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What can fixit after Brexit?

An empirical study of the economic effect on UK trade, following an exit from the European Union

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Abbreviations

Comprehensive Trade and Economic Agreement (CETA)

European Economic Agreement (EEA)

European Free Trade Agreement (EFTA)

European Union (EU)

Foreign Direct Investment (FDI)

Free Trade Agreement (FTA)

Gross Domestic Product (GDP)

European Union Treaty (TEU)

North Atlantic Free Trade Agreement (NAFTA)

Most Favored Nation (MFN)

Rules of Origin (RoO)

Treaty on the Functioning of the European Union (TFEU)

United Kingdom (UK)

World Trade Organisation (WTO)

Foreword

This bachelor thesis is written at the department of Economics at Lund university during the fall semester of 2016. We sincerely want to thank our supervisor Maria Persson, associate Professor at the department of Economics, for guidance and valuable input.

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Abstract

One of the most debated political events during 2016 was the referendum regarding the United Kingdom's future in the European Union. Despite the many warnings received from economists the UK voters voted for 'leave', paving the way for Brexit. This thesis reviews some possible alternatives regarding the UK-EU relationship post Brexit and concludes that the economically best case scenario would be for the UK to replace their current EU membership with an EEA agreement outlined as the one today enjoyed by Norway. The authors then uses the best case scenario alternative to estimate the loss in UK trade in goods with the EU. The estimation is done using a modified gravity model. Through the empirical study the authors find that leaving the EU and entering into an EEA agreement will heavily reduce the UK's trade in goods with the EU.

En av de mest uppmärksammade politiska händelserna under 2016 var den brittiska folkomröstningen gällande Storbritanniens framtid i den Europeiska Unionen. Trots många varningar från nationalekonomer vann lämna-sidan, ett resultat som banar väg för Brexit. Den här uppsatsen går igenom några möjliga alternativ för det framtida förhållandet mellan UK och EU och fastställer att det ekonomiskt vore bäst för UK att ersätta sitt nuvarande EU-medlemskap med ett EES-avtal utformat som det Norge idag åtnjuter. Författarna använder en modifierad gravitationsmodell för att undersöka förlusten i varuhandel från UK till EU. Genom den empiriska undersökning finner författarna att lämna EU och ersätta avtalet med ett EES-avtal skulle minska brittisk varuhandel med EU kraftigt.

Keywords: Brexit, European Union, the UK, European Economic Area, Trade, Gravity Model

1. Introduction

One of the most debated political events during 2016 was the referendum regarding the United Kingdom's future in the European Union. Surprising for many the referendum resulted in a victory for the leave side, despite the many warnings received from economics.

Today the debate is concerning what the effect of Brexit will be, something which is difficult to analyze since it still is very unclear what will replace the current EU membership. Out of all possible outcomes the best case scenario would be the Norwegian solution, i.e. for the UK to become an EEA member and in this way keep their access to the single market. Even if this best case scenario will be the minimum level of cost for the UK, a cost for the UK to leave the EU is a fact. According to economic theory trade increases welfare and a deeper economic integration increases trade. It has in earlier research been stated that agreements between countries to reduce trade barriers, such as the EU, increases trade between the participating parties. Indicating that a withdrawal from such an agreement would reduce trade. This paper is therefore aiming to analyze how much less the UK will trade with the EU if it leaves the union. To answer the question 'What will the economic effect on UK's trade in goods with the EU be, following an exit from the EU?' we will look at the best case scenario where the UK leaves the EU and enters into an EEA agreement.

We will use the gravity model to empirically investigate the effect of replacing an EEA agreement with an EU membership and conclude that the effect will be inversely proportional to leaving the EU and enter into an EEA agreement, a so-called "Mirror effect". By using the gravity model, this paper will investigate trade in goods between the EU15 countries and two of the EEA members, Norway and Iceland, to detected if going from being an EEA to an EU member has a positive effect on trade. The gravity model is considered one of the most effective models when studying bilateral trade flows and is considered to create some of the most robust findings for empirical econometric studies, see Leamer and Levinsohn (1995) (Shepard 2013).

To proxy the effect, this study will use the EU expansion in 1995 when Sweden, Austria and Finland joined the EU, all previously being members of the EEA agreement. This is the most outstanding and similar historical event to the UK replacing their EU membership with an EEA agreement. Since Sweden, Finland and Austria are western countries having economies in similar size to the UK, it is likely the UK's economy would be affected in a similar way. The three countries joined the EU at the same time, which makes the effort of investigating the effect more precise.

After conducting robustness checks our estimation results implies that, if all else equal, replacing an EEA agreement with an EU membership has a substantial positive effect on trade. This would indicate that doing the opposite would have a great negative effect on trade.

The paper will begin with details concerning the legal aspects of leaving the EU. Following this is a thorough review of five alternatives for a future UK-EU relationship and a brief discussion concerning which of the alternatives that is the best case scenario for the UK. Thereafter is the economic theory regarding differences between an EEA and EU membership explained and put into relations to the UK. This sections is followed by a overview of previous studies about Brexit and the economic effect of an EU membership. Following is the empirical method outlined and explained. This section includes an explanation of the gravity model and our adjusted estimation equation. Lastly is a description of the results and a conclusion of our findings. The paper ends with a bibliography and appendix.

2. Article 50: The legal details on leaving the EU

The European Union (EU) referendum is in itself not binding but depends on Article 50 being invoked by the Prime minister. Article 50 was added onto the European Union Treaty (TEU) during the Treaty of Lisbon[1] and provides the first specific legal Treaty for leaving the EU. It states the procedure a country needs to go through to withdraw from the Union and reads as follows:

[1] In force on 1 December 2009.

"1. Any Member State may decide to withdraw from the Union in accordance with its own constitutional requirements.

2. A Member State which decides to withdraw shall notify the European Council of its intention. In the light of the guidelines provided by the European Council, the Union shall negotiate and conclude an agreement with that State, setting out the arrangements for its withdrawal, taking account of the framework for its future relationship with the Union. That agreement shall be negotiated in accordance with Article 218(3) of the Treaty on the Functioning of the European Union. It shall be concluded on behalf of the Union by the Council, acting by a qualified majority, after obtaining the consent of the European Parliament.

3. The Treaties shall cease to apply to the State in question from the date of entry into force of the withdrawal agreement or, failing that, two years after the notification referred to in paragraph 2, unless the European Council, in agreement with the Member State concerned, unanimously decides to extend this period.

4. For the purposes of paragraphs 2 and 3, the member of the European Council or of the Council representing the withdrawing Member State shall not participate in the discussions of the European Council or Council or in decisions concerning it.

A qualified majority shall be defined in accordance with Article 238(3)(b) of the Treaty on the Functioning of the European Union.

5. If a State which has withdrawn from the Union asks to rejoin, its request shall be subject to the procedure referred to in Article 49."

- The Lisbon Treaty, 2009

As stated in Article 50 of the Lisbon Treaty the withdrawal procedure begins with the Prime minister invoking Article 50(1) in the European Union Treaty.

Article 50(1) states that if any member wishes to exit the EU, they have to notify the European Council of its intention to do so. Next step of the procedure is for the Union to negotiate an international agreement in concordance with Article 218(3) Treaty on the Functioning of the European Union (TFEU), which envisages the Commission's submission of recommendations to the Council "which shall adopt a decision authorising the opening of negotiations (...)." Stated in Article 50(3) the negotiations has a two year time limitation in which the member state and EU negotiates the withdrawal agreement. A time limitation which can only be extended if all EU member states agrees on such extension. If no agreement is met after two years, and the time limit is not extended, then the UK would revert to WTO terms and Most Favoured Nation (MFN) tariffs would be imposed.

Once an agreement is met it has to be ratified by the Council acting by qualified majority voting, after the European Parliament has approved it (Article 50(2)). During the negotiations the exiting member state will still be a part of the usual EU activities, EU institutions and decision-making, however it will not participate or be present in any voting regarding their withdrawal. This is subject to all institutions in the EU (HM Treasury, 2016).

