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Examining the effects of EU integration on the UK's Trade Flows

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ABSTRACT

This thesis examines the UK's trade flows patterns as a means seeing whether wider integration with the EU and EU membership has affected the UK's trade sectors. This should serve as a means of understanding the implications of Brexit using data covering 50 partner countries from 1978 to 2018. It also analyses other factors that affect trade and their relationship to the UK's trade flows. Adopting a panel regression technique with a focus on correlated random effects model, the study finds a significant positive effect by which a percentage increase in the UK's GDP, wider integration, EU membership and colonial ties raises the UK's overall trade flows by 59 percent, 21 percent, 25 percent and 111 percent, respectively. However, distance as a proxy for cost of trade was statistically significant and reduces the UK's overall trade, export and imports flows by 65 percent, 64 percent and 62 percent, respectively.

This thesis observed that, that the UK benefited from economic integration with the EU, suggesting that Brexit disrupt the UK's trade sector by having more limited access to the EU single market and its adverse effect on existing supply chains (those that were in place at the time of Brexit). Also, large distances reduce the UK's trade flows and cost of trade with the EU is lower since the EU is closer to the UK than non-EU countries. As a result, this finding imply post-Brexit trade deal with the EU should be a top priority to the UK government to avoid decline trade value and trade infrastructures must be improved to reduce the effect of distance on trade flows if the UK's priority is to target a trade deal with the US.

Keywords: UK, EU, Brexit, US, Colonial ties, GDP, Wider Integration, Single Market, Supply Chains, Trade, Export, Import, Panel Regression and Correlated Random Effect.

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CHAPTER ONE

1.1 INTRODUCTION

In 1973, the United Kingdom (UK) became an active member of the European Economic Community (EEC) which later underwent deeper economic integration to become the European Union (EU). Even though the UK avoided full integration in the EU by seeking opt-out clauses to continue using the pound sterling and, remaining outside the Schengen area, it was part of the custom union and was subject to free movement of goods and services within the EU. Thus, the UK was required to implement and enforce EU-wide regulations to facilitate intra-EU trade.

International trade provides a wide range of opportunities (goods and services) to consumers and numerous exports and import options for producers. The Office for National Statistics (ONS 2015) reports that, the UK ran trade deficit but when examined in detail, the UK only had a trade deficit in goods (value of imports exceeds the export value) since 1990, but a surplus in services (value of exports exceed the import value). Nevertheless, the last overall trade surplus the UK experienced was back in 1997. In 2014, the UK's value of exports and imports within the EU was 45 percent and 53 percent respectively (ONS, 2015). Germany is the UK's second export destination and top source of imports by value (ONS, 2018).

The UK has consistently reduced the proportion of its trade within the EU since 1999 and emerging economies have become important bilateral trade partners as result of their strong economic growth. Export to countries outside the EU have increased more than imports, particularly driven by export of financial services. The US and China have special trade relationship with the UK even though geographically the UK is far from these countries in terms of distance. The US is the UK's top export destination and the second most important country in terms of imports (ONS, 2018).

Since 2016, the UK trade has become a topic of interest in the media amidst its decision to leave the EU. Pogkas and Diamond (2020) noted that, Brexit means the UK sought divorce from the EU custom union which enables free trade of goods and services among members of the union. However, the UK can adopt Norway and Switzerland approach by negotiating trade agreements with the EU. Norway and Switzerland negotiate free trade deals through the European Free Trade Association (EFTA) with other EU Member States. The EFTA provides entry for Norwegian companies to the EU single market and promotes trade with partner countries. As a result, one central part of the discussion on Brexit is the UK's divorce from EU has been the implication for the UK's trade flows within and outside Europe. One way to address this conundrum is to examine the UK's bilateral trade flows as a means of seeing whether wider and deeper integration has affected the UK's trade sector.

However, Dhingra et al. (2016) examine the implication of Brexit on the UK's bilateral trade with other countries but their focus was on the content of a trade agreement to build a framework to measure the implication of Brexit. Dhingra et al. (2016) also examined the implication of Brexit through an optimistic and pessimistic scenario. They assumed, in the optimistic scenario, that trade costs between the UK and EU would be small and that the UK's trade relations would be like Norway which has access to the EU single market. The pessimistic scenario assumed trade relations would be decided based on World Trade Organisation (WTO) regulations which implies UK is not successful in negotiating trade agreement with EU and as a result tariffs will determine the cost of trade.

This thesis will focus on examining the changing trade (exports and imports) between the UK and all its bilateral trade partners. The objective is to analyse the UK bilateral trade flow patterns and examine whether deeper and wider integration and EU membership has affected the UK's trade sector as a means of understanding how Brexit and weaker integration might affect its trade. A question that follow is: does EU integration matters to the UK's trade sector? Aside

from integration, what other factors influence the UK's trade flows? The objective of the study will be examined by employing a gravity model of trade using panel model estimation considering both a fixed and random effect model and correlated random effect model. The model will investigate how trade is related to the UK's GDP and the GDP of its bilateral trading partners, the distance between London and the capital city of the UK's trading partner, the period in which the UK is integrated with the EEC and EU, EU membership of the trading partner, population of the UK and bilateral trading partners, the bilateral real exchange rate, common language, contiguity and colonial ties. The study covers the UK's bilateral trade with 50 countries for 41 years (1978-2018) using annual data that includes some years the UK was a member of the EEC, and the years of integration within the customs union, common market and the formation of the economic union and expansion toward Central and Eastern Europe.

