Consequences of Brexit and Options for a "Global Britain"

Brakman, Steven; Garretsen, Jan; Kohl, Tristan

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Consequences of Brexit and Options for a "Global Britain"

Abstract

The United Kingdom has opted to leave the European Union. The trade and welfare consequences of this decision are large; most studies predict a trade and welfare loss for both the UK and the EU. The UK parliament has indicated that it aims for new and ambitious trade agreements following Brexit, but has not been explicit what type of trade agreements it envisions (except that it should be broad) or with whom specifically. In this paper, we consider the UK's options. We first confirm, in line with existing studies, that the negative trade consequences of Brexit are substantial, especially for the UK and also for the EU. After reviewing all potential options, we have a simple answer to the question whether the UK has an alternative for the existing trade agreement with the EU. The answer is: No. Only a trade agreement with the EU can compensate for the negative trade consequences of Brexit.

JEL-Codes: F130, F140.

Keywords: Brexit, Gravity Model, trade predictions.

Steven Brakman
Faculty of Economics & Business
University of Groningen
PO Box 800
The Netherlands – 9700AV Groningen
s.brakman@rug.nl

Harry Garretsen
Faculty of Economics & Business
University of Groningen
PO Box 800
The Netherlands – 9700AV Groningen
j.h.garretsen@rug.nl

Tristan Kohl
Faculty of Economics & Business
University of Groningen
PO Box 800
The Netherlands – 9700AV Groningen
t.kohl@rug.nl

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1. Introduction

On June 23, 2016, the people of the United Kingdom voted to leave the European Union (EU), the so-called Brexit. In a letter dated March 29, 2017, British prime minister informed the EU of the intention to terminate its EU membership.

The EU swiftly responded on March 31 that this '*...creates significant uncertainties that have the potential to cause disruption, in particular in the UK but also in other member states* (p.2).'[1] Indeed, the Brexit creates uncertainties on many fronts: political, social, and economic. In this paper, we will focus on the economic aspects of the Brexit and highlight the consequences of the Brexit on trade flows, and analyse the trade options of the UK.

From an international trade perspective, the choice of the UK to leave the EU is remarkable. Leaving a large free trade area as the EU is most likely trade and welfare reducing. Without a new agreement, relative trade barriers will change by making trade with the EU relatively more expensive compared to outside-EU trade, resulting in trade creation with the non-EU world and trade diversion away from the EU. The balance between these developments is most likely trade and welfare reducing, as trade barriers between the UK and the largest trading block in the world increase.[2] This sombre evaluation is corroborated by almost all analyses of Brexit. The estimates range between roughly 1.5% reduction in GDP to more than 7%, depending on assumptions made how the Brexit takes place (Baldwin, 2016). Only 'Economists for Brexit' produced a positive estimate, but this seems to be an outlier in the available estimates (see Miles, 2016, p. 31, for an overview).

The challenge for the UK is to find a new position within the world of trade agreements. The letter of the UK prime minister (see note 1) indicates that the principles of the Brexit with respect to international trade are outlined in the White Paper of February 2, 2017, which says that the UK aims to (p.8) '*forge a new strategic partnership with the EU, including a wide reaching, bold and ambitious free trade agreement...*' and that '*we will forge ambitious free trade relationships across the world*'.[3] The various comments of politicians indicate that

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[1] See for the letter of the British prime minister: http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/29_03_17_article50.pdf. The answer from the EU: EU Draft Guidelines following the United Kingdom's notification under Article 50 TEU, Council of The European Union, XT 21001/17, Brussels.

[2] The so-called Kemp-Wan theorem gives the condition for the net effect to be positive: trade must remain fixed after the change in membership. So, trade barriers have to adjust in special ways to make this happen (see Feenstra, 2016, for a discussion).

[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/589191/The_United_Kingdoms_exit_from_and_partnership_with_the_EU_Web.pdf

the negotiations will at times become confrontational; the UK links the trade negotiations to security issues and Gibraltar, whereas Donald Tusk (EU president) has warned that 'cherry picking' by the UK will not be accepted by the EU (see note 1).

In this paper, we will not predict or speculate what the most likely outcome of Brexit negotiations will be, but instead analyse the options for the UK with respect to international trade. The UK indicated in the White Paper that it would like to 'forge new trade agreements.' The question we answer in this paper is what trade agreements could be an alternative to the current situation of UK's EU membership. Based on a state-of-the art gravity model we will first estimate with our data – value added trade data – what the consequences are of Brexit. Next, we will analyse options for the UK that have been put forward in several policy discussions – including a trade partnership with the US, or with various other parts of the world – and confront those estimates with a (renewed) partnership with the EU. Our broad conclusion is simple: the UK has no alternative than a trade agreement with the EU unless it is willing to accept a trade reduction.

The paper is structured as follows. Section 2 describes the methodology and our dataset. Section 3 presents our estimation results. Finally, section 4 concludes.

2. Methodology

2.1. Gravity equation with counterfactual scenarios

A well-known and well-established method to estimate the consequences of trade agreements (TAs) is the so-called gravity equation (for a survey, see Head and Mayer 2014). This is an accepted method to evaluate the effects of changes in variables that in some way affect barriers to trade between countries. Key in modern formulations of the gravity models are the so-called Multilateral Resistance (MLR) terms. These terms are related to price indices, and are important to analyse the effects of a TA between, say, two countries on the rest of the trading system. Without these terms, the simulated effects of a TA would only affect the two countries involved. With these price index terms present, however, a TA changes the MLR terms and thus affect the whole trading system as trade between any pair of countries takes place against the background of changed price indices. We provide a simple derivation to illustrate how this works.

We follow Baldwin and Taglioni (2006), as summarized in Van Bergeijk and Brakman (2010, p. 9-10) and proceed in 6 steps.

Step 1: The first step is an equilibrium equation which says that the value of trade flows from country *i* to *j*, $p_{ij}x_{ij}$, should equal the share, s_{ij}, that country *i* has in expenditure of *j*, E_j: $p_{ij}x_{ij} = s_{ij}E_j$, where p_{ij} is the import price from *i* to *j*.

Step 2: Assuming the familiar constant elasticity of substitution (CES) demand structure, it is straightforward to derive demand for each individual product and calculate s_{ij}, explicitly:

$s_{ij=}\left(\frac{p_{ij}}{P_j}\right)^{1-\sigma}$, where $P_j = \left(\sum_{i=1..N} n_i \left(p_{ij}\right)^{1-\sigma}\right)^{1/(1-\sigma)}$

where P_j is the exact price index associated with the CES demand structure; σ > 1 is the elasticity of substitution between varieties 'n_i'; N is the number of countries.

Step 3: Trade costs are crucial in gravity models. Let $t_{ij} > 1$ indicate all bilateral trade costs from country *i* to *j* (man-made and natural costs), then the price in market *j* equals: $p_{ij} = p_i t_{ij}$, where p_i is the so-called mill price of a product in the market of origin, *i.*

Step 4: The gravity model describes total bilateral trade, T_{ij}, for industries, or countries, so we have to aggregate across varieties (products): $T_{ij} = n_i p_{ij} x_{ij} = n_i s_{ij} E_j = n_i \left(p_i t_{ij}\right)^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}}$, where we use $s_{ij=}\left(\frac{p_{ij}}{P_j}\right)^{1-\sigma}$, and the price including transportation costs.

Step 5: We assume that all goods are traded, implying that the total output of a country *j*, Y_j, equals total sales to all destination countries (including the home country): $Y_i = \sum_j T_{ij} = n_i (p_i)^{1-\sigma} \sum_j \left(t_{ij}^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}}\right)$, where we use the result of step 4. We can re-write this equation as follows: $n_i (p_i)^{1-\sigma} = \frac{Y_i}{\Pi_i^{1-\sigma}}$, where $\Pi_i = \left(\sum_j \left(t_{ij}^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}}\right)\right)^{1/(1-\sigma)}$, and substitute this in the final step of 4 to obtain:

Step 6: A gravity model [by combining step 4 and step 5]:

$$T_{ij} = Y_i E_j \left(\frac{t_{ij}}{P_j \Pi_i}\right)^{1-\sigma}, \quad (1)$$

Equation (1) is a basic formulation of a modern gravity equation.