The withdrawal agreement will outline the transition process for the United Kingdom (UK) and as being stated in Article 50(2) the negotiations should be "taking account of the framework for its future relationship with the Union". This future relationship agreement on trade between the UK and the EU can be negotiated on the side of the negotiations of the leaving process (HM Treasury, 2016). If this agreement will be a mixed agreement, i.e. not only containing agreements on trade in goods but also agreements on common foreign and security policy, the agreement would have to be ratified by the national parliament of all 27 member states. This gives every EU member veto right. With every country having the ability to block the negotiations it is not impossible for the negotiations to last for up to the maximum limit of two years (HM Treasury, 2016). Put in short, as Article 50 is invoked the UK has maximum two years of absolut crucial trade negotiations in front of oneself that will determine the future UK-EU relationship.

3. Replacing the UK's EU membership: What are the alternatives?

By accessing the actual cost of the UK leaving and entering into a new relationship with the EU, one should understand the economic implications of Brexit. However, these costs are usually subjective, intangible or diffuse and depends on the outcome of the withdrawal negotiations. Thus, making the procedure of estimating them difficult. In this paper we have limited the possibilities to four alternative relationships of which the EU currently have with other non-member states together with the UK only being a member of the WTO. The following section will outline what these relationships entail and their positive and negative aspects for the UK. The agreements will follow in the order from deepest form of integration to the lowest. We will focus on the effects the different forms of integration will have on trade and also focus on the voters reasons for leaving the EU.

The voters reasons for leaving the EU

According to surveys completed before the referendum it can be stated that the hardest critique from the british people against the EU membership is regarding sovereignty and regaining the control over the migration, economy and law. However, access to the single market seems to be in the voters interest even after leaving the EU (ComRes 2016; Ipsos Mori 2016; Lord Ashcroft 2016). Information valuable to understand the victory of the leave side.

3.1 Membership of the European Union - being one of the gang

The EU is a complex institution and not always straightforward to explain. Members of the EU are both economically and politically deeply integrated through their common institutions, policies and laws which member states are obliged to implement and follow. We will in this section keep a heavy focus on trade in goods and services, and how these matters, for the UK, are affected by being a part of the EU. Nonetheless will we briefly go through some of the Union's history together with the history of the UK in the Union. With this done

it will be stated clear that detangling from the level of economic integration reached in the EU will not be a quick-fix.

At the European Council summit in Maastricht in December 1991 the Treaty on European Union was created, signed in February 1992 and ratified by all twelve member countries[2] in May 1993 (McCormick, 2011:63). Currently EU has 28 members[3] (European Union, 2016) all of them enjoying the four freedoms[4] of the single market and having identical restrictions on imports. The EU also negotiates on behalf of its members in trade negotiations and represents the members in multilateral organisations such as the WTO.

The UK joined the EU in 1973 and have since enjoyed both the internal integration, as in the single market, together with the external integration, as in being a part of the customs union and EU's trade agreements with third countries.

Currently the UK holds a 'special status member' of the EU, meaning that they are full members of the single market but will not join the Euro zone nor participate in the Schengen open border agreement (HM Treasury, 2016:25). This allows the UK to control their currency and have freedom in their macroeconomic policies and keep some sovereignty (HM Treasury, 2016:28). However, the UK fully participates in the single market and through it enjoys the four freedoms. Half of the UK's goods exports and 37% of exports in services goes to the EU (HM Treasury, 2016:31; Hatzigeorgio & Lodefalk, 2016:17), giving understanding to that the EU is an important market for the UK to have access to.

The single market was created by the removal of tariffs and quotas on trade in goods within the union together with the customs union, which implies a common external tariff and the removal of costly, complex and time-consuming customs control within the EU. Further on the single market reduces non-tariff barrier to trade within the EU, including aligning regulations, standards and specification required to trade, removing distortions to competition

[2] Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain and United Kingdom (European Union, 2016).
[3] Austria, Belgium, Bulgaria, Croatia, Cyprus Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom (European Union, 2016).
[4] The four freedoms consist of trade in goods, services, capital and labour.

and guaranteeing non discriminatory access to services markets (HM Treasury, 2016:25). For advanced economies such as the UK, costs associated with non-tariff barriers are the primary cost of trade and the single market has reduced these costs significantly more than other similar trade agreements (HM Treasury, 2016:).

The importance of the single market is becoming greater as the UK is moving towards becoming increasingly focused on high-value activities in its economy. Today approximately 80% of the UK's GDP is made up by services, an industry dependent on cross-border supply chains, which without the single market would be very costly to obtain (HM Treasury, 2016:24). Also advanced manufacturing industries are highly dependent on these cross-border supply chains and would suffer the same costs as the service industry without access to the single market (HM Treasury, 2016:24).

The EU is considered a key player in the WTO and a leader in signing bilateral trade agreements. Therefore, the EU is considered to have great negotiating power (Baldwin & Wyplosz 2015:284). Being a member of the EU has allowed for UK to access global markets by bilateral agreements with non-member states and after the current bilateral agreements, roughly 80% of the UK trade will consist of either being with EU members or other countries through FTAs (HM Treasury 2016:24).

As an EU member the UK has obligations to implement EU rules and law together with contributing to the EU budget. The membership of the Union however gives the UK influence over the decision making and governance of the EU (HM Treasury, 2016:25), especially large influence is given to the UK through its veto right in the European Council (HM Treasury, 2016:11). Financially a member country has to contribute by roughly 1% of their GDP to the EU budget (Baldwin & Wyplosz, 2015:38-42, 69). Important to remember in the matter of financial contribution is that the UK today experience a rebate, resulting in a lower fiscal contribution to the budget than other members. In the year of 2014 the rebate reduced the contribution of UK by 35%, an amount of almost €6.1 billions (D'alfonso, 2016). Also, during the most recent budget meeting the UK Prime Minister secured a reduction of the budget size in real terms, which has never before been done (HM Treasury, 2016:11).

3.2 European Economic Area (EEA) - staying close with the neighbours

In 1989 Jacques Delors proposed the European Economic Area (EEA) agreement, which would extend the single market of the EU to the members of the European Free Trade Agreement (EFTA) (Baldwin & Wyplosz, 2015). On 1 January 1994 the EEA was established and within the single market providing for the four freedoms – with some exceptions for agricultural and fisheries product. Today the EEA consists of the EU28 together with Norway, Liechtenstein and Iceland. To be a member of the single market, members of EEA have to obtain membership of EFTA. Becoming a member of EFTA requires a unanimous approval from all EFTA members followed by the same procedure to become a member of the EEA (HM Treasurer, 2016:89; EFTA, 2016).

The UK going Norweigan

Further on we will use Norway as an example based on it being the largest one out of the EEA countries and will therefore give us the most reliable interpretation of the trade agreement as it could be put into reality for the UK. For those who would like to keep enjoying the advantages of having access to the single market without being part of a union heading for deeper integration 'The Norwegian Model' with an EEA membership is an attractive option.

A positive aspect of the EEA agreement for the UK would be to keep enjoying the four freedoms. This would be economically beneficial since a large part of the UK's trade is conducted with other EU countries (HM Treasury 2016:24). As Norway are a part of the single market they are not part of the customs union, meaning that Norway are free to conduct their own trade negotiations with other countries together with setting their own external tariffs (Dhingra & Sampson, 2016:3). For the UK this can be seen as a positive regain of power over its borders.

The greatest drawback from this post-Brexit alternative is that the UK no longer will be part of the customs union, presumably leading to less trade between the UK and the EU (Dhingra

et al, 2015:3). Being outside the customs union makes it possible for the EU to use anti-dumping against the UK as it before has done towards Norway, resulting in an 16% tariff on Norwegian salmon (Dhingra & Sampson, 2016:4). Border controls and the implementation of 'Rules of Origin' (RoO) will also affect trade between the two parts negatively (Dhingra & Sampson, 2016:4).

Furthermore, there was an urge among the British voters to regain power to the UK from the EU. As an EEA member, Norway does not participate in the EU monetary union, common foreign and security policy or the EU's justice and home affairs policies (Dhingra & Sampson, 2016:3). Neither does Norway have to apply CAP (Dhingra & Sampson, 2016:3).

The leave-side have strongly argued for a Brexit to restore UK sovereignty over law making. This does not rhyme well with entering EEA as this would mean cancelling the UK's influence over trade agreements between itself and its largest trading partner, the EU, losing even more sovereignty. To be in the position of not being able to influence or block any proposals that is not in the national interest of the UK must be seen as negative against the background of that the British people are starving for greater sovereignty.