1.2 ORGANIZATION OF THE STUDY

This thesis is organized as follows. In chapter two, a background into the UK's bilateral trade flow within and outside the Europe is presented, before and after the creation of the EU. In chapter three the relevant theoretical and empirical literature review is described. The data, gravity model and the econometric method to be implemented in estimating the model is discussed and developed in chapter four. Testing procedures for the model by pooled ordinary least square (POLS) considering fixed and random effects and correlated random effect are also discussed. Chapter five analyses and presents the results obtained from the estimation. Chapter six summarizes, concludes and discusses the implications of the results for the UK's trade flows. The chapter closes with limitations of the study and suggestions for future research.

CHAPTER TWO

OVERVIEW OF THE UK'S TRADE PATTERNS

2.1 THE ECONOMIC PROFILE OF THE UK

The UK is a developed market-oriented economy and is the world's sixth-largest national economy calculated by nominal GDP. The UK is well-known for exporting trade in services cross the world. Table 1 provides selective macroeconomic profile for the UK.

Table 1: Selective Macroeconomic Indicators

Year	1978	1983	1988	1993	1998	2003	2008	2013	2018
GDP (Current US$)	335.9 B	489.6 B	910.1 B	1.1 T	1.7 T	2.1 T	2.9 T	2.8 T	2.9 T
GDP per Capita (Current US$)	5976.9	8691.5	15987.2	18389.0	28214.3	34419.1	47287.0	43444.5	42962.4
GDP Growth rate (%)	4.2	4.2	5.8	2.5	3.3	3.3	-0.3	2	1.4
Unemployment rate (%)	5.5	11.5	8.6	10.4	6.2	5	5.7	7.6	4.1
CPI (%)	7.6	5	3.8	2.5	1.6	1.4	3.6	2.6	2.5
Bank Rate (%)	9	9.9	9.5	5.6	6.9	3.7	4	0.5	0.8
HH Market concentration index				0.07	0.06	0.06	0.05	0.05	0.05
Index of export market penetration				23.34	33.08	35.42	35.99	36.46	33.13
Trade (% of GDP)	54.68	50.53	47.12	49.48	48.96	49.92	56.13	61.18	61.78
Trade Balance	-8.0 B	-8.4 B	-43.6 B	-25.3 B	-41.6 B	-93.9 B	-187.0 B	-120.6 B	-187.1 B
Trade in services (% of GDP)	12.17	10.69	9.6	10.81	12.17	15.84	18.87	20.78	22.89

Source: Own Calculation, Data from ONS (2019), World Bank (2020) and WITS (2020).
NB: B=Billion and T=Trillion

From 1978 to 2018, the service sector which is particularly the financial service industry is very important to the economy and contributes to substantially to the UK's GDP, with services trade accounting to 23 percent of GDP in 2018. Its manufacturing sector particularly the aerospace, pharmaceutical, oil and gas industries play a important role in the manufacturing sector of the economy. The UK's GDP (current US$) has steadily increased since it joined the EEC in 1973. The Centre for European Reform (2016) finds that between 1995 and 2011, the contribution of EU's trade as a percent UK's GDP fell from 9.6 percent to 8.8 percent. However, the UK cyclical trends of trade surpluses and deficit has been replaced by 21 years of a consistent trade deficit since 1998. As of 1978, the UK has recorded trade deficit of $8 billion and this has substantially increased to $187 billion in 2018.

Also, the UK unemployment rate has declined over the years although it experiences high unemployment rate of 11.5 percent and 10.4 percent in 1983 and 1993, respectively. One explanation to the declining pattern of UK's employment is the weakening of trade unions and limited collective bargaining which has enhanced employers' positions to hire and sack workers. Consumer price index (CPI) declined from 9.4 percent in 1973 to 2.5 percent in 2018. The declining inflation is as a result of falling gas and electricity price, government spending cuts, higher taxes and monetary policy target to control money supply. Trade as a percentage of GDP rose from 48 percent in 1998 to 62 percent in 2018. Wider integration with the EU and trade with emerging economies benefited the UK trade sector by contributing to half of the overall GDP. A breakdown of the economic sector reveals that, services is the top important sector to the UK's economy. Trade in Services as a percentage of GDP increased from 11 percent in 1993 to 23 percent 2018. This increase is widely dominated by export in financial services to other countries outside and within Europe and deeper integration is one of the reasons behind the rise. The UK provide various forms of financial services (banking, auditing, consulting, investment etc) to various sectors across the globe.

The Hirschman Herfindahl (HH) market concentration index accounts for trade dispersion value across partner nations where an index close to 1 shows trade portfolio is dispersed across few markets and otherwise. This index has also decline from 0.7 in 1993 to 0.5 in 2018. This explains how wider integration diversified the UK's trade portfolio across several countries. Index of export market penetration which measures the degree of UK's exports reaching the international market. This index has increase from 23.3 points in 1993 to 36.4 points in 2013 and decline to 33.1 points in 2018. This means deeper and wider integration helped the UK export sector to reach several countries market as a result of free trade agreements and financial service agreement.