In empirical research, other variables are included that affect trade barriers, such as a common language between i and j, a shared border, similar history (colonies), and most importantly for this paper, being part of a common TA. Note that bilateral trade is not only affected by variables describing the bilateral relation between i and j, but also by Π_i and P_j, the MLR terms. These terms depend on all prices in the system. Changes in trade costs between two countries thus also affect the rest of the trading system. As a result, we have in our simulations two types of effects: those that directly affect the trading partners themselves because they exit/enter a TA, and the effects with respect to the rest of the world through the MLR terms (price index effects).

In practice, the estimation of equation (1) is difficult as the MLR terms depend on parameters that have to be estimated. Anderson and Van Wincoop (2003) have a custom programmed iteration model to find the estimates of equation (1). We follow Anderson et al. (2015), as they have developed a more straightforward estimation method (see also Anderson and Yotov 2015; Larch and Yotov 2016). A crucial step in their method is to re-estimate the model as described in steps 1-6, for the alternative policy scenario, the counterfactual model.

First, equation (1) is estimated by using importer and exporter fixed effects to capture the MLR terms. Using these estimates the implied trade costs, $\left(\frac{t_{ij}}{P_j\Pi_i}\right)^{1-\sigma}$, are derived. Next, the new policy scenario is included by turning on/off, in our case, a TA dummy. In case of Brexit, the TA dummy that describes the EU membership of the UK becomes zero. Given the estimates, one can calculate the counterfactual implied trade costs and substitute these in the expressions for the MLR terms as defined above. This results in counterfactual MLR terms. By imposing market clearance, one can calculate the new values of Y_i. In this way, we can compare the original (baseline) situation to counterfactual situations and calculate changes in trade flows and income.[4]

In this paper, we will focus on the so-called 'full endowment general equilibrium' trade effects, i.e. the change in trade once income and expenditure have adjusted to the new MLR terms and counterfactual trade costs (for a detailed discussion, see Larch and Yotov 2015).

[4] Trade agreements come in all sorts of shapes and forms. In Kohl et al. (2016) we differentiate between various provisions in trade agreements and differentiate whether or not a provision is legally enforceable; resulting in 52 different elements in a trade agreement. Because we do not know how negotiations between the UK and various trading blocs in the world will incorporate various elements, we opt for the simple way to describe a TA, i.e. with a binary dummy.

2.2. Data

While traditional estimates of the gravity equation rely on gross trade data, a growing literature has emphasized the importance of using novel measures of value-added exports (VAX) data to account for the international fragmentation of production (see, e.g., Johnson and Noguera 2012, Koopman et al. 2014, and Kaplan et al. 2016). In line with this development, we explicitly use data on trade in value-added instead of gross exports. Value-added data are more relevant for exercises like we present in this paper because changes in value added trade are more directly linked to income and welfare of the countries involved.

Value-added exports are from the World Input-Output Database (WIOD), covering 43 countries in 2014, the most recent year available.[5] For a detailed description of WIOD, its construction and applications, see Timmer et al. (2015, 2016). The 43 countries covered account for more than 85% of world GDP and are listed in Appendix Table A1. Other typical gravity-equation controls (bilateral distance, contiguity and common language) are from CEPII (Mayer & Zignano 2011). Trade agreement data are from Kohl (2014) and updated using the WTO Regional (Preferential) Trade Agreements Database.

2.3. Empirical strategy

Following Anderson et al. (2015), we estimate the following equation with PPML:

$$VAX_{ij} = \ln(DIST_{ij}) + CNTG_{ij} + BRDR_{ij} + TA_{ij} + F_i + F_j \qquad (2)$$

where VAX is the value added exports of origin *i* to destination *j* at destination prices; DIST is the bilateral distance between the trade partners in kilometres; CNTG is a dummy which is 1 when *i* and *j* share a common border and 0 otherwise; BRDR is a binary variable equal to 1 if international trade is involved and 0 if the country is trading with itself (see step 5 in section 2.1); TA is 1 when *i* and *j* have a trade agreement and 0 otherwise; F_i and F_j represent origin and destination fixed effects, respectively, and are the MLR terms.[6,7]

[5] Our results are qualitatively similar when using alternative data sources, specifically, (i) gross trade and production data generously provided by Mario Larch as used in Anderson et al. (2015) and Anderson and Yotov (2016), and (ii) the OECD Trade in Value Added Database (TiVA). All results are available from the authors upon request.

[6] Output and expenditure (origin and destination GDP in traditional gravity equations; see equation 1) are fully captured by the MLR terms in the baseline scenario, and recalculated based on the counterfactual trade costs (see Anderson et al. 2015).

[7] The baseline parameter estimates (robust standard errors) are -0.601 (0.047) for ln(DIST), 0.518 (0.137) for CNTG, -3.920 (0.148) for BRDR and 0.258 (0.084) for RTA; all estimates are significant at the 1% level.

In the following section, we will present the results of a series of different scenarios that can be calculated with the methodology outlined above.

First, we consider the case of a "hard Brexit", in which the UK terminates its EU membership and all trade agreements to which the UK belonged as member of the EU.[8] In order to calculate the counterfactual trade costs, the binary TA variable will be "switched off", i.e. from 1 to 0, for all country-pairs involving the UK and another EU member. An alternative option might be a so-called "soft Brexit", in which the UK leaves the EU and retains its membership in all the EU's trade agreements with countries such as Canada, Mexico and South Korea.[9, 10]

Second, once a "hard Brexit" is in place, we explore which trade agreements the UK can pursue in its "Global Britain" strategy. One possible option is that May and Trump negotiate a US-UK trade agreement. We will show that such an agreement would only have a minor role in reducing the UK's losses. To add insult to injury, even the most extreme case of a "Global Britain" in which the UK has a TA with all non-EU countries would still not be sufficient to offset the UK's post-Brexit loss in trade.

Finally, one may ask how severe the trade impact of Brexit would be in light of other potential threats to the international trade regime. We will consider the case of the US abandoning the North American Free Trade Agreement (NAFTA), the dissolution of the EU, and, as a worst-case scenario, the collapse of all trade agreements worldwide.

3. Results

A full overview of all results is presented in Appendix Table A2 (percentage change compared to baseline, i.e. pre-Brexit) and Appendix Table A3 (change in absolute values).

3.1. Great Brexit

The set up for our discussion of the various scenarios is relatively straightforward. Ranked on the horizontal axis by the size of their economy, as measured by ln(GDP), we show for each country in our sample the effect of the change in the trade agreement status on value

[8] Note that all EU members' trade agreements are centralized at the EU level. The UK does not have trade agreements that are independent and separate from the EU.

[9] For the purpose of our analysis, it does not matter whether the UK signs a new bilateral agreement with current EU TA partners, or (re)negotiates its membership in existing agreements between the EU and its TA partners.

[10] While there is some debate as to the merits of a 'Norway' construction (i.e. free trade, but no labour mobility), such a scenario cannot be computed with our counterfactual gravity equation setup. The reason is that that TA variable is already 1 for UK-EU members in the baseline, so that nothing would change in the counterfactual scenario in which an alternative agreement is activated.

added exports (in %) using the methodology outlined in section 2. The bubble for each country is proportional to a country's value-added exports in 2014. These results are full endowment general equilibrium effects, that however still could underestimate the impact of Brexit or related scenarios (see also Dhingra et al, 2016) for mainly two reasons. First, the effects are static in the sense that the dynamic negative impact of a reduction in trade could have on productivity growth is not taken into account. Second, the analysis is only concerned with trade effects and ignores the changes on international factor mobility that the changes in trade agreements might give rise to. So, in the case of Brexit, the analysis does not deal with the possible effects of changes in labour migration or (re)location decisions of (multinational) firms. Having said so, the first scenario when estimating (2) and "creating" the counterfactual is the case of a "hard Brexit" where the UK not only leaves the EU but also all other trade agreements it currently has as an EU member. The results are shown in Figures 1 and 2 below (where Figure 2 is just a blown-up version of Figure 1).