Neither will the EEA put a stop for the free movement of people in the European zone since the four freedoms still are exercised (HM Treasury, 2016:89).

Besides the political losses for the UK entering the EEA there is also ground for scepticism about to what extend the EEA will eliminate UK's financial contributions to the EU. In 2011 Norway's contribution to the EU budget was £106 per capita, which is only 17% lower than UK's net contribution of £128 per capita (House of Commons, 2013). If this decrease in the financial contribution to the EU is substantial for the 51.9% pro-leave voters it is definitely a subject for discussion. Furthermore the EEA membership does not include its members in the deeper integration that occurs within the EU, creating indirect costs through implementation and satisfactory of EU's RoO requirements (Dhingra & Sampson, 2016:4).

Being outside the customs union also implies higher administrative costs since the UK needs to negotiate new trade agreements with all trade partners, not only the EU. As the UK leaves

the EU all of the FTAs between EU and third countries expires and new ones needs to be established and maintained.

Important not to forget is that as a part of the EU the UK has experienced a rebate on their financial contribution to the union (HM Treasury, 2016:91). Norway is not receiving any such rebate, giving us the assumption that the UK will in an EEA-future not receive any rebate on their economic contribution, creating a heavier costs than imagined and carried out in the referendum campaign.

3.3 The UK going Swiss

Switzerland is not a member of the EU nor the EEA but has negotiated many bilateral agreements with the EU, giving Swiss some access to the single market (Dhingra & Sampson, 2016:4). Thus the Swiss model consists of a series of bilateral treaties, where each treaty provides for Switzerland to participate in a particular EU policy or programme. Furthermore the membership of the EFTA gives Switzerland the rights to conduct free trade with the EU in all non-agricultural goods (UK Treasury, 2016). However, Switzerland is not a part of the customs union, which leaves the Swiss firms exporting to the EU with additional administrative costs related to trade facilitation.[5]

An approach as Switzerland's would allow for the UK to choose the EU initiatives which it wishes to participate in, but there are drawbacks. A major one is the lack of a comprehensive trade agreement between the UK and the EU regarding trade in services, meaning that Switzerland does not have access to the single market in services to the great extent it would have had through an EU membership (Dhingra & Sampson, 2016:5). Even if Switzerland has some bilateral agreements regarding trade in certain services, these do not comprises the key sectors for the UK, being financial and business services (Economic Outlook, 2014:7). Reasons for this is high level of political sensitivity to problems in many service sectors, as social issues, and difficulties with identifying technical rules and standards between the two parts (Kawka, 2014:325). Since the UK's trade are made up out of 40% trade in services, and

[5] Cost related to trade facilitation could be both non-tariff barriers, such as costs of rules of origin, and trade barriers, as quotas and tariffs.

that 37% of the services being traded are exported to the EU (Economic Outlook, 2014:6) there will be costs associated to this sector if the UK decides to try and go Swiss.

Similar to the Norwegian alternative, being an EEA country, the loss of influence over the regulations can be seen as a major drawback and a further loss in sovereignty. Switzerland has no influence over the design of the EU programmes in which it participates. The country has to, exactly as Norway, accept the regulations on trade being decided by the EU and only makes the in or out decision (Dhingra & Sampson, 2016:5).

For the Swiss solution to be an alternative it is vital for the UK to be able to gain access to the single market of trade in services, otherwise the Swiss alternative appears a doubtful one since it would sincerely hurt the UK's ability to export financial and business services to the EU (Dhingra & Sampson, 2016:5). However, the swiss alternative will result in a deficit in economic integration between the EU and the UK, resulting in higher costs for the UK.

As with the EEA countries Switzerland makes a financial contribution to the EU, this contribution has in the recent years on an average been 60% lower than the UK's net contribution per capita (House of Commons, 2013). The benefit of a lower financial contribution to the EU could be ruled out by the costs of loss in economic integration with the EU (Dhingra & Sampson 2016, 5).

3.4 Comprehensive Trade and Economic Agreement between Canada and the EU - building bridges over troubled water

The Comprehensive Trade and Economic Agreement (CETA) was a proposal of a trade agreement between the EU and Canada that will reduce 98% of the tariffs between the two parts (Johnson, 2014:481). The free trade agreement (FTA) proposal was signed by all parts in 2016 and CETA will allow for free trade flows for goods and services, but with restrictions on the free movement of people (National Board of Trade Sweden, 2017). CETA will not give the same benefits as a customs union, leaving EU-Canada trade still depending on separate external tariffs and RoO to make sure the goods being traded are produced in the EU respective Canada.

The process of conducting CETA has been going on since 2007 and is the third try in forty years (Johnson, 2014:479), an evidence of that comprehensive trade agreements as this takes long time to negotiate into place. Furthermore Canada has a number of comprehensive trade agreements with other countries, with NAFTA as the most extensive one, where it is proven that it takes a long time to harmonise standards between trading partners.

It has been debated whether CETA could be used as a template for an agreement on EU-UK trade both before and after the referendum (Shankar, 2016). An agreement like this would give the UK greater independence in policy making and border control, where the latter is in line with the will of the British people (ComRes, 2016; Ipsos MORI, 2016; Lord Ashcroft, 2016). The agreement would give great access to the market of goods and services once put in place (Johnson, 2014:480-481), on the other hand it leaves the UK completely excluded from preferential trade with the EU if the agreement is not signed by all needed, only resulting in the loss of time put into the negotiations.

Since an agreement as the CETA is not a customs union there will be added administrative costs for the UK. RoO will force the UK to present for where all parts of a good is produced to make sure it really is enough to be counted for as a good from the UK. Also in this type of agreement will the UK stand completely outside the legislation process and will not be able to influence regulations for the EU. This will be a bigger problem for the UK than it is for Canada, the geographical position of the UK do make it dependent on the EU, also since it will remain the UK's largest trading partner.

Since the UK and the EU already is deeply economically integrated the two parts need an agreement on more than just trade in services and goods. The free movement of people will affect a lot of UK citizens living in the rest of Europe as for the Europeans leaving in the UK.

3.5 The customs union between the EU and Turkey

On december 31th 1995 a customs union between the EU and Turkey came into force bringing Turkey's trade policies in line with the Common Commercial Policy of the EU (Tekce, 2015:399). The customs union covers all industrial goods but not agricultural goods[6]

[6] Turkey do, however, have bilateral trade concessions applying to agricultural products (Tekce, 2015).

or services (Tekce, 2015:399). The Customs Union between the two meant that Turkey adopted the common external tariffs of the EU on imports and export (European Commission, 2016), agreeing on this means that Turkey will have no say on the tariffs which it has to impose on goods it imports from non-EU countries.

As the UK conduct great trade with the EU, so does Turkey (Baskin & Vermulst, 2016:17-18). With Turkey being the only country outside of the EU having a Customs Union with the area, it could be seen as an alternative for the UK to keep inside the Customs Union and at the same time gaining the possibility to strike own trade deals with countries outside the EU.

There are however drawbacks, the implementation of many aspects of the EU's Common Commercial Policy has in recent years caused problems for Turkey. This due to that the EU is negotiating and concluding many FTAs with third countries, binding also Turkey to these but without a say in the negotiations (Baskin & Vermulst, 2016:17-18).

3.6 World Trade Organization - the fallback option

The World Trade Organization (WTO) was officially established on the 1th of January 1995 as an outcome of the Uruguay Round (WTO, 2017). The organization has the aim of supervise and liberalize trade and is governed by a set of rules out of which the most important guiding principle is the non-discrimination in trade policy, i.e. the most favoured nation principle (MFN) saying that all tariffs imposed should be non-discriminatory (Baldwin & Wyplosz, 2015). In the case of the UK leaving the EU without being able to negotiate and conduct any new trade agreements with the EU and the rest of the world, the UK will fall back on the framework of WTO. This means introduce the MFN rules and to apply the same external tariffs towards all 163 other (WTO, 2016) members of the WTO.

Imposing MFN tariffs means that the UK will meet higher export costs whilst exporting to the EU, as the UK in a post-Brexit world is subject to the EU common external tariff (HM Treasury, 2016; Dhingra & Sampson, 2016). At the same time the UK still has to meet the

rules and legislation on product standard, the environment and safety regulations of the single market to be able to export to the EU (HM Treasury, 2016).