2.2 THE UK'S TRADE SECTOR

The UK trade sector has experienced substantial changes bilateral trade flows patterns outside and within Europe. According to Ward (2018), since 1998, the UK has registered a balance of trade deficit in its combined trade in goods and services. A question asked is: how does the EU's patterns of trade resemble the UK's? To address this, Table 2 presents the annualized percentage change in total trade (export and imports value) by the UK, EU, world and all the integrated countries with the EU from 1978-2018. This will help illuminate how the UK's trade patterns are different or similar to the EU's and all the integrated countries within the EU. It can be observed from the table that between 1978 and 1993, the UK's annual average percentage change in export and import value was very similar to the all the other 11 integrated European countries. The UK's annual average change in import value was 6 percent higher than the EU and change in export value was 11 percent lower. Germany and France's trade changes were similar to the EU export value. After deepening the EEC to become the EU in 1993, three other countries (Austria, Finland and Sweden) joined the EU leading to wider integration within the union. Between 1993-2000, although the share of export and import value reduced, the UK registered an increase in the annual percentage change in both export and import value of 51 percent and was very similar to the EU but a bit different from member states within the union. This trend continued to the 2000s as a result of competition from emerging countries using the EU technology and innovations to develop fast. As a result, the EU experience an increase in value chain service to the rest of the world for which the UK play a major role particularly by providing financial services to industries within the EU.

After the recovery from the global financial crisis, the European debt crisis unfolded. Between 2010-2016, the UK's annual export percent value reduced by 2 percent, but import increased to 12 percent. This trend is very similar to the EU in general but different from specific member states (Germany, France and Belgium in particular) that recorded positive change in export

value. This increase is as a result of redirection of exports towards growth spots of the world economy, particularly to emerging market economies.

Table 2: Percentage change in Trade (Export and Import)

Countries/Areas	1978-1993		1993-2000		2000-2010		2010-2016		2016-2018	
	Exports (%)	Imports (%)	Exports (%)	Imports (%)	Exports (%)	Imports (%)	Exports (%)	Imports (%)	Exports (%)	Imports (%)
United Kingdom	92	113	51	51	35	53	-2	12	19	6
Belgium	-	-	-	-	81	81	0	-4	16	18
France	101	101	39	48	58	66	-1	-8	15	17
Germany	99	118	43	38	82	74	4	2	15	20
Italy	105	101	37	56	65	75	6	-17	18	22
Luxembourg	-	-	-	-	81	72	-4	-15	10	22
Netherlands	87	85	62	52	85	87	-2	-8	23	28
Denmark	87	61	48	55	71	67	-4	3	18	21
Ireland	150	109	109	88	63	22	10	10	21	24
Greece	70	97	24	48	88	61	2	-20	34	29
Portugal	188	170	49	57	63	60	14	-12	19	25
Spain	142	155	65	76	78	72	12	-5	17	21
Austria	-	-	29	33	95	81	5	0	20	20
Finland	-	-	59	77	48	72	-11	-17	23	23
Sweden	-	-	55	58	55	65	-9	-2	18	18
Cyprus	-	-	-	-	108	68	-16	-45	24	42
Czech Rep.	-	-	-	-	149	135	21	13	20	26
Estonia	-	-	-	-	89	101	26	23	13	19
Hungary	-	-	-	-	113	100	13	11	18	24
Latvia	-	-	-	-	120	114	20	12	30	17
Lithuania	-	-	-	-	157	109	25	32	33	30
Malta	-	-	-	-	100	110	-10	2	-17	33
Poland	-	-	-	-	161	139	29	15	23	28
Slovakia	-	-	-	-	170	166	20	13	22	19
Slovenia	-	-	-	-	103	98	20	16	24	31
Bulgaria	-	-	-	-	135	147	27	20	23	25
Romania	-	-	-	-	145	157	30	23	27	29
Croatia	-	-	-	-	-	-	13	9	22	34
EU	103	107	50	52	80	79	5	-2	18	22
World	124	113	57	58	91	90	4	7	21	19

Source: Own Calculation, Data from IMF (2020a) DOTS Database.

In 2016, the UK took the decision to withdraw from the EU (Brexit). From 2016-2018, the UK managed to increase its export value by 19 percent whereas the import value increased by only 6 percent. During this period, the UK experience faster annual percentage increase in exports than the EU and most of the member states. The interesting part of the period is, the UK was

the only country that experience lesser import percentage change within the union. This means
that the UK begun to prepare itself towards post-Brexit. To understand the trade patterns more
clearly, Table 3 presents the UK's bilateral share of trade value with the EU and some partner
countries. The table gives some insight into how the shares of trade value change in addition to
the percentage changes in trade and provide answers to questions such as, what is the share of
value of the UK export/import with members of EU versus non-EU members and the rest of
the world?