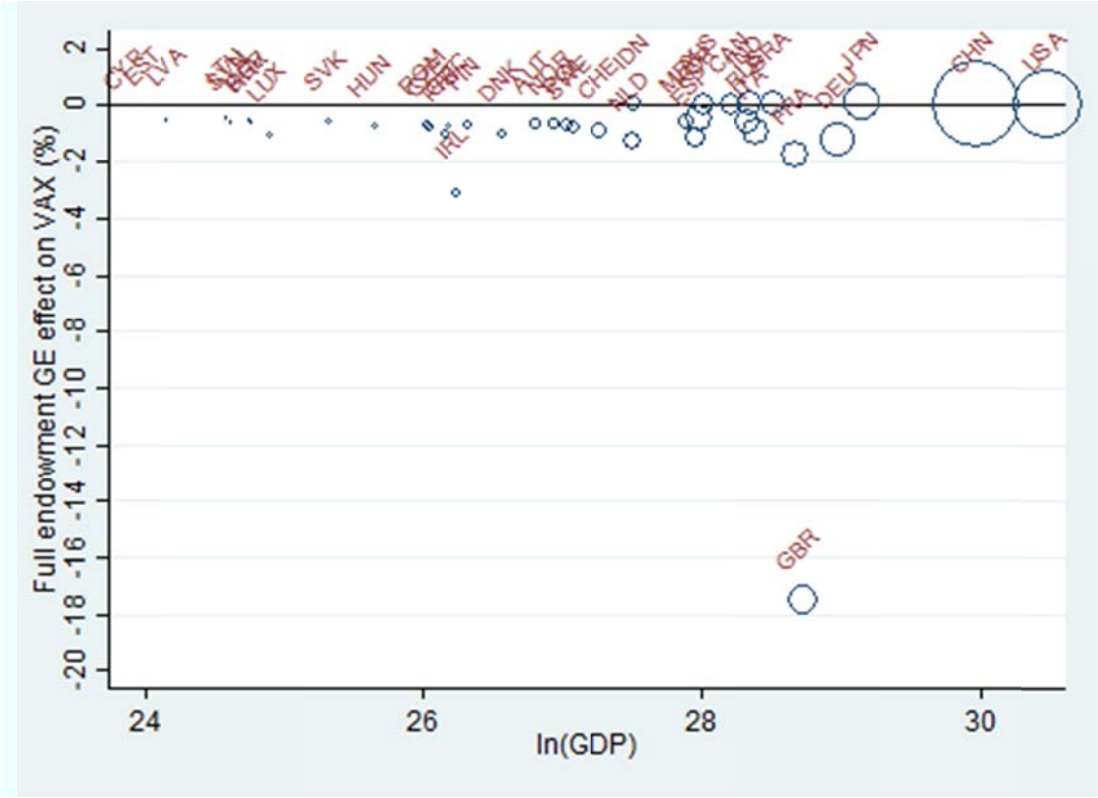

Figure 1: "Hard Brexit" – UK terminates EU membership and membership in all other EU-based trade agreements. Bubbles proportional to countries' value-added exports in 2014. For a comparison with gross trade, see Figure A1 in the Appendix.

As Figure 1 makes clear, a hard Brexit scenario has a strong negative impact on the value-added exports of the UK, decreasing by almost 18%, because trade with the (remainder of the) EU becomes more expensive. It shows the asymmetric impact of a hard Brexit in which, not very surprisingly, the exports and thereby the UK economy are hit much harder than the other EU member states or non-EU countries. These countries also experience a trade decline, but to a lesser extent than for the UK, because the UK market is smaller than that of the EU. The impact is also stronger if one focuses on VAX, as we do here, when compared with the impact of on gross trade as can be seen by comparing Figure 1 with the results for gross trade in Figure A1 in the Appendix. The main reason for this difference (which holds for all our scenarios) is that the value-added data take the intricate production value chain linkages between, in *casu* the UK and the rest of the world, into account whereas the gross trade data do not do so.

Figure 2 gives a detailed or 'zoomed in' view of the hard Brexit results as shown by Figure 1 so as to highlight that (mainly) other EU countries are also negatively affected by a hard Brexit in terms of their value-added exports. This holds first and foremost for Ireland, where value exports decrease by more than 3%, but also a number of other EU countries see their value-added exports drop by 1-2%. Note that non-European countries are *not* really affected by a hard Brexit.

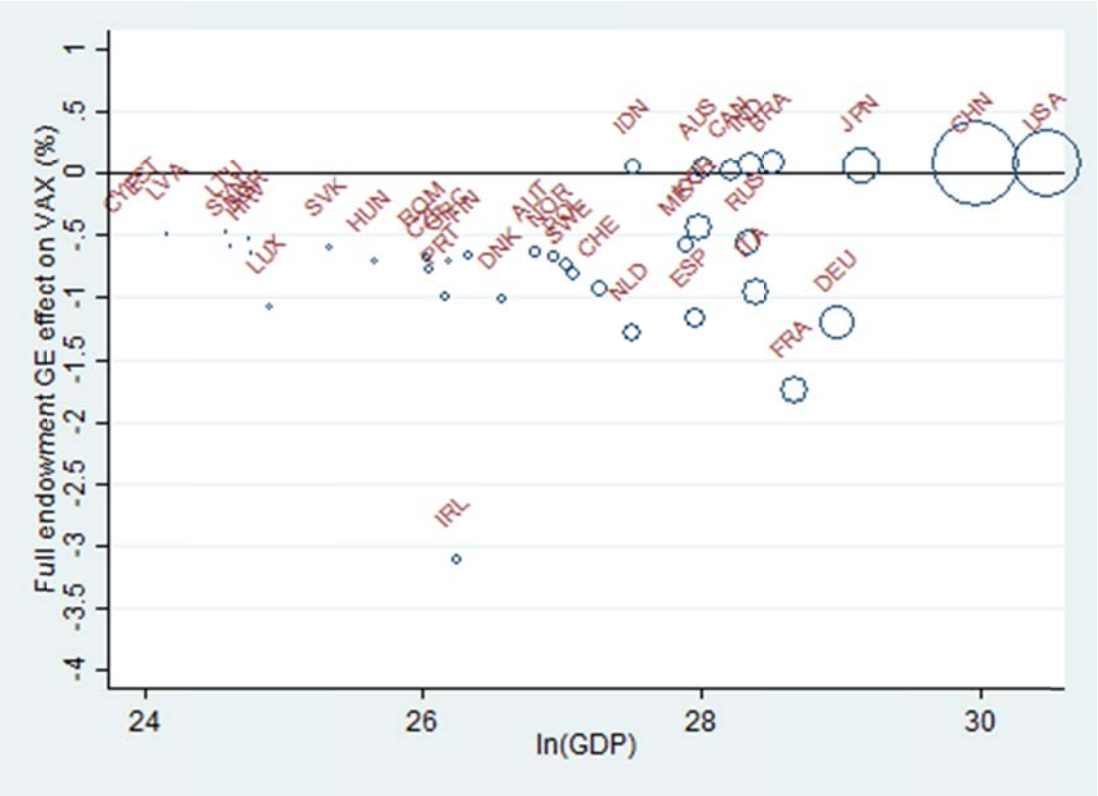

Figure 2: "Hard Brexit" – Detailed view of **Figure 1** without UK. Bubbles proportional to countries' value-added exports in 2014.

As a milder version of the hard Brexit scenario we also looked into a "soft" Brexit option whereby the UK leaves the EU, but somehow manages to retain all other trade agreements with non-EU countries that it currently enjoys as an EU member state. Figure 3 shows the results. The main message is that the negative impact of Brexit is only slightly mitigated under this scenario: the UK's VAX fall by (almost) 14% compared to 18% under a hard Brexit scenario. The results for the other countries are basically unchanged.