The agreements on services included in WTO is far less liberalized in comparison to the ones the UK has experienced as a member of the EU. The WTO scenario would mean reduced access to EU markets for UK service producers (Dhingra & Sampson, 2016), something that will be problematic for the UK due to their high export in trade in services (Economic Outlook, 2014).

After leaving the EU there is no longer anything binding the UK to keep the common external tariff with the EU. Dhingra et al describes the most likely scenario as the one where the UK inherit the EU tariffs and in the future reduce the import tariffs below EU levels to lower import costs for UK consumers and firms, and in this way also increase the competition faced by UK businesses. The remaining question is how much this really will affect the economy and the competition as the current average tariff charged on imports to the EU is 1% (World Bank, 2015) leaving the reduction possibilities heavily limited. It seems more probable for the UK to instead meet higher non-tariff barriers, which requires international agreements to overcome (Dhingra & Sampson, 2016).

There will with the WTO alternative be higher administrative costs since the UK needs to update the commitments towards the organization, something that has formerly taken as part of the EU (HM Treasury, 2016), and they need to negotiate all their bilateral trade agreements on their own and not via the EU, contributing to more administrative costs.

The loss of economic integration is gained in greater political sovereignty, making it possible for the UK government to set economic policy and regulatory standards not accounting for other EU countries. Further on WTO has no agreement on free movement of people or labour, which is in line with the leave campaigns aim of regaining control over the immigration. Relying on the framework of WTO the UK has no obligation to in any way economically support the EU.

Put briefly the WTO alternative is a threshold for the minimum economic integration between the UK and the EU possible after Brexit.

3.7 Best case scenario

In this paper we have focused on two approaches to the possible future relationship between the UK and the EU post Brexit, one which would be the most economically beneficial for the UK and one where the British voters are being pleased regarding the reasons for voting 'leave'.

From the different scenarios being discussed in this paper the one with the highest level of economic integration, i.e. the Norwegian alternative, will be the most economically beneficial for the UK. Further on the other possibilities will follow in the same order as they do in this paper, with exception for the EU-Turkey and CETA alternatives where it is not stated clear which will be the most economically beneficial.

When regarding the voters reasons for leaving the EU, a less economically integrated option would be preferable. But since a fairly high share of voters still want to be a part of the single market, staying relatively close with the EU still is a credible outcome.

Based on earlier research together with the results of surveys performed before the EU referendum it seems both economically sufficient and as a reasonable compromise between what is economically sufficient and the wishes of the British people, to remain in close partnership with the EU even after Brexit. Both in academia (Dhingra & Sampson, 2016) and in various think tanks (Open Europe, VOX) it has been discussed that the best case scenario regarding future trade agreement between the UK and the EU will be negotiated to look like the one today enjoyed by Norway and the EU, i.e. the UK becoming part of the EEA agreement. This since this option gives a bid on the minimum cost in terms of trade for the UK outside the EU. This conclusion will be fundamental in our empirical method.

Figure 1. Overview of possible outcomes and their economic aspects.

	EU	**EEA** (Norway)	**Bilateral agreements** (Switzerland)	**Comprehensive Trade and Economic agreement** (Canada)	**Custom Union** (Turkey)
Tariff-free trade	Full.	Some tariffs on agriculture and fishery.	Some tariffs on agriculture.	Some tariffs on agriculture. Some tariffs on manufactured goods will remain for a transitional time period.	Tariff-free trade only applies o manufactured goods and processed agricultural goods.
Customs union (external trade)	Full. Access to EU FTAs and no costs associated with customs.	None. No access to EU FTAs and customs costs.	None. No access to EU FTAs and customs costs.	None. No access to EU FTAs and customs costs.	No customs costs for manufactured goods. Has to alter their external trade policy with EU.
Policies and regulations	Full.	Has to comply with most EU regulations and rules. Includes: market/product standard, free movement of people, environment, social, energy and climate.	Adopts EU rules in the sectors of which the agreements covers. Participates in the free movement of people and adopts EU rules regarding i.e environment, social, energy and climate.	International agreements and standards apply. Firms that trades into EU has to conform with EU standards.	Has to adopt EU product standard. Commit to similar rules regarding competition, state aid etc. Commits to EUs environmental standard regarding goods.
Financial contributions	Full. Contribution to EU budget.	Has to pay for EEA grants, grants to Norway, administration costs and costs associated with the programme.	Grants to new EU members. Pays administration costs and costs associated with the program.	None.	None.
Votes on EU regulations and rules	Full.	None.	None.	None.	None.

Source: HM Treasury (2016).

4. How does replacing an EU membership with an EEA membership affect trade in goods?

Some of the effect an EEA membership would have for UK's trade in goods is outlined in the previous section, section 3.2. The purpose of this section is to clarify the economic theory concerning the difference between an EEA and an EU membership, and how these differences affect the cost of trade in goods.

4.1 Increased regulatory costs

A cost associated with leaving the EU and enter the EEA is the increase in regulation costs. For the UK to qualify for an EEA membership, they will have to implement and abide by EU regulations. As an EEA member the UK would have little influence in the drafting and the decision making of these regulations. Meaning that the UK are not able to protect their trade interests and would have to abide the decisions made by the EU (Springford & Tilford 2014:8). Being a member of the EEA would mean limited influence over further development of the single market. Changes in the regulatory framework done by the EU concerning to expanding market access the UK have no saying in the modeling of the rules and regulation. This will have a negative impact on trade, as the cost associated with protecting the UK's interests would increase (HM Treasury 2016).

4.2 Non tariff barriers

Being a member of EEA mean being on the outside of the customs union. This is associated with increased cost of trade due to non-tariff barriers of trade such as RoO and anti-dumping.

4.2.1 Rules of Origin

RoO states that some fixed percentage of a products value-added must be performed in the exporting country to enter the EU market duty-free. These rules can act as barriers to trade as they can be expensive to obey by and if they are not met, EU tariffs are applied. Within the EU goods subject to intra-EU trade does not have to comply with RoO (Baldwin and

Wyplosz 2015:132). By leaving the EU for the EEA, RoO would apply to all British export of goods to the EU.

Being subject to RoO for exporting goods to the EU could affect UK's trade by increased trade costs. An estimate is that being subject to RoO would increase UK's cost of exports by 4 - 15% (The Economist 2016). There are two types of costs, which are associated with RoO: administrative and production costs. The administrative costs are related to the necessary procedures required to prove that the exporting goods comply with RoO. As firms supply chains are becoming more complex due to the ongoing globalization, the cost associated with verifying a product's RoO are increasing (National Board of Trade Sweden 2012:14) (Dhingra & Sampson 2016:5). Production costs refers to increase in costs for intermediate goods due to product-specific RoO. For exporters, this means limiting their use of supplies from outside the EU and turn to EU suppliers instead (National Board of Trade Sweden 2012:14).

4.2.2 Anti-dumping

Not being part of the customs union also makes the UK a subject for antidumping measures by the EU (Dhingra & Sampson 2016:4). In theory the EU is free to restrict imports from EEA countries by using antidumping, this would mean adding an additional cost to the product being sold to a lower price on the export market than on the home market (Tullverket 2011:1). The usage of antidumping is by the EU motivated as a way to protect the internal market (Tullverket 2011:1). Leaving the EU and entering into an EEA agreement could for the UK be associated with costs since their exported goods will be sold at a higher price than intended. This has empirically been shown to affect trade negatively. The EEA member Norway has suffered from a lower productivity, not being able to undertake the deeper integration of the EU and being a subject for antidumping (Dhingra & Sampson 2016:4).

4.3. Further concerns

Another aspect worth mentioning is that as a member of the EEA almost all trade in goods are subject to tariff and quota-free trade, accept fisheries and agriculture. It is also important to point to the fact that being member of the EEA would mean that the UK have no access to

the EU's trade deals with the rest of the world. These two aspects will affect trade negative as they increase costs associated with trade (HM Treasury 2016).

5. Earlier research

This section will outline earlier research done estimating the effects of an EU membership and other trade agreements among European countries. We will use both peer-reviewed articles and articles published by The Centre for Economic Performance (CEP) which is a politically independent research centre at the London School of Economics.