Table 3: UK's annual average bilateral share of trade value with selected countries/regions

Countries/Areas	1978-1993		1993-2000		2000-2010		2010-2016		2016-2018	
	Exports ($)	Imports ($)	Exports ($)	Imports ($)	Exports ($)	Imports ($)	Exports ($)	Imports ($)	Exports ($)	Imports ($)
Germany	**237.4 B**	**342.8 B**	**210.7 B**	**268.2 B**	**400.3 B**	**645.8 B**	**283.9 B**	**526.5 B**	**94.0 B**	**180.0 B**
United States	**253.0 B**	**260.6 B**	**242.5 B**	**266.1 B**	**509.2 B**	**430.0 B**	**361.7 B**	**325.4 B**	**123.9 B**	**126.3 B**
China	8.8 B	11.4 B	10.9 B	36.6 B	58.0 B	327.7 B	118.2 B	342.7 B	48.8 B	122.3 B
Scandinavia	141.5 B	231.0 B	105.4 B	145.1 B	185.0 B	407.2 B	118.1 B	309.9 B	33.3 B	89.7 B
Baltic States	89.9 M	509.0 M	2.3 B	6.4 B	9.2 B	17.2 B	7.8 B	13.6 B	3.0 B	4.5 B
Europe	48.6 B	47.5 B	53.2 B	46.2 B	161.3 B	256.3 B	153.7 B	247.2 B	56.2 B	85.3 B
EU	**1.1 T**	**1.3 T**	**1.0 T**	**1.1 T**	**2.1 T**	**2.6 T**	**1.3 T**	**2.0 T**	**437.1 B**	**685.0 B**
World	524.9 B	558.5 B	423.3 B	538.4 B	767.6 B	1.2 T	684.9 B	808.6 B	208.2 B	226.7 B

Source: Own Calculation, Data from IMF (2020a) DOTS Database.
NB: M=Million, B=Billion and T=Trillion

Across all periods, the EU accounted for largest share of the UK trade value. On a country level,
Germany was the UK's top import origin and the United States was the UK's top export
destination. Thus, the UK manufacturing sector import transport equipment from Germany to
complete its automobile building. Between 1978-1993, the UK export and imports value with
Germany was $237.4 billion and $342.8 billion, respectively. The United States accounted for
$253.0 billion of the UK export and $260.6 billion of the imports. Between 1978 and 1993,
trade relations between the UK and other EU member states deepened. Both the UK export and
import rates was about $1.1 trillion and $1.3 trillion, respectively, during this period. Between
this period, the existence of EU trade barriers contributed to relatively small share of trade

between the UK and non-EU members excluding Norway and Switzerland accounting for about $48.6 billion and $47.5 billion for both export and imports, respectively.

The pattern of UK trade changed after 1993 as more countries leads to wider European integration and consequence of trade creation and diversions. In the late 1990s, there was a cut in the share of both export and import with the EU, but imports were more affected as a result of Europe declining competitiveness to new international trade participants such as China and other Asian countries. Between 1994 and 2000, the UK reduced its share of import value from all the EU member states which led to total import value of $1.1 trillion from the EU as compared to a total of $1.3 trillion in the period 1978-1993. The decline in trade with the EU between these periods was because the UK built strong trade relationship with non-EU members such China and the Baltic states (Estonia, Latvia and Lithuania) as a result of cheap labour and goods from these nations. The UK recorded $36.6 billion of imports from China compared to $11.4 billion back in 1978-1993. The share of imports value from the Baltic states was about $6.4 billion to compared to $509.2 million back 1978-1993. However, the share of export and import value with the United States remained virtually same.

There was significant recovery in imports with the EU between 2001 and 2010, but then the increase in export with the EU was also significant. Imports from other EU members increase at a proportionate level to import with the rest of the world. As a result of the financial crisis and severe euro crisis in many of the member state countries, the share of trade from china and countries outside Europe increase substantially. However, between this period, the United States was the UK largest export destination accounting for about $509.2 billion and $645.8 billion of the UK imports originated from Germany. Import from China recorded was about $327.7 billion.

After recovery from the global financial crisis, between 2011 and 2016, the UK's share of export registered with the EU was $1.3 trillion and $2.0 trillion in imports. However, the UK

continued to maintain same trade pattern with its important partners such as the United State and Germany and strengthen the relationship with China. Within the 6 years period, the UK share of export and imports value registered with China was $118.2 billion and $342.7 billion, respectively. A positive trend in both export and import was registered with the rest of the world. Gradually, the UK's trade ties with non-EU members deepened. This can be explained that, wider integration continuous reduce the UK's share of trade within the EU because the accession of eastern European countries in the EU provided cheaper goods and services inside the EU.

In 2016 when the UK made the decision to withdraw from the EU, the share of both export and imports value registered with the EU between 2017 and 2018 was $437.1 billion and $685.0 billion, respectively. The import value with China was on the level with the United States (ONS, 2018). The United States is by some means the largest export market if focus is confined to individual countries instead of grouping countries within the EU. In addition, between 2016-2018, the UK maintained strong trade relationship with Germany. According to ONS (2018), Germany was the second largest export destination and ten of the UK's top 25 export destination were in the EU in 2018. Thus, by considering value chains UK firms provide financial services to German automobile firms that sell cars across the world. However, from the table, trade with the rest of the world was disproportionately small when compared trade value from Germany.

ONS (2018) states that even though the UK's share of exports in global trade has progressively decreased from about 11 percent in 1948 to around 3 percent in 2018, Europe has remained the UK's top export destination and import origin for both goods and services. To understand the content and what constitutes the UK-EU trade patterns, Table 4 present the UK share of trade value in goods and services with the EU, 1999-2018.

From Table 4, the UK has registered balance of trade deficit in goods with the EU since 1999. Between 1999 and 2005, the UK share of export in goods jumped only from £101.0 billion to £121.7 billion and £110.7 billion to £160.1 billion increase in imports of goods from the EU. There has been progressively increase in the UK imports from the EU between this period, representing an increase in balance of trade in goods deficit from -£9.4 billion to -£38.3 billion. On the side of trade in service, the UK was importing more services than it exports to the EU between 1999 and 2005. The UK has recorded a balance of trade in services with EU from 1999-2004 and surplus in 2005.