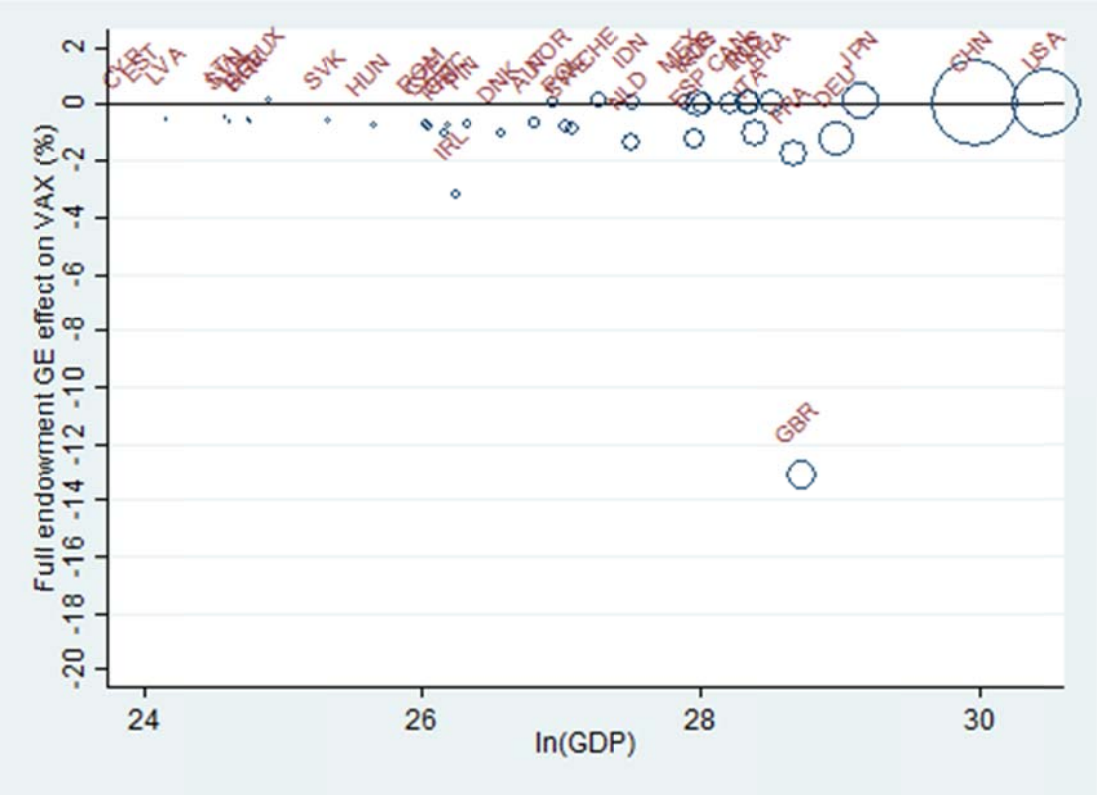

Figure 3: "Soft Brexit" – UK terminates EU membership and retains membership in all other EU-based trade agreements. Bubbles proportional to countries' value-added exports in 2014.

The conclusion that arises from Figures 1-3 is clear. Brexit will have a strong negative impact on the value-added exports of the UK. If no deal is struck between the UK government and the EU now that the Article 50 procedure has begun, our estimates suggests that the UK will experience a drop in VAX by almost 20% which is very substantial. The remaining EU countries are also negatively affected in terms of their VAX, with the largest impact occurring for the UK's main trading partners in the EU. Given these rather bleak long-term trade effects of Brexit, it is perhaps no wonder that the UK government has signalled to actively seek to establish other (new) trade agreements with trading partners outside the UK. Headed by Prime Minister Theresa May, the UK government has invoked the idea of "Global

Britain" where the UK by inter alia establishing new trade agreements arguably would be able to off-set the effects of Brexit for the UK economy. It is to this scenario that we turn to next.

3.2. Brexit with Global Britain

In this sub-section, we assume that a hard Brexit has materialized and then look into the effects of alternative trade agreements by the UK on the value-added exports for the UK and the other countries in our sample. Inspired Donald Trump's vocal support for Brexit and early talks by Trump with May after he became president of the USA, Figure 4 shows the effects of a bilateral trade agreement between the UK and the USA. Since we assume that this trade agreement is struck with the full Brexit in place, one should compare the outcomes in Figure 4 with those reported in Figure 1. The main effect of the trade agreement between the UK and the USA is that it increases the value-added export for both countries by approximately 2%. For the UK, this implies that the negative impact of Brexit is only marginally offset by such a bilateral trade agreement with the USA (compare the -18% in Figure 1 with the -16% in Figure 4). Easier access to the US market compensates the trade loss of Brexit to some extent, but within the logic of the gravity market the US is further away and thereby less attractive.

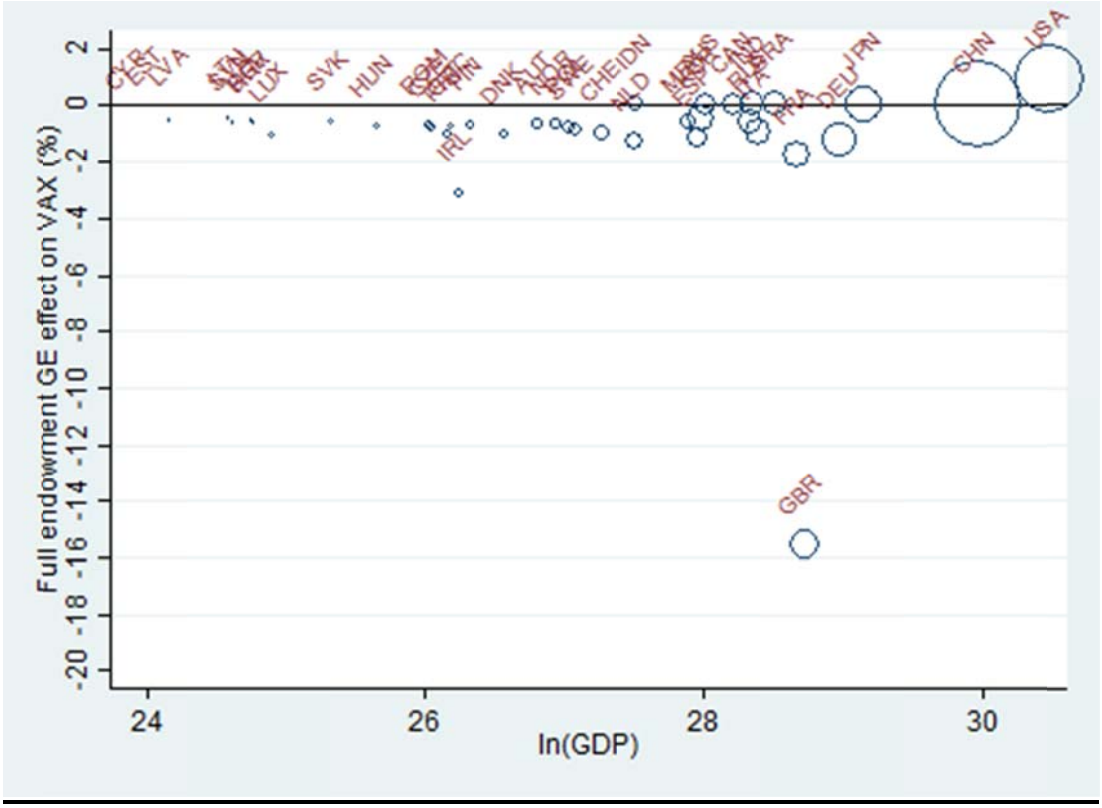

Figure 4: UK-US-FTA – "Hard Brexit", followed by a trade agreement between the UK and US. Bubbles proportional to countries' value-added exports in 2014.

A bilateral trade agreement between the UK and China (the largest bubble, meaning the country with the largest value added exports in 2014) would have similar effects (not shown here) in the sense that it would raise the UK's value-added exports by 2%, but this again falls short to compensate for Brexit. This may lead one to conclude that the Global Britain scenario can simply not offset the negative trade effects, as measured by the change in value added exports, of Brexit. But this ignores the fact that China and the UK are only two of the non-EU countries that the UK trades with. In order to investigate the maximum trade potential of the Global Britain scenario, we also analysed what happens if the UK goes for a hard Brexit but at the same time manages to strike a trade agreement with all other countries in our sample outside the EU. As Figure 5 shows, this scenario would indeed provide a boost for the value-added exports of the UK and the other countries concerned (see besides the USA and China now also an increase in VAX for e.g. Japan, Russia or Canada). For the UK, it remains however the case that the combination of hard Brexit with a Global Britain scenario is still negative to the extent that its valued added exports fall by more than 6%.