Baier et al. (2008) examines the effects of EU membership, EFTA membership and EEA membership on international trade between the countries participating in the trade agreements between year 1960-2000 by using a gravity model. The authors find that being a member of EU, EFTA or EEA increases trade by about 75%. The authors can also conclude that EU members usually conduct more trade with other EU members than they do with members of EFTA. Baier et al. (2008) conclude that their results shows a larger gain in welfare due to higher trade between countries within EU than earlier suggested by *ex ante* considerations and much larger than earlier empirical estimates using cross-sectional gravity equations.[7]

Ottaviano et al (2014) focuses on the welfare gains arising from trade openness with EU countries and taking part of the single market, quantifying some effects associated with the UK in a post-Brexit world by assuming both an optimistic scenario as well as a pessimistic scenario. The optimistic scenario would mean for tariffs on goods to remain at zero and the pessimistic scenario in which the UK imposes MFN tariffs on trade in goods. Ottaviano et al. (2014) uses a quantitative model of international trade together with a gravity model in their estimation. To quantify the effects of the model Ottaviano et al (2014) uses Feyer's (2009) result, which estimates the static loss in % of GDP to be between 1.13 to 3.09 and are concluding that with dynamic effects the losses could up to double. Although Brexit would harm the UK's economy through reduced trade, Ottaviano et al. (2014) has found that the cost will be smaller when the UK remains more economically integrated with the EU. Ottaviano et al. (2014) finds that tariff and non-tariff barriers between the UK and the EU

[7] To note is that Baier and Bergstrand do not measure beyond tariff cuts.

leads to a drop in the welfare of the UK and are also able to conclude that trade liberalization increases welfare.

Instead of a gravity model Dhingra et al (2016a) estimates the welfare effect for the UK to leave their current EU membership by using a general equilibrium trade model. The authors conclude that the welfare changes will range between the optimistic scenario of -1.28% and the pessimistic scenario of -2.61% of GDP, comparing the welfare differences between the scenario in which the UK remains a member of the EU and the scenario where they are not a member. Dhingra et al. (2016) do leave out certain aspects,[8] which together with the conclusion on that historical evidence of countries which has joined the EU has experienced increased trade and higher income,[9] contributes to that the welfare loss presented according to Dhingra et al (2016a) is underestimated and more likely lies around -6.3% to 9.5% of GDP.

In an article Dhingra et al. (2016b) estimates the effect that Brexit will have on UK's living standards together with trade using a modern quantitative trade model. Simulating an optimistic scenario where UK enjoys similar trade relations with the EU as Norway and Switzerland does today[10] alongside a pessimistic scenario where UK is not successful in their negotiations and fall back on the MFN tariffs and rules of the WTO. Concluded in the paper is that the cost of leaving the EU membership will be larger than the gains from lower contribution to the EU budget. Dhingra et al. (2016) can from this study also state that the short term effect of Brexit on UK's trade will lay between 1.3% to 2.6% of reduced income and that the long term decline in income will raise to 6.3% and 9.5%.

In 2015 Booth et al. wrote a report about the economic impact from leaving the current EU membership and entering into some new trade agreement with the EU. Booth et al. (2015) assumes the UK to leave the Union on the first of January in 2018 and that the effects of Brexit would come into effect in 2030. Using a GTAP model[11] the authors find that in the case of a fall back to WTO's MFN tariffs the loss in UK's GDP will be of 2.2%. In the case

[8] Such as the loss in productivity due to the firms being met with less competition and the larger variety of goods and services which are available for consumers within the EU due to the integration between the member countries.
[9] Rarely evident in static trade exercises such as being performed by Dhingra et al. (2016).
[10] See chapter 4 for further details on these trade agreements.
[11] A computable general equilibrium model.

of ambitious deregulation there will be an overall gain of 1.55% of the UK's GDP.[12] However, these estimates are considered outliers and a more realistic estimation is around 0.8% in permanent loss in GDP if the UK negotiates a comprehensive trade deal with the EU and a 0.6% gain in GDP when the UK presumes free trade and deregulation with the rest of the world.

In a report written by the UK government (HM Treasury:2016) it is stated that as a member of the EU the UK has benefitted from a more open economy and thereby gained support for trade and investments. Their current membership has yielded to an increase in overall trade for the UK. By facilitated trade negotiations with the rest of the world, trade as a part of the UK's national income has increased from 30% to above 60% since the years before the UK was a member of the EU. Being a member of the EU has increased UK trade with other EU members by three quarters and UK's FDI attractiveness has improved. It is estimated that around three quarters of total foreign investor has positioned itself in the EU due to their willingness to invest in the UK.

From earlier research conducted on the topic of economic integration in the EU zone it has been concluded that deeper integration through trade agreements and the European Union has had positive effects on trade. Inversely it has been found that a withdrawal from the EU will lead to reduced trade, reduced welfare and lower living standards for the UK.
Different alternatives to an EU membership has been mentioned in earlier research, with the EEA agreement as a prominent alternative. To estimate the effect of this occasion on trade we will as Baier et al. (2008) and Dhingra et al. (2016) use a gravity model.

6. Empirical method

This section will outline the method used in this paper. The first chapter contains an overview of the empirical strategy. The second chapter outlines the econometric model that has been used and also contains an explanation of the variables being used in the equation and a description of the data. The last chapter is a discussion of possible estimations issues.

[12] In this scenario the UK would not make any contributions to the EU budget.

6.1 Empirical strategy

To be able to estimate the effect of Britain leaving the current EU membership and entering into an EEA membership this paper has outlined an empirical strategy. Since no nation has ever before left the EU we will estimate this effect by using Sweden, Finland and Austria as proxies for the effects of replacing an EEA agreement with an EU membership,[13] and conclude that the effect will be inversely proportional when leaving the EU and instead entering into an EEA agreement. We have decided to use this expansion for our study as it is the most similar historical event to the best case scenario for the UK. As Sweden, Finland and Austria have economies that are in similar size to the UK and the countries are geologically close to the UK, their economies would respond to this transformation in a similar way as the UK. Further, as the three countries entered the EU at the same time, the estimation of the effect will be more precise. Based on the assumption that the best case scenario for the UK is to become an EEA member, then it is a reverse situation to the expansion in 1995. Thus, it would be a good proxy to use for this paper.

In this paper we will use the gravity model to estimate the effect of a transformation in membership from EEA to EU has on trade. The sample being used contains the original EU12 members whom entered into the agreement prior to 1992 and the three countries, Sweden, Austria and Finland, that entered in 1995 as well as the two of the EEA members: Norway and Iceland. We have chosen to include Norway and Iceland in our sample to be able to get a more comprehensive reference group. The regression covers the years 1992-1998.

6.2 Econometric model

The gravity model is considered a key tool for investigating the effects of trade-related policies on trade and can be derived from traditional trade theories such as the Ricardian model and the Heckscher-Ohlin model. Gravity comes from the model resembling Newton's law of gravity and refers to that countries will trade in proportion to their economic mass (GDP) and the distance between them is inversely proportional (Shepard 2013: 9). The model

[13] Sweden, Finland and Austria signed the EEA agreement in 1992, which entered into force on the first of january 1994. In 1995 the three countries joined the EU (EUR-Lex 2016).

expects that larger countries will have larger trade volumes, this since larger countries are able to import a larger amount of goods, in absolute terms, and can offer a large amount of goods to other countries. Increased distance between countries will reduce trade, as larger distance increases transportation costs (Krugman et al. 2009:15). Economist Jan Tinbergen first used the gravity model in 1962 when analysing trade flows between two countries and the effects of the country's GNP and geographic distance (United Nations 2012:103). Since then the model has been frequently used in analysis of determinants and patterns of trade and for estimating the effects of trade agreements. The gravity model explains the effects of economic integration by comparing the actual trade flows with the anticipated trade flows without integration (Shepard 2013:3). Leamer and Levinsohn argues that the gravity model has provided some of the "...most robust findings in empirical economics" (1995, Shepard 2013:3). This econometric model is therefore considered to be the best fit for this paper.