Table 4: The UK share of trade value in goods and services with the EU, 1999-2018

	Trade in Goods			Trade in Services		
Date	Exports (£)	Imports (£)	Overall Balance (£)	Exports (£)	Imports (£)	Overall Balance (£)
1999	101.0 B	110.7 B	-9.7 B	32.9 B	36.4 B	-3.4 B
2000	111.0 B	118.6 B	-7.6 B	35.9 B	38.6 B	-2.8 B
2001	113.7 B	129.1 B	-15.3 B	39.5 B	42.0 B	-2.5 B
2002	114.6 B	139.6 B	-25.0 B	40.6 B	45.0 B	-4.4 B
2003	111.0 B	140.6 B	-29.6 B	45.5 B	48.6 B	-3.1 B
2004	111.8 B	145.3 B	-33.6 B	48.9 B	51.1 B	-2.2 B
2005	121.7 B	160.1 B	-38.3 B	56.9 B	54.8 B	2.0 B
2006	153.0 B	186.0 B	-33.0 B	62.6 B	57.7 B	4.9 B
2007	128.1 B	171.2 B	-43.1 B	68.4 B	58.2 B	10.2 B
2008	141.6 B	182.4 B	-40.8 B	72.0 B	61.8 B	10.2 B
2009	125.1 B	165.5 B	-40.4 B	71.9 B	60.3 B	11.6 B
2010	143.3 B	187.6 B	-44.3 B	74.4 B	60.1 B	14.3 B
2011	160.9 B	204.0 B	-43.2 B	82.4 B	61.6 B	20.8 B
2012	151.0 B	208.1 B	-57.1 B	82.8 B	63.7 B	19.1 B
2013	151.0 B	219.3 B	-68.2 B	84.8 B	68.2 B	16.6 B
2014	146.5 B	223.4 B	-76.9 B	91.1 B	69.7 B	21.4 B
2015	133.2 B	220.5 B	-87.3 B	91.3 B	73.4 B	17.9 B
2016	142.4 B	237.9 B	-95.6 B	105.6 B	80.2 B	25.4 B
2017	163.9 B	258.8 B	-95.0 B	117.0 B	86.6 B	30.5 B
2018	170.7 B	265.0 B	-94.3 B	120.3 B	92.4 B	27.9 B

Source: Own Calculation, Data from ONS (2020) Database.
NB: B=Billion

Between 2006 and 2016, the UK has continuously recorded balance of trade surplus in services with EU. There has been continuous increase in services surplus and deficit in goods with the EU. The UK goods exported, imported and balance with the EU in 2006 was £153.0 billion,

£186.0 billion and - £33.0 billion, respectively. In 2016, the UK goods exported, imported and balance registered were £142.4 billion, £237.9 billion and - £95.6 billion, respectively. Contrary, the UK recorded a positive increase in service transaction with the EU during the period. Export in services changed from, £62.6 billion in 2006 to £105.6 billion in 2016. The trade balance in services changed from £4.9 billion to £25.4 billion in 2016.

After the UK notified the EU of its intention to leave in 2016, the UK recorded the highest export and imports of goods and service trade value and maintained a consistent trade deficit in goods and progressive increase in service between 2017 and 2018. According to ONS (2018), the UK's trade deficit in 2018 estimated around -£37.7 billion, equivalent to -1.8 percent of GDP, reflecting an increase in trade deficit from -£25.1 billion in 2017, equivalent to -1.2 percent of its GDP. The trade deficit with the EU represent about -3.1 percent of UK's GDP, down from -3.7 percent high back in 2015.

The EU is the UK's largest single market for exports particularly road vehicles, petroleum and financial services in 2018 and United States accounted for single largest export destination country for road vehicles and financial services. On the hand, taken as a bloc, the EU is the UK largest source of imports particularly road vehicles and financial services and Germany, United States represent the single largest source of imports for road vehicle and financial services respectively.

It is also important to remember the UK relationship with the commonwealth countries. The commonwealth consists of 52-member state countries and most are outside the EU except Cyprus and Malta who are members of the EU. In 2018, the UK trade in exports to the Commonwealth is estimated around £60 billion accounting 9 percent of UK's total exports while imports estimated around £55 billion accounting 8 percent of UK's total imports (ONS, 2018). This represent a balance of trade surplus of £4 billion, although a deficit £3 billion was recorded in goods and the value was offset by £7 billion balance of trade surplus in service.

Overall, since 2010, the UK has registered a balance of trade surplus with the Commonwealth annually.

The trade patterns as presented in Table 1-3 clearly shows that, the UK is closely integrated with the EU and many British businesses depends heavily on imports from the EU. The highly dynamic European common market integrates the EU-UK supply chain by allowing free and easy flow of goods for cross-border exchange of both raw and/or finished goods. However, one major concern to businesses in the UK is the uncertainty Brexit will inject to UK-EU supply chains productivity and cost-efficiency. To understand the supply chain, Figure 1 present UK-EU trade in goods and services, 2018.

Figure 1: UK's major economic sectors percentage of Trade, 2018.