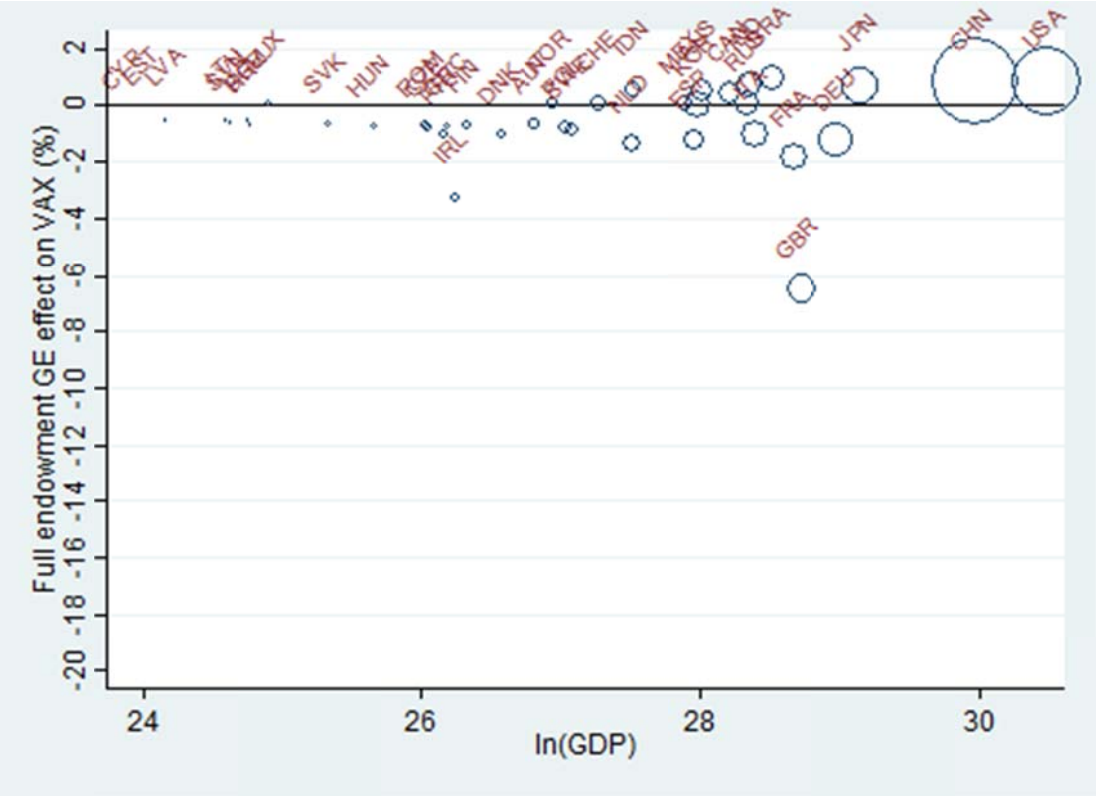

Figure 5: UK-WORLD-TA – "Hard Brexit", followed by the UK joining trade agreements with all countries in the world *except* EU members. Bubbles proportional to countries' value-added exports in 2014.

All in all, the conclusion from the estimation results in section 3.1 (Brexit only) and section 3.2 (Brexit *cum* Global Britain) must be that not only will Brexit have a strong negative trade impact on the UK, but also that it is rather difficult to see how these negative effects can be more than offset by other trade agreements by the UK. The hard Brexit case as summarized by Figure 1 assumes that the UK will be not able to come to a new trade agreement with the EU before March 2019 (2 years after the Article 50 procedure began) and that all of the UK's trade with the EU (and the other countries with which the EU has a trade agreement) will take place under basic WTO rules (see De Grauwe, 2016). In the current discussion in the UK, the option "better no deal than a bad deal" with the EU is considered to be a possible outcome. When it comes to the UK's trade, the "no deal" world will look like Figure 1. At the other extreme of the "no deal" option is the so-called Norway scenario whereby the UK would (continue to have) full access to the EU's single market. As a non-EU member, Norway effectively takes part in the EU's single market much like a regular EU member, but it does so without full and unlimited factor mobility which, given the importance of labour migration in the Brexit debate, is considered to be viable and attractive option by some observers and

policy makers in the UK. In terms of our analysis, where as we stated before factor mobility is not taken into account, the no doubt long and difficult negotiations that would result in a Norway-type of deal between the UK and the EU would for the UK at best replicate the current trade agreement it has with the EU as an EU member! Brexit would then lead to new situation where the UK's trade agreement with the EU would essentially copy the current situation where the UK is an EU member.

3.3. Trumping the Union Jack Flat

In our final set of analyses, we aim to put the possible trade impact of Brexit into some perspective by investigating the trade effects using the same estimation procedure as before of alternative dissolutions of trade agreements. In each of the examples we consider, the question is: what are the "knock-on" effects of these dissolutions, over and above the effects of a hard Brexit? The first example takes an election promise by Donald Trump to its logical conclusion by looking into the impact on value-added exports that would come from the dissolution of NAFTA, the trade agreement between Canada, Mexico and the USA. From Figure 6 we can see that dissolving NAFTA would have a clearly negative impact on the VAX of the 3 countries that make up NAFTA but it would not, recall again Figure 1, have much of a discernible effect on the value-added exports of the other countries in our sample, including the UK.

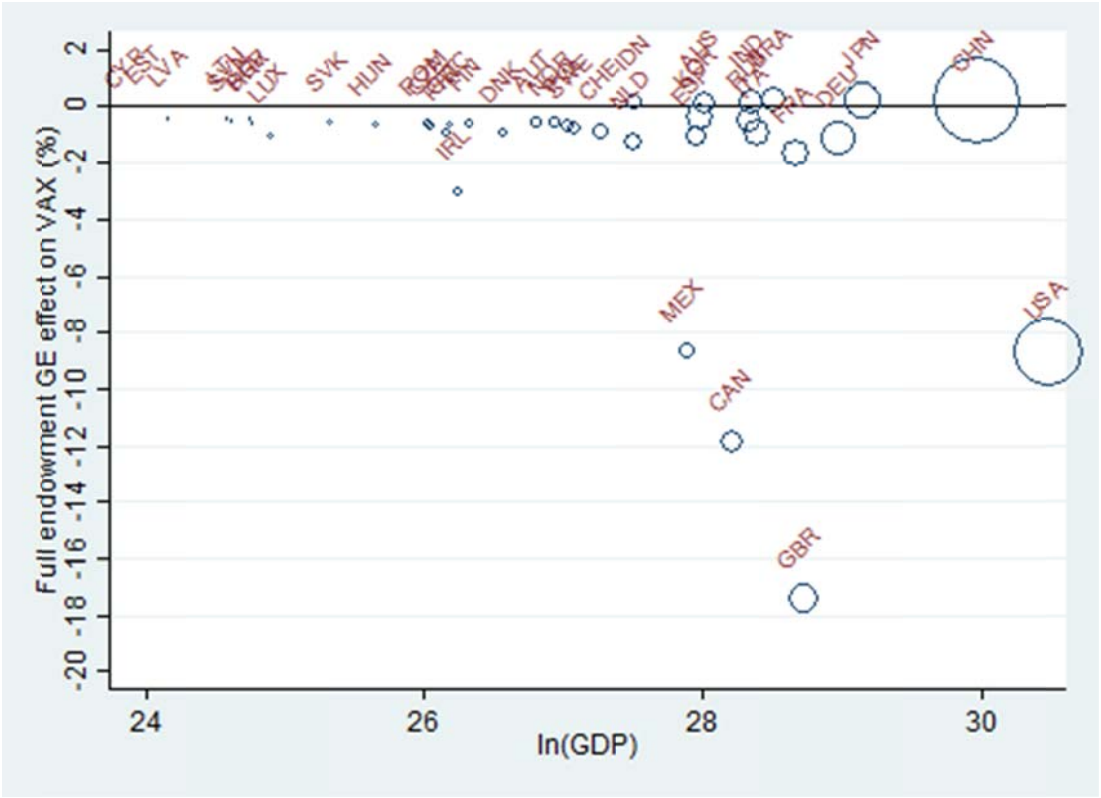

Figure 6: No-NAFTA – "Hard Brexit", followed by the US dissolving NAFTA. Bubbles proportional to countries' value-added exports in 2014.