The gravity equation in its simplest form can be written as equation (1). The trade from country *i* to country *j,* denoted T_{ij}, is proportional to the country's GDP, denoted *Y* and inversely proportional to the distance, *D,* between the countries. This variable is usually a observed proxy for trade costs. β_0, β_1, β_2 and β_3 are unknown parameters (Santos & Tenreyro 2006:642).

$$T_{ij} = \beta_0 Y_i^{\beta 1} Y_j^{\beta 2} D_{ij}^{\beta 3} \quad (1)$$

The model is usually log-linearized to make Ordinary Least Squares (OLS) [14] estimation of the unknown parameters possible. Equation (2) is a modified version of the gravity model where ε_{ij} is a random error term and c is a the regression constant (Santos and Tenreyro 2006:642; Shepard 2013:9).

$$lnT_{ij} = c + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnD_{ij} + \varepsilon_{ij} \quad (2)$$

[14] The OLS estimator minimize the residual sum of squares and is considered one of the most popular estimation methods for regression analysis (Dougherty 2011:85-87).

Dummy variables are usually included in the equation as control variables for the effect of additional cost of trade. These usually includes common language, borders, colonial history and membership in bilateral or regional trade agreements (Gasiorek 2010:97).

In recent contributions to the gravity model Anderson and van Wincoop (2003) showed that bilateral trade is established by relative trade costs and not absolute trade costs between countries *i* and *j*. It is therefore important to include multilateral trade-resistance (MTR) as an average trade barrier between the importing and exporting country (United Nations 2012:105). The potential issues related to MTR and our solution for the issues in our model, will be discussed in section 6.4, estimation issues.

6.2.1 Modified gravity equation

In this paper the gravity model has been estimated by using the OLS method. Our modified model is based on the previous mentioned basic log-linearized gravity model equation[15] and takes the following form:

$$lnX_{ijt} = c + \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_2 ln(Pop_{it}) + \beta_3 ln(Pop_{jt}) + \beta_4 Distance_{ij} + \beta_5 Language_{ij} + \beta_6 Border_{ij} + \beta_7 EU_{ijt} + \eta_t + \gamma_i + \lambda_j + \varepsilon_{ij} \quad (3)$$

In this model, c is, as in the original gravity model, the constant in the equation. β for the continuous variables are interpreted as elasticities, and can be recognized as the percentual change in X_{ijt} when the variable changes one percent, holding all other variables constant. The β for the dummy variables is interpreted as the difference in size to the reference group and needs to be recounted to be able to be interpreted as a procentual effect.[16] The following section will explain the variables in detail.[17]

Our dependent variable is denoted X_{ij} and represents the trade between country *i* and *j*. The variable is estimated using the calculations on trade flow from the CEPII gravity dataset (2016a). Trade is calculated by using the Direction of Trade Statistics (DOTS) database

[15] Equation (2)
[16] See section 7.1 and equation (5) for the equation and reference.
[17] See appendix 1 for a summary, table 1.1.

where the author's of the dataset, Head et al (2010), chooses the information based on which source of data they find most reliable.[18] Following are the explanation and prediction of the independent variables.

The main explanatory variables are population and GDP, the two variables determine the economic size of the exporting and importing countries. GDP_{it} represents the gross domestic product for year t for the exporting country *i* and GDP_{j_t} denotes the importing gross domestic product for country *j* for year t. The variable is measured in current $US and is predicted to have a positive effect on trade flow. Population for country *i* year t is denoted Pop_{it} and for country *j* in year t Pop_{jt}. When keeping GDP constant an increase in population would lead to a decrease in GDP per capita. Therefore, the effect for population is negative. However, it has been discussed that this variable could be positive as well.

The variable $Distance_{ij}$ is the geographical distance between the exporting and importing countries capitals. The distance is measured as a straight line and in kilometers. One usually uses the capitals as the point of reference since they often are the country's economic center. A larger distance indicates greater transportation costs which affect trade negative, thus, increased distance between country *i* and *j* would have an negative effect on trade flow.

To account for the trade costs that the distance variable does not include, dummy variables have been added to the equation. These variables will act as control variables since previous gravity model literature has proven that these additional trade costs can have a significant impact on trade (Shepard 2013: 29). The variable $Language_{ij}$ is included to capture information costs (United Nations 2012:106). It takes the value one if both countries obtain the same official language and zero otherwise. If the two countries share official language the information cost is most likely lower than if they didn't share language, as this facilitates communication between the countries. Thus, the variable is predicted to have a positive effect on trade. The dummy variable $Border_{ij}$ takes the value one if country *i* and *j* share a border and zero if they do not. Sharing a border indicates lower transportation costs and therefore it will have a positive effect on trade.

[18] See Head et al (2010) for more information.

This papers most interesting dummy is the variable EU_{ijt}, which takes the value one if both country i and j are members of the EU at year t and zero if otherwise.[19] By adding this variable we can measure the effect of joining the EU from being an EEA member. The effect will occur when the nations goes from being members of the inner market to begin full EU members. As mentioned in section 5, previous research, being a member of the EU have a positive effect on member countries trade. This would predict that becoming a member of the EU would have a positive effect on trade flow. Variable η_t represents fixed effects over time for each year and is added to intercept any time specific effects, that is effects which are similar between countries but varies over time. This is important as global financial events or similar occurrences otherwise may affect our results. λ_j represents importer fixed effects and γ_i for exporter fixed effects. These variables are added to capture time invariant, country specific effects. This could be historical or cultural effects, or a country's business cycle, which are different between countries and specific to a certain nation. The variable ε_{ij} is the error term.

6.3 Data

This paper uses a panel data set with data gathered from 16[20] countries during 1992 to 1998. The country sample includes the members of EU15 and countries that are only members of EEA[21] and not the EU. A list of countries used in this paper can be found in appendix 1, table 1.2. Information regarding our main variable EU_{ijt} is gathered from the European Union's official website and the information contains which countries are members of the EU and their year of entry (EU 2016). The data concerning our dependent variable *Trade flow* is gathered from CEPII[22] "Gravity" dataset (2016b). Information regarding our other independent and bilateral variables: *GDP*, *Population*, *Common border* and *Shared language* are gathered from the CEPII gravity dataset. Variables *GDP* and *Trade flow* are measured in

[19] See appendix 1 for a summary of when countries entered the EU.
[20] Belgium and Luxemburg are analysed as one country, since most reported trade data from the year 1992-1998 are combined for these two countries.
[21] Lichtenstein is not included in sample due to difficulties in finding trade data for Liechtenstein during the year 1992-1998. Data not found on following databanks: CEPII (2016b), UN COMTRADE (2016), the World Bank (2016) and Eurostat (2016).
[22] CEPII is a research center situated in France, which produces datasets that are commonly used for gravity models.

US dollar at current prices, which is preferable as it is adjusted for inflation. Data for *Distance* is collected from CEPII "GeoDist" dataset (2016a).

6.3.1 Processing errors

The data we collected from CEPII was adjusted manually to fit our sample and our EU_{ijt} dummy was created manually. We understand that there exists a risk of processing errors, meaning that we can have entered some values incorrectly, which would affect our results. As we were aware of this risk we frequently performed random sample test in our data set and compared the data entered to the original data set.

6.4 Estimation issues

When using a OLS estimation for the gravity model there is a possibility of estimation issues that one has to be aware off. This section will outline four possible issues when performing econometric analysis and the effects in might have on our results.

6.4.1 Gauss-Markov assumptions

The Gauss-Markov theorem claims that a linear regression model with uncorrelated error terms, that have equal variance (homoscedasticity) and an expected value of zero is the best linear unbiased estimator (BLUE) for the unknown coefficients is the OLS estimator. If the estimator is BLUE then the estimations of the coefficients are on average corresponding to the correct value. To be sure that the Gauss - Markov assumptions are fulfilled and the estimations are BLUE we need to control and adjust for heteroskedasticity and autocorrelation.

Heteroskedasticity means that the variation in the error terms is not constant, which causes our variables standard errors to be incorrect. This means that our regressions F-tests and t-tests could be invalid and the prediction of the coefficients will be ambiguous. To test for

heteroskedasticity we performed both a Breusch-Pagan[23] test and a White's test. [24] The results can be found in Appendix 2.