Commodity groups	% of total UK trade, 2018	% of which is trade with EU-27	EU MFN[1] average applied duties, %
Transport equipment	17	78	4.7
Chemicals	15	77	4.6
Non-electrical machinery	14	59	1.8
Minerals and metals	14	52	2.0
Agricultural products[2]	9	77	0.0–35.9
Other manufacturers	7	57	2.3
Electrical machinery	7	51	2.5
Clothing and textiles	6	49	11.5
Petroleum	5	50	2.5
Wood, paper, etc	4	61	0.9
Leather, footwear, etc	2	65	4.1
Fish and fish products	1	51	11.6

Source: Mckinsey and Company (2019)

From the figure, consumer-goods and food manufacturing companies are closely integrated with the EU in 2018 because large portion of the total trade receipt is transaction between the

UK-EU. As a result, manufacturing companies are concerned about Brexit because should the UK is unsuccessful with free trade agreement with the EU, existing supply chains of these companies will be hit by tariff which will make them uncompetitive. Also, Brexit will lead to border frictions on supply chain in terms of delays at ports and warehousing which is a major problem to food manufacturing companies with short shelf-life (Mckinsey and Company, 2019). The British food industry is face with uncertainty about the future food safety and labelling regulations because if bitter post-Brexit happen and the UK decides not to comply with the EU allergenic ingredients information required on packaging, companies will incur substantial cost to highlight the changes to information requirements (Longman, 2016).

In 2018, chemical industry recorded the second largest trade in the UK with the EU accounting 77 percent of the total. The chemical industry importance cannot be underestimated to the UK's economy. Manufacturers rely on chemicals for manufacturing processes and other operational reasons. With globalization and foreign trade in recent years becoming main factors for the chemical distribution industry, Brexit – opposing trade openness, labour movements and in a way a rejection of globalization. Regarding the UK chemicals supply chain, Brexit means there will be review on existing rules and regulations of conducting business in terms of information exchange and intelligence input, competition law and market fragmentation which makes it difficult to forecast and plan for future operations (Lampadarios, 2017).

The transportation supply chain was the top largest trade sectors to the UK's economy in 2018 contributing to about 17 percent of total trade of which 78 percent was trade receipt with the EU. Considering automobile industry, the UK import transport equipment from Germany for its automobile manufacturing. Brexit means these imports will be subject to tariffs by British officials which will increase the manufacturing cost, increase automobile prices and UK's automobiles industry becomes uncompetitive in the international market. As a result of Brexit, some major companies have threatened to leave the UK and the companies contemplating to

relocate includes Airbus which employ about 14,000 employees and over 100,000 jobs are connected to them (Mueller, 2020).

The question is; how Brexit would affect the UK's relationship with non-EU countries. The UK benefits from trade agreements negotiated at the EU level with third party countries. A typical example is Norway and Switzerland various trade agreements with the EU which allow EU member states to access these third-party countries markets without trade friction. Brexit means, the UK will negotiate independent bilateral trade agreement with Norway for example and all other third-party countries with existing trade agreements with the EU. Pro-Brexiters envisaged that Brexit will enable the UK to establish its own trade agreement which will benefit and freed small companies which had never traded in the EU-UK supply chain from regulatory fee and burden associated with EU membership (The Week, 2020).

American Shipper (2019) explained that Brexit will affects trade flows and supply chain in threefold and identified complicated issues regarding rules of origin requirements the UK should address when negotiating post-Brexit trade agreements. The first is UK's exports destined for EU markets and non-EU countries that have trade agreement with the EU. The second is the UK's mechanised imports origin from the EU market and countries that have trade agreement with the EU. The third are goods origin outside the EU that currently transit the UK and destined to EU countries and vice versa. Institute for Fiscal Studies (2018) asserted that, during post-Brexit negotiations, the UK should focus on rules of origin requirement for goods which firms must comply in order to minimize overlapping trade agreement EU has with third party counties. They used the EU-Korea rules of origin requirements to explain that a good exported from EU is considered originated if less than 45 percent of the recipes used to produce the goods is imported oustide the EU or Korea.

Considering these indirect multiplier effects of trade on Brexit is very important to address because the UK trade sector is closely integrated with the EU and has specialize in producing

intermediate goods and services. Hard post-Brexit relationship with the EU will put international and local supply chains under deep uncertainty. British companies across all sectors must undertake a strategic assessment of Brexit impacts, not just the short-term trade disruptions but also long-term possibility of managing supply chains while post-Brexit trade negotiations escalate.

2.3 THE UK'S POST-BREXIT OPTIONS

Post-Brexit negotiations were set to continue in the transition period after the UK's official withdrawal from the EU on January 31, 2020. As a result of COVID-19, negotiations are stalled, and a framework of future trade relationship is deemed to be outlined soon. A basic translation of Brexit means, the UK is set to leave the EU single market and custom union but there is no clear detail on what kind of future relationship the UK would like to have with the EU. However, the UK have few post-Brexit trade options on the table to negotiate with the EU. The Institute for Government Analysis (2017) highlight four main options available to the:

i. Norway Option: This option means the UK will have access to the EU single market and leave the custom union but the UK would be subject to conform with free movement of goods and services, must accept current and future EU regulations without influence. However, the UK will have independent power to establish its own trade policy and could also negotiate as a bloc with countries in the EFTA.