More relevantly perhaps for the purpose of our present paper, where we are primarily concerned with the impact of Brexit for the UK and the EU, is a scenario where the Brexit is followed by other "exits" from the EU with the result that the EU itself and thereby the single market ceases to exist. In our estimations, this simply means that all EU countries will experience their own (hard) Brexit, so to say. As Figure 7 illustrates, this has strong negative effects on the VAX for all (former) EU members; the impact is the strongest for the main intra-EU trading countries like France, Germany, the Netherlands but also the UK. For these countries, the negative trade effects are in the range of what we found for an isolated Brexit in Figure 1 (note, all other non-EU TAs remain active).

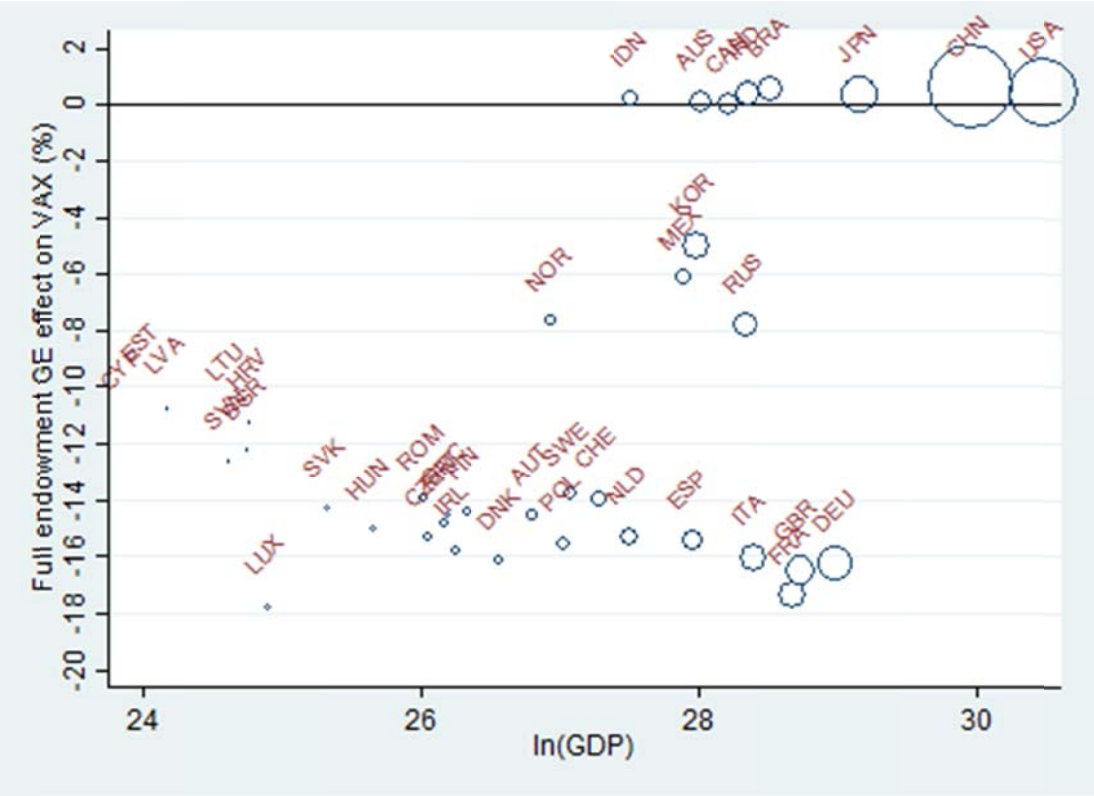

Figure 7: No-EU – "Hard Brexit", followed by a dissolution of the EU and termination of EU countries' membership in EU-related PTAs. Bubbles proportional to countries' value-added exports in 2014.

Our final and truly bleak trade scenario is that we estimate the gravity equation (2) and construct our counterfactual as outlined in section 2 under the assumption that a "hard Brexit" is accompanied by all-out global trade war where all existing trade agreements would be dissolved. Figure 8 shows the results for this "no trade agreement left" scenario. The main difference with Figure 1 (hard Brexit only) or Figure 7 (hard Brexit and dissolution EU as trade agreement) is that now the rest of the world, that is to say the non-EU countries, are also severely affected. This is especially true for countries in our sample that are not only relatively small and open but also relatively heavily dependent on trade in modern global value chains like Mexico or Korea. Under this scenario, unlike with most of the other trade agreement scenarios we discussed, there are only losers in the sense that all countries witness a fall in their value-added exports, see also Table A2 for the exact values.

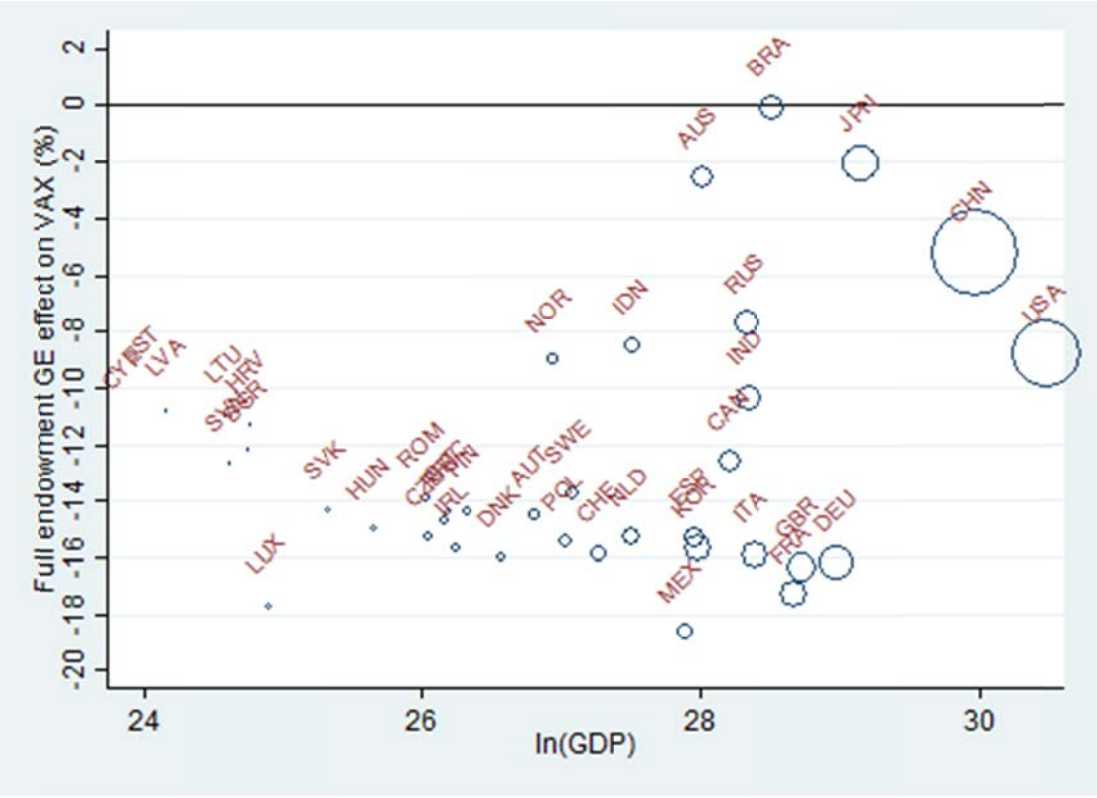

Figure 8: No-TA – "Hard Brexit", followed by a dissolution of all trade agreements worldwide. Bubbles proportional to countries' value-added exports in 2014.