Another issue when estimating the gravity model, having heteroskedastic data, is that the error term will change characteristics when being log-linearized. The expected value of a log-linearized error term, is not the same as the log-linearized value of the error terms' expected value: $E(ln\,\varepsilon) \neq ln\,E(\varepsilon)$. This issue can lead to that the estimation on average not being corresponding to its true value. This can be solved by estimating the gravity model in its original form, most commonly through a Poisson Pseudo Maximum Likelihood (PPML). However, this method is beyond the scope of this paper and will not be used (Gómez-Herrera, 2014, Santos Silvia och Tenreyro, 2006).

If the error terms are correlated in our regression there exists autocorrelation, which can cause underestimation of our standard errors. To test for autocorrelation we execute the Durbin-Watson test. As our result indicates that there is both heteroskedasticity and autocorrelation in our regression we adjust for it by using robust standard errors[25] in our regression.

6.4.2 Multilateral trade resistance (MTR)

A critique against the gravity model was indicated by Anderson and van Wincoop (2003). Countries demand for goods and export are country specific, which has an impact on a country's trade flow. One should therefore consider the relative trade cost and analyse the multilateral trade resistance (MTR) instead of of the bilateral trade resistance. "Trade between two regions depends on the bilateral barrier between them relative to average trade barrier both regions face all their trading partners" (Anderson and van Wincoop 2003:10). For instance, trade between Germany and Portugal depends on the barriers of trade between them, relative to the cost of trading with the rest of the world. A reduction in trade barriers between Germany and another trading partner would lead to a bilateral trade net diversion

[23] The Breusch-Pagan test detects if there is heteroskedasticity in the regression. If the null hypothesis is rejected for the alternative hypothesis these is heteroskedasticity in the data.
[24] The White's test is commonly used to detect heteroskedasticity. The null hypothesis states that the variance in the error term is constant.
[25] Using robust standard errors is a common method for adjusting for heteroskedasticity.

away from Germany Portugal to Germany and the third country, and an increase in Germany's international trading with third countries (Adam and Cobham 2007:6-7). A common method to account for MTR is to proxy the multilateral term with importer and exporter fixed effects (Santos and Tenreyro 2006: 643). In this paper we have included importer and exporter fixed effects to control for MTR.

6.4.3 Zero trade flows

Zero trade flows, i.e. zeros in the reported trade data, would mean that there is no reported bilateral trade between the exporter and importer during that time period. Since we log linearize the gravity model in this paper this becomes an issue. The log of zero is undefined and these observations will be discarded. By not including these recordings the results will be inconsistent and misleading. This since there might exist trade between the nations, but it is small and might have been rounded to zero, or actually it does not exist trade between the countries at all. Zeros in trade may also be a consequence of missing observations (Shepard 2013:52). This error can be solved by the PPML estimator. This estimate includes zero trade values and would therefore give a more accurate result (Santos and Tenreyro 2006:643). However, as these is no reported zero trade flow in our data the OLS estimator can be used.

6.4.4 Endogeneity and unobserved heterogeneity

When performing studies based on trade policies a problem that might occur is that all variables are not exogenous. Endogeneity occurs when it is correlation between our a explaining variable/s and the error term (United Nations 2012: 118). This can easily occur in the gravity model. An example of this is the variable GDP, which is considered to have an effect on trade, on the other hand, trade affects GDP. These excluded explaining variables would then be caught by the error term, making it correlated to GDP. In our model, it is possible that endogeneity would occur as our EU variable could be correlated with the error term. This can be due to the fact that countries tend to enter into agreements with partners they already trade with, since it is easier for them to implement the trade agreement if their partners already has done it. Thus, these unobserved explaining variables would be intercepted by the error term,which leads to it being correlated with our EU dummy.

Another estimation issue that is correlated to omitted values is unobserved heterogeneity. Unobserved heterogeneity may occur due to omitted variables bias, meaning that increased trade between two countries might occur due to characteristics that is omitted the regression. When using the gravity model, this can occur when trade between two countries are specific to that country pair. This would then not be included in the regression model. In our model this could be similar regulations that would facilitate trade (Gómez-Herrera, 2013).

Endogeneity and unobserved heterogeneity can make the estimations to not one average be corresponding to their true value or our standard errors to be incorrect. A method to overcome the issue of endogeneity in our panel data is to use fixed effects (United Nations 2012: 118, 126). By using fixed effects, the OLS estimation would intercept these land specific an unobserved variables. This would eliminate the problem of heterogeneity and endogeneity.

7. Empirical results

7.1 Estimation

Our baseline estimation is a OLS estimation of our modified gravity model equation with exporter, importer and year fixed effects. The results are presented in table 1, column 1.

Table 1: Estimation Results

Estimation	*Baseline estimation*	*Robustness test 1*	*Robustness test 2*	*Robustness test 3*
Depended variable	*Trade flow*	*Trade flow*	*Trade flow*	*Trade flow*
GDP exporter	0.354 [0.224]	0.335 [0.259]	0.181 [0.255]	1.209*** [0.002]
GDP importer	1.188*** [0.000]	1.037*** [0.000]	1.185*** [0.000]	1.296*** [0.000]
Population exporter	-2.687 [0.276]	-2.202 [0.361]	0.230 [0.922]	-0.449 [0.227]
Population importer	-1.681 [0.148]	-0.234** [0.046]	0.556 [0.714]	-1.630 [0.155]
Distance	-0.776*** [0.000]	-0.737*** [0.000]	-0.776*** [0.000]	-0.946*** [0.000]
Common border	0.485*** [0.001]	0.454*** [0.001]	0.485*** [0.001]	0.410*** [0.003]
Shared language	0.273 [0.135]	0.269 [0.119]	0.274 [0.135]	0.187 [0.363]
EU	0.171* [0.052]	0.262** [0.018]	0.172** [0.041]	0.213* [0.081]
No of Observations	1680	1680	1680	1680
R-squared	0.920	0.897	0.920	0.917
Importer FE	*Yes*	*No*	*Yes*	*Yes*
Exporter FE	*Yes*	*Yes*	*Yes*	*No*
Year FE	*Yes*	*Yes*	*No*	*Yes*

Note: Presented is the results of the coefficients. All of the estimations are estimated using OLS and their dependent variable is trade flow. FE is an abbreviation for fixed effects. Robust p-values in brackets. Asterisks denote significant at the 1%(***), 5% (**) and 10% (*) levels.

Our estimations indicated an R-square around 90% which is good and the baseline estimation is in line with our predictions. The coefficients for the control variables *GDP exporter* and *GDP importer* have positive signs, as predicted by previous economic theory. However, only the variable *GDP importer* is significant at one percent level, indicating that a one percent increase in GDP would increase trade between the countries. The coefficients for population, *Population exporter* and *Population importer*, both have negative signs and would indicate that an increase in population has a negative impact on trade. However, none of the populations coefficients are significant in any of the estimations and cannot explain the variations in trade. One of the reasons for this could be that population does not vary remarkably over time and the effect is caught by the time invariant country specific effekt. The control variable *Distance* is significant at a one percent level and indicates that trade would decrease if distance would increase by one percent, which is in accordance with our prediction. A prediction of this is that if distance increase between the exporting and importing country, then the costs associated with transport would increase. The dummy variables *Common border* and *Shared language* shows positive signs and would imply that if countries share a border or have an official language in common, if all else equal, trade more than countries that does not. This is in line with economic theory, however only border is significant on a one percent level. The variable *Shared language* is insignificant in all of the estimations and cannot prove that having a common official language will lead to countries trading more. The main variable of interest, the dummy variable *EU*, is positive and implies that if, all else equal, both countries are members of the EU trade between them will increase. We accept that the coefficient is significant at a ten percent level. By using the formula (5) it is possible to appreciate the procentual change in trade countries experience when both countries are members of the EU.

$$(e^{Coefficient} - 1) \times 100 \qquad (5)$$[26]

Equation (5) is equal to the procentual change in trade. It implies that when countries go from being EEA to EU members, their trade increases by 19%. [27]

[26] See United Nations (2012) page 143.
[27] (e^(0.1712)-1)*100=0,1866

7.2 Robustness tests

7.2.1 Robustness test 1: OLS with year and exporter fixed effects

Presented in table 1, column two is the first robustness test with a OLS estimation excluding importer fixed effects. The results are slightly different form our original estimation. Still, the control variables show the same signs as in the original estimation. Our main variable *EU* is positive and significant at a five percent. When excluding importer fixed effect the *EU* variable obtains its highest value. By using equation (5) we can appreciate the procentuell effect to be around 30%.[28] A reason for this higher estimation of the variables effect could be that the importer fixed effect clears for some of the effects of the *EU* variable.