ii. Turkey Option: The UK leaves the EU single market and custom union but agree free trade for goods and establish new custom union with the EU. This option will reduce border friction and custom compliance, but goods imported from third party countries will attract common external tariff. The common tariff would restrict the UK from striking new trade deals with non-EU countries because the UK would have to comply with EU product regulations.

iii. New bilateral free trade and customs agreement: This model is basically noted as the Swiss option, Ukraine option and the Canadian option. The Swiss model would grant the UK free

trade with the EU but their access to the EU service single market is limited. The UK would have to comply free movement of labour and the EU single market regulations without influence on those rules. However, the UK would pursues independent trade policy and could negotiate trade agreements together with countries in the EFTA. Adopting the Ukraine model would enable the UK nearly have full access to the EU single market for free movement of goods and services, particularly financial services but would have to abide to EU regulations without influence on those rules. However, the Ukraine model do not allow for free movement of people. Also, the Canadian model is a comprehensive economic and trade agreement that would allow the UK to have free trade in EU single market for specific goods but limited access to the EU's service single market. The Canadian model means, there will be no free movement of labour and the UK do not have to comply to the EU's regulation which would inject complexities to rules of origin requirements, border checks and custom compliance. However, the UK will be independent to establish its own trade policy.

iv. World Trade Organization (WTO) option: This model tends to be the last resort option for the UK, only if they are unsuccessful with post-Brexit trade deal with EU. This option means, trade between the UK and EU will be subject to tariff based on WTO terms. Trade frictions created by tariff, quotas and border checks means there will be little access to the EU single market and custom union. Given that tariff is a tax implemented on trade, this option will disrupt British companies supply chain to the EU single market. Consequently, the UK and EU would create a border between Northern Ireland and Republic of Ireland to prevent goods from moving to the UK or EU without custom checks. Another consequence relating to WTO option is, if tariff reduce UK's competitiveness and trade is reduced substantially, Scotland is likely to hold another referendum to leave the UK and become independent in order to join the EU. Therefore, analysis of this consequence of WTO options comes with a big price the UK must pay.

All the options above carry some merits and consequences, so the UK should analyse all models

carefully and strike the best trade deal with the EU.

CHAPTER THREE
LITERATURE REVIEW

3.1 THEORETICAL REVIEW

For every discussion of trade, a strong consideration of theoretical argument regarding international trade cannot be overlooked. To understand the rigorous theoretical aspects of trade, a study of the international trade theories is reviewed.

3.1.1 THEORIES OF ECONOMIC INTEGRATION

Balassa's (1961) defined economic integration as taking every effort to remove discrimination within areas. There are four stages of economic integration ranging from a free trade area (FTA), a customs union (CU), common market (CM), and finally an economic union which is the most advanced stage of integration. An FTA is a deal between two or more countries aimed at removing trade barriers such as tariffs and quotas to enhance import and export across international borders under a framework of duty-free trade across a substantial part of trade while at the same time member countries retain autonomous right to negotiate trade agreements with non-members. In other words, individual countries of the FTA can maintain tariffs and quotas on countries outside the area. Considering the EU, it has FTAs and other components of trade agreements with many countries outside the EU and Europe and is continuously negotiating with many other countries. The EU negotiates free trade deals on behalf of all its member states countries, as the member countries have given the EU a 'special right' to conclude trade agreements. One potential concern of the EU's FTA in relation to Brexit is the Irish Border. UK businesses can profit by exporting their products to Ireland (FTA member) then through it to the single market. If the EU does not set rules regarding country source of products, then the border can be used as transhipment strategy by UK's businesses to escape trade barriers imposed on the UK by the EU.

A CU is the second level of economic integration in which a specific external tariff applies to goods imported from countries outside the union. The integration goes deeper in that a member's tariffs are harmonized with the rest of the union. Moreover, a common customs authority must be created to ensure compliance with all customs procedures and practices. Viner (1950) finds that sizable countries with similar industry protection can gain substantial economic benefit than harm from custom unions. However, the common external tariff barrier varies across goods but not across partners in the Union. The common external tariff also precludes transhipment strategy from non-member. The European Community (EC) is the most famous example of a CU. Since the creation of the EEC in 1958, there has been a major feature of the EU. Europe's CU started with six countries in 1968, the Be-Ne-Lux countries, France, Germany and Italy, and five years later (1973) the UK joined the EEC and automatically became a member of the CU by giving up it independence in setting tariff rates. The UK continues to act as a member of the customs union throughout the Brexit transition period. As of February 2020, the relationship between the UK-EU continues to be resolved until the conclusion of the transition phase.

A CM is the third level of economic integration that goes beyond custom union in that it enables free movement of labour and capital among member countries. This is often regarded as "factor integration". Potential concern of the CM is that member nations give up authority in immigration and central bank sovereignty to control capital flows. The EU was transformed into common market in early 1993 and gained the repute as the top advanced form of economic integration. The European CM is a single market that aims to ensure the free movement of labour, capital, goods and services which is noted as the "Four Freedom" within the EU. The market entails the 27 countries of the EU and, with exceptions granted to Iceland, Liechtenstein and Norway through the European Economic Area Agreement, to Switzerland through bilateral

treaties and to the UK through the length of its transitional phase as stated in the Brexit withdrawal agreement.