4. Conclusions

The UK decided, following a referendum in 2016, to leave the EU. The negotiations between the UK and EU to determine under what conditions the Brexit should take place, started in March 2017. From an international trade perspective, the Brexit is puzzling, as almost all studies predict that trade with the EU will decrease significantly.

The UK government states that it is aiming to replace the current UK membership of the EU by other, broad, trade agreements. However, at this stage it is not clear what a new trade agreement would look like and which countries could be involved in these new agreements.

This paper reviews the alternatives that the UK government has. The central question we try to answer is: does the UK have an alternative compared to the current membership of the EU, that is, an alternative that would compensate for the large negative trade shock of Brexit. Reviewing the options that have emerged in discussions on Brexit, such as a broad agreement with the US, China, or all countries except the EU, our conclusion is simple: the UK has no trade-enhancing alternative than an agreement that mimics the current situation.

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Appendix

Table A1: WIOD Country Coverage

AUS	Australia	IRL	Ireland
AUT	Austria	ITA	Italy
BEL	Belgium	JPN	Japan
BGR	Bulgaria	KOR	South Korea
BRA	Brazil	LTU	Lithuania
CAN	Canada	LUX	Luxembourg
CHE	Switzerland	LVA	Latvia
CHN	China	MEX	Mexico
CYP	Cyprus	MLT	Malta
CZE	Czech Republic	NLD	Netherlands
DEU	Germany	NOR	Norway
DNK	Denmark	POL	Poland
ESP	Spain	PRT	Portugal
EST	Estonia	ROM	Romania
FIN	Finland	RUS	Russia
FRA	France	SVK	Slovak Republic
GBR	United Kingdom	SVN	Slovenia
GRC	Greece	SWE	Sweden
HRV	Croatia	TWN	Taiwan
HUN	Hungary	TUR	Turkey
IDN	Indonesia	USA	United States
IND	India		

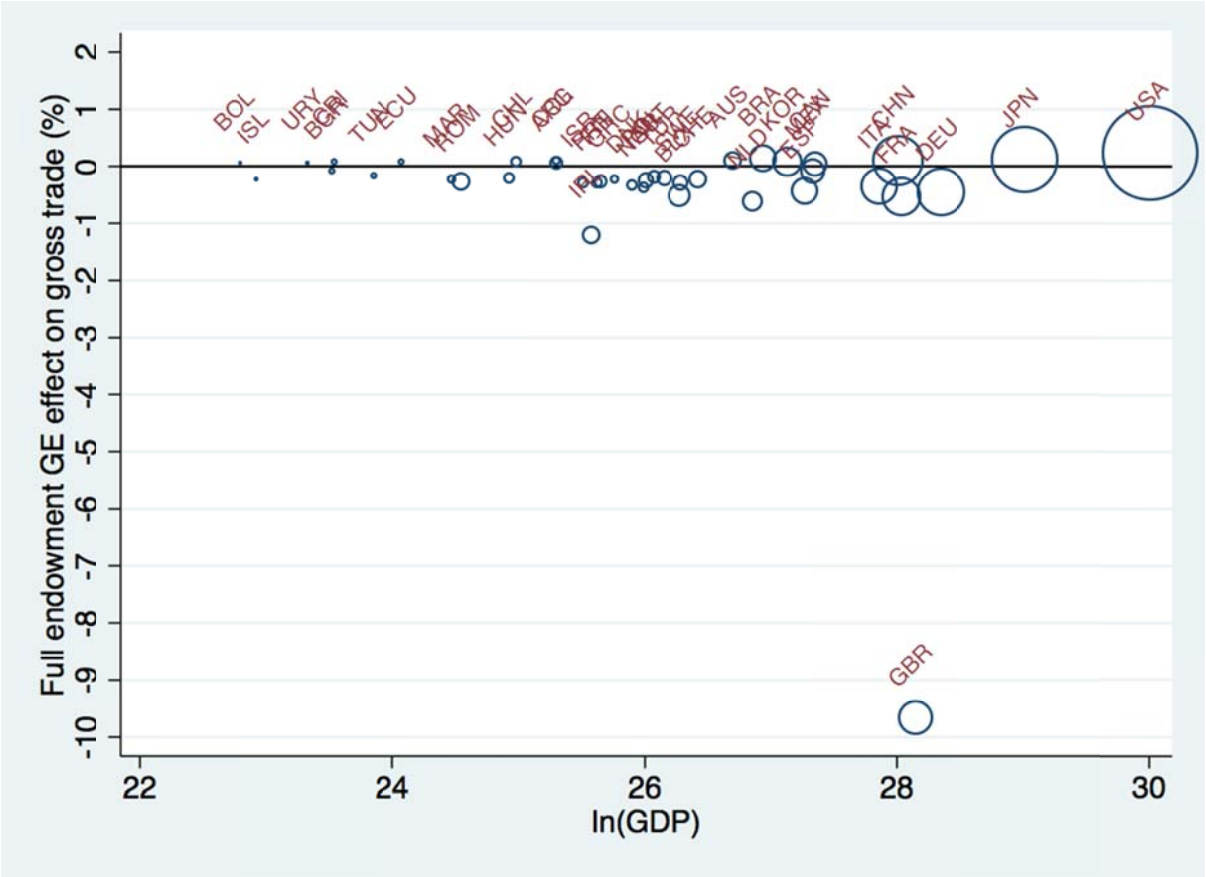

Figure A1: "Hard Brexit" – UK terminates EU membership and membership in all other EU-based trade agreements. Dependent variable: Gross trade. Underlying gross trade and production data generously provided by Mario Larch as used in Anderson et al. (2015) and Anderson and Yotov (2016). Bubbles proportional to countries' gross exports.

Table A2: Full Endowment General Equilibrium Effects for Counterfactual Scenarios (continued on next page)

Abbreviation	Description	Full Endowment General Equilibrium Effect on… (%)							
		Gross Trade	Value Added Exports						
		"Hard Brexit"	*"Hard Brexit"*	*"Soft Brexit"*	*UKUSTA*	*UKWORLDTA*	*NoNAFTA*	*NoEU*	*NoTA*
AUS	Australia	0,09	0,04	0,05	0,03	0,51	0,13	0,11	-2,56
AUT	Austria	-0,22	-0,63	-0,63	-0,64	-0,65	-0,59	-14,58	-14,54
BEL	Belgium	n/a	-1,28	0,16	-1,29	0,11	-1,24	-16,50	-16,46
BGR	Bulgaria	-0,10	-0,54	-0,54	-0,54	-0,56	-0,50	-12,23	-12,22
BRA	Brazil	0,10	0,09	0,08	0,08	0,98	0,27	0,59	-0,06
CAN	Canada	0,03	0,03	0,04	0,01	0,43	-11,87	-0,02	-12,63
CHE	Switzerland	0,17	-0,93	0,14	-0,94	0,10	-0,88	-13,94	-15,84
CHN	China	0,07	0,08	0,07	0,08	0,85	0,19	0,60	-5,20
CYP	Cyprus	n/a	-0,58	-0,58	-0,58	-0,60	-0,52	-11,24	-11,20
CZE	Czech Republic	n/a	-0,78	-0,79	-0,79	-0,82	-0,74	-15,33	-15,28
DEU	Germany	-0,51	-1,20	-1,24	-1,21	-1,28	-1,16	-16,26	-16,18
DNK	Denmark	-0,36	-1,01	-1,03	-1,02	-1,06	-0,95	-16,13	-16,03
ESP	Spain	-0,48	-1,17	-1,19	-1,18	-1,22	-1,08	-15,43	-15,30
EST	Estonia	n/a	-0,45	-0,45	-0,45	-0,46	-0,41	-10,31	-10,35
FIN	Finland	-0,28	-0,67	-0,69	-0,67	-0,71	-0,61	-14,46	-14,37
FRA	France	-0,58	-1,75	-1,79	-1,76	-1,84	-1,69	-17,38	-17,30
GBR	United Kingdom	-8,68	-17,46	-13,08	-15,52	-6,46	-17,39	-16,46	-16,36
GRC	Greece	-0,28	-0,70	-0,72	-0,71	-0,74	-0,64	-14,55	-14,44
HRV	Croatia	n/a	-0,63	-0,63	-0,64	-0,65	-0,59	-11,25	-11,26
HUN	Hungary	-0,22	-0,70	-0,71	-0,71	-0,73	-0,65	-15,05	-14,99
IDN	Indonesia	n/a	0,04	0,05	0,04	0,58	0,12	0,19	-8,55
IND	India	n/a	0,07	0,07	0,06	0,76	0,15	0,43	-10,37
IRL	Ireland	-1,25	-3,12	-3,18	-3,14	-3,26	-3,05	-15,79	-15,68
ITA	Italy	-0,39	-0,95	-0,97	-0,96	-1,01	-0,89	-16,05	-15,94
JPN	Japan	0,07	0,06	0,06	0,06	0,70	0,17	0,36	-2,12
KOR	South Korea	0,05	-0,44	0,06	-0,44	0,03	-0,37	-5,00	-15,65
LTU	Lithuania	n/a	-0,47	-0,47	-0,48	-0,49	-0,44	-10,95	-10,99
LUX	Luxembourg	n/a	-1,07	0,14	-1,08	0,10	-1,03	-17,79	-17,72