7.2.2 Robustness test 2: OLS with importer and exporter fixed effects

The results for the robustness test number two is presented in table 1, column three. In this estimation we have excluded time fixed effects. The signs for the control variables shows similar signs, except for the population variables. For our main variable *EU* the estimation of the coefficients differs slightly and show similar signs as in previous estimations. It is significant at a five percent level.

7.2.3 Robustness test 3: OLS with importer and year fixed effects

Our third robustness test, presented in column four excludes exporter fixed effects. This is the only estimation where *GDP exporter* is significant. The controls variables show similar signs as in the original estimation. For our main variable *EU* the coefficient has a higher estimation than in our original estimation and is significant at a ten percent level.

[28] (e^(0.2620)-1)*100=29.95

7.2.4 Robustness test 4: OLS without year 1992

Further robustness test are done to control the robustness of our selected time period.

Table 2: Further robustness tests

Estimation	*Robustness test 4*	*Robustness test 5*
Depended variable	*Trade flow*	*Trade flow*
GDP exporter	0.324 [0.111]	0.234 [0.089]
GDP importer	1.178*** [0.000]	1.201*** [0.000]
Population exporter	-0.188 [0.943]	1.141 [0.650]
Population importer	-2.016 [0.115]	-2.668 [0.143]
Distance	-0.777*** [0.000]	-0.784*** [0.000]
Common border	0.478*** [0.001]	0.476*** [0.002]
Shared language	0.271 [0.130]	0.253 [0.159]
EU	0.178* [0.089]	0.239 [0.112]
No of observations	1440	1200
R-squared	0.921	0.922
Importer FE	*Yes*	*Yes*
Exporter FE	*Yes*	*Yes*
Year FE	*Yes*	*Yes*

Note: Presented is the results of the coefficients. All of the estimations are estimated using OLS and their dependent variable is trade flow. FE is an abbreviation for fixed effects. Robust p-values in brackets. Asterisks denote significant at the 1%(***), 5% (**) and 10% (*) levels.

Test number four is presented in table 2, column one. When excluding the year 1992, 240 observations are dropped. The control variables show their predicted signs and the variables

GDP importer, *Distance* and *Common border,* are significant at a one percent level. The numerical values for our main variable *EU* differs slightly and is significant at a ten percent level.

7.2.5 Robustness test 5: OLS without year 1992 and 1993

Test number five excludes the year 1992 and 1993 and is presented in table 2, column two. When dropping the year 1993 an additional 240 observations are dropped. The manual dummies for the time fixed effects for year 2 and 5 are dropped due to collinearity. In this estimation all the control variables, except *Population exporter*, show similar signs as in the original version. The coefficient of the main variable *EU* is higher than in the original estimation, but is insignificant and cannot explain the variation in trade. There can be many reasons for why the EU dummy is not significant in this regression. One reason can be that the effect of the transformation from being an EU to an EEA member has on trade can have an effect before a country officially joins the EU. Therefore, by including years prior to the official entry the model can include these effects. Another reason can be that the estimated panel data is too small, when excluding 1992 and 1993, and the variation in the EU dummy is intercepted by the land specific effect.

7.3 Summary of empirical results

The prediction of the EU dummy, was that it had a positive impact on trade. In most of the econometric estimations our main variable EU have a positive sign and is significant at a five and ten percent level. This would strengthen our prediction and indicate that when countries goes from being an EEA member to being member of the EU, if all else equal, their trade increases by 19%. In most of the estimations the control variables show their expected sign and are in accordance with international trade theory. This lays a good foundation for our results.

8. Summary and conclusion

The aim of this paper was to examine the economic effect on trade in goods following a potential exit by the UK from the European Union and instead entering the best case scenario solution. This solution would for the UK be to join the EEA, and negotiate towards a

Norwegian solution. □As this paper is based on predictions the results and analysis of it should be read with caution.

To be able to perform an empirical analysis and through a quantitative approach study the future replacement, we decided to use the situation in 1995 when Sweden, Finland and Austria replaced their EEA membership with an EU membership, as a proxy. In our empirical strategy we assume that the effect of replacing an EU membership with an EEA membership will have the inverse effect. By doing so we can conclude that leaving the EU and entering into an EEA agreement, the UK would lose the positive effect on their trade volume. The loss shows to be close to 19% of their trade volume. Considering that trade is a big part of UK's GDP (HM Treasury, 2016), this loss would have a huge impact on the country's economy.

The estimated gain for the countries leaving the EEA agreement and entering into the EU, which could be perceived as a fairly small change due to the countries already being integrated with the EU members at the time entering, has in fact a huge impact on the countries economies. This tells us that another scenario than the best case scenario proposed, by this paper, probably will lead to an even larger loss in UK trade with the EU.

To conclude, this paper is in line with earlier research, saying that an EU membership has a positive effect on trade, which would mean that exiting from their current EU membership reversely would have a negative impact on the UK's economy. Our study differs from previous research as it presents the possible best case scenario for the EU-UK relationship and not the two cases of either being a part of the Union or the fallout option of WTO.

What is not reached in the scope of this paper are the effects of Foreign Direct Investments (FDI's) for the UK. Neither have the paper discussed how trade with the rest of the world will be affected by Brexit. Since the paper keeps a heavy focus on trade it does not draw any conclusions on how trade in services, capital and movement of people are being affected. There is room for a lot of further research and it is important not to forget that Brexit will affect the UK in many aspects beyond trade in goods with the EU. Regarding further research it would be of interest to estimate the loss in trade in the different trade scenarios discussed in the paper.

The UK should base policy on evidence, which in this paper, largely points to one conclusion: that the UK should stay as close as possible with the EU to lose as little as possible. Even if the EEA trade agreement is not the most likely outcome, it is definitely the best case scenario.

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Appendix

Appendix 1

Table 1.1 Description of variables and data sources

Variables	Description	Source
Dependent variables		
Trade flow	Trade flow from *i* to *j* in millions of $US.	CEPII gravity dataset
Independent variables		
GDP	Gross domestic product, measured in current $US	CEPII gravity dataset
Population	Population	CEPII gravity dataset
Distance	Geographical distance between the cities in countries *i* and *j*.	CEPII GeoDist dataset
Shared language	Indicating of country *i* and *j* share official language	CEPII gravity dataset
Common border	Indicating if country *i* and *j* share a border	CEPII gravity dataset
EU	Variable that takes the value 1 if both country *i* and *j* are members of EU, otherwise 0	Author's calculations

Table 1.2 List of countries included in sample

1958 EU-12	1995 EU-15	EEA
1. Belgium (1958)	13. Austria (1995)	16. Norway
2. Germany (1958)	14. Finland (1995)	17. Island
3. France (1958)	15. Sweden (1995)	Liechtenstein
4. Italy (1958)		
5. Luxembourg (1958)		
6. Netherlands (1958)		
7. Denmark (1973)		
8. Ireland (1973)		
9. United Kingdom (1973)		
10. Greece (1981)		
11. Spain (1986)		
12. Portugal (1986)		

Note: Lichtenstein not included in sample due to difficulties in finding correct data for trade. Source: European Union (2016), EFTA (2016)

Appendix 2

Table 2.1 Test for heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
H0: Constant variance
Variables: fitted values of lflow

chi2 (1)	=	258.41
Prob > chi2	=	0.0000

Authors note: Null hypothesis rejected at a 1% level. Heteroskedasticity exists

Table 2.2 Test for heteroskedasticity

White's test for H0: homoskedasticity
Against Ha: unrestricted heteroskedasticity

chi2 (41)	=	456.01
Prob > chi2	=	0.0000

Authors note: Null hypothesis rejected at a 1% level. Heteroskedasticity exists.

Table 2.3 Test for autocorrelation

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation

F(1, 239)	=	25.000
Prob > F	=	0.0000

Authors note: Null hypothesis rejected at a 1% level. Autocorrelation is observed.