BMW will come in straight away, soon followed by the Champagne growers, then the cheese makers on the phone... These forces on the ground would outweigh political opposition” (quoted in *The Daily Telegraph*, 2 June 2016).

Note 91. Harry Western (2021) Five years on – the things Remainers got wrong about Brexit, *Briefings for Britain*, 28 August; <https://www.briefingsforbritain.co.uk/five-years-on-the-things-remainers-got-wrong-about-brexit/>

Note 92. See Box 1.D Impact of a decision to leave the EU on the financial services sector, ‘HM Treasury Analysis: The Immediate Economic Impact of Leaving the EU’, published on 23 May 2016; <https://www.gov.uk/government/publications/hm-treasury-analysis-the-immediate-economic-impact-of-leaving-the-eu>

Note 93. The data for 2020 and 2021 are distorted by the Coronavirus Pandemic and not included.

Note 94. David Frost lecture: Reflections on the Revolutions in Europe; <https://no10media.blog.gov.uk/2020/02/17/david-frost-lecture-reflections-on-the-revolutions-in-europe/>

Note 95. Philip Wales, Russell Black, Ted Dolby and Gaganan Awano (2018) *UK Trade in Goods and Productivity: New Findings*, Office for National Statistics and ESCoE Discussion Paper 2018-09, July.

Note 96. Jeffrey A. Frankel and David Romer (1999) Does Trade Cause Growth? *American Economic Review*, 89(3), 379-399.