LVA	Latvia	n/a	-0,49	-0,49	-0,50	-0,51	-0,45	-10,74	-10,77
MEX	Mexico	0,04	-0,58	0,07	-0,59	0,04	-8,69	-6,16	-18,62
MLT	Malta	n/a	-0,90	-0,92	-0,91	-0,95	-0,83	-16,09	-15,94
NLD	Netherlands	-0,66	-1,28	-1,31	-1,29	-1,35	-1,24	-15,31	-15,27
NOR	Norway	0,18	-0,67	0,08	-0,67	0,06	-0,62	-7,63	-9,04
POL	Poland	-0,28	-0,74	-0,76	-0,75	-0,78	-0,69	-15,55	-15,46
PRT	Portugal	-0,34	-0,99	-1,00	-1,00	-1,03	-0,91	-14,80	-14,69
ROM	Romania	-0,30	-0,68	-0,69	-0,68	-0,71	-0,62	-13,95	-13,87
RUS	Russia	n/a	-0,56	0,08	-0,56	0,06	-0,51	-7,79	-7,75
SVK	Slovakia	n/a	-0,60	-0,60	-0,60	-0,62	-0,56	-14,32	-14,30
SVN	Slovenia	n/a	-0,59	-0,59	-0,59	-0,61	-0,55	-12,61	-12,64
SWE	Sweden	-0,33	-0,80	-0,82	-0,81	-0,85	-0,74	-13,80	-13,71
TWN	Taiwan	n/a	0,04	0,05	0,04	0,56	0,12	0,18	0,37
USA	United States	0,17	0,08	0,07	0,92	0,87	-8,69	0,47	-8,80
EU average	Average per EU28 Member excl. GBR	n/a	-0,92	-0,83	-0,92	-0,86	-0,87	-14,39	-14,45
EU total	Total effect for EU28 excl. GBR	n/a	-1,18	-1,14	-1,19	-1,17	-1,13	-15,88	-15,80

Table A3: Full Endowment General Equilibrium Effects for Counterfactual Scenarios in Absolute Terms

Abbreviation	Absolute Effect on VAX (in millions of US$)						
	"Hard Brexit"	*"Soft Brexit"*	*UKUSTA*	*UKWORLDTA*	*NoNAFTA*	*NoEU*	*NoTA*
AUS	$513	$653	$456	$7.195	$1.782	$1.608	-$36.409
AUT	-$2.613	-$2.624	-$2.635	-$2.713	-$2.443	-$60.452	-$60.294
BEL	-$7.743	$944	-$7.801	$656	-$7.506	-$99.760	-$99.554
BGR	-$375	-$378	-$378	-$391	-$345	-$8.511	-$8.507
BRA	$1.644	$1.517	$1.499	$17.908	$4.859	$10.790	-$1.143
CAN	$407	$597	$239	$6.871	-$191.053	-$242	-$203.284
CHE	-$6.928	$1.005	-$6.983	$729	-$6.530	-$103.691	-$117.835
CHN	$17.766	$15.738	$16.431	$179.628	$40.550	$127.487	-$1.101.592
CYP	-$107	-$108	-$108	-$111	-$97	-$2.087	-$2.079
CZE	-$2.261	-$2.284	-$2.279	-$2.358	-$2.128	-$44.341	-$44.182
DEU	-$43.172	-$44.379	-$43.509	-$45.720	-$41.453	-$582.693	-$579.895
DNK	-$2.915	-$2.969	-$2.938	-$3.062	-$2.748	-$46.554	-$46.263
ESP	-$14.323	-$14.559	-$14.438	-$15.024	-$13.313	-$189.320	-$187.816
EST	-$137	-$136	-$138	-$140	-$126	-$3.144	-$3.155
FIN	-$1.772	-$1.816	-$1.786	-$1.876	-$1.625	-$38.321	-$38.094
FRA	-$40.397	-$41.420	-$40.692	-$42.575	-$39.131	-$402.126	-$400.208
GBR	-$439.434	-$329.243	-$390.745	-$162.654	-$437.713	-$414.418	-$411.887
GRC	-$1.109	-$1.133	-$1.118	-$1.171	-$1.012	-$22.890	-$22.718
HRV	-$297	-$297	-$299	-$306	-$278	-$5.268	-$5.273
HUN	-$1.021	-$1.030	-$1.029	-$1.064	-$950	-$21.864	-$21.767
IDN	$370	$433	$335	$4.841	$974	$1.616	-$71.649
IND	$1.204	$1.205	$1.109	$13.586	$2.634	$7.749	-$185.361
IRL	-$8.125	-$8.273	-$8.181	-$8.489	-$7.937	-$41.146	-$40.865
ITA	-$19.635	-$20.050	-$19.797	-$20.715	-$18.248	-$330.196	-$327.884
JPN	$2.446	$2.502	$2.231	$28.270	$6.722	$14.462	-$85.954
KOR	-$8.895	$1.182	-$8.970	$644	-$7.513	-$101.367	-$317.402
LTU	-$204	-$203	-$205	-$210	-$188	-$4.724	-$4.740
LUX	-$1.536	$205	-$1.548	$146	-$1.476	-$25.574	-$25.485
LVA	-$181	-$180	-$182	-$187	-$167	-$3.956	-$3.968
MEX	-$4.891	$615	-$4.973	$326	-$72.834	-$51.666	-$156.173
MLT	-$137	-$140	-$139	-$144	-$126	-$2.454	-$2.431
NLD	-$12.176	-$12.423	-$12.269	-$12.789	-$11.778	-$145.101	-$144.742
NOR	-$2.931	$371	-$2.954	$251	-$2.713	-$33.447	-$39.652
POL	-$4.399	-$4.489	-$4.435	-$4.638	-$4.087	-$92.461	-$91.942
PRT	-$1.949	-$1.973	-$1.965	-$2.037	-$1.789	-$29.131	-$28.901
ROM	-$1.432	-$1.454	-$1.444	-$1.503	-$1.315	-$29.522	-$29.355
RUS	-$10.913	$1.628	-$11.004	$1.155	-$9.949	-$151.964	-$151.105
SVK	-$742	-$742	-$748	-$767	-$693	-$17.820	-$17.798
SVN	-$300	-$300	-$303	-$309	-$281	-$6.448	-$6.462
SWE	-$4.117	-$4.209	-$4.150	-$4.345	-$3.816	-$70.790	-$70.306
TWN	$317	$374	$287	$4.170	$866	$1.364	$2.729
USA	$10.509	$9.835	$123.707	$116.639	-$1.166.768	$63.091	-$1.181.451
EU total	-$173.175	-$166.418	-$174.513	-$171.844	-$165.057	-$2.326.655	-$2.314.686