The final stage of economic integration is economic union, which is the most comprehensive of the four stages of integration. It includes features of a CM but also harmonized institutions to have coordinated economic policy across member nations. Even though individual countries are still independent to retain internal policies such as wage settings, a supranational institution exist formulate policies which are binding upon all members. The union can form monetary union to support all the other members to integrate economically by adopting common currency. A potential concern of economic union is members give up more national sovereignty and autonomy in monetary and fiscal policy.

The UK as a member of the EU had full freedom to move goods around the EU. This help saves time and money on goods traded among the EU member states. Brexit could interfere with trade, leave the country with high cost of importing vital goods (transport equipment from Germany) and potentially disruption supply chains. Nevertheless, if the UK can benefit from negotiating new trade agreements with countries outside the EU. This could also open new lines of business, providing more employment prospects. While the UK continues to negotiate post-Brexit trade agreements, the EU will only allow the UK to enter the European CU if it agrees to grant EU nationals the freedom to stay and work in the UK.

3.2 TRADE CREATION AND DIVERSION

This section provides an overview of trade creation and trade diversion that is associated with economic integration. By aligning trade policy and business standards and technical regulations, economic integration might result in more trade within a regional block than with countries outside of the block. To illustrate this the consequences of trade liberalization on a specific industry, a framework of partial equilibrium is considered. Suppose, for simplicity, three countries exist in the world: Countries A, B, and C. In the representative industry, each

nation has supply and demand for a homogeneous commodity. Country A is a net importer and Countries B and C are net exporters competing for access to Country A's market. Countries A and B form a union but the emphasis of the analysis is on Country A. Countries B and C are assumed to be large countries, but Country A is considered to be a small country in international markets, meaning it accepts international prices as given. This simplifies the analysis while not affecting the general lesson of the thought exercise.

Country A initially applies a tariff of the same rate on the goods imported from both Countries B and C. The discussion starts with an initial equilibrium under the tariff regime. The change in equilibrium is associated with Countries A and B forming a CU, where imports from Country B enter duty-free into Country A and imports from Country C are still subjected to the previous tariff rate. Welfare analysis measures the change in the price resulting from the formation of the CU.

3.2.1 TRADE CREATION

Trade creation usually means that a free trade region develops new trade that would not otherwise have existed. For this reason, commodity supply is provided by the more-efficient producer. Generally, trade creation would in most cases increase the national welfare of a country. Suppose country A import goods from country B and at the same time produces the good domestically prior to the creation of CU between country A and B. Figure 2 shows that country A is a price taker at $1.00 per unit from country B. If a 50 percent tariff is imposed on the good, then the domestic price in country A is $1.50, consumption is 200 units and domestic supply is 160 units. Hence, the import quantity from country B by country A is 40 units. With the formation of the CU and the removal of tariff, country A imports 150 units (250 units - 100 units) at price $1.00. As a result, 60 units (160 units - 100 units) of the increase imports have been switched from domestic production more efficient producer in country B.

Figure 2: Trade Creation
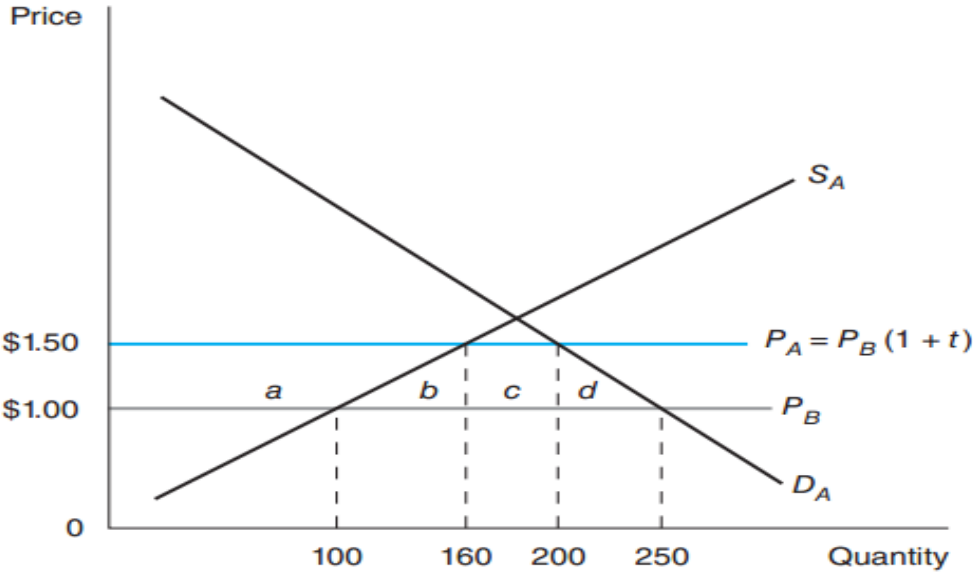
Source: Appleyard & Field (2014)

By examining area (a+b+c+d) where area (a) represent producer excess transfer from country A, area (c) represent initial tariff revenue obtained by country A's consumers. However, area (b+d) represent the increase in welfare associated with increased imports from the removal of tariffs.

Trade creation can be related to the manner by which tariff barriers within the EU are removed and contrary treatment is set against third party countries which makes trade with non-EU countries difficult. Carbaugh (2009) explained that, the abolition of tariff and quotas within the EU made manufactured goods cheaper for the UK which led to substantial increase in imports from the EU. This means that, if the UK is unsuccessful with trade agreement with the EU by leaving the custom union and having no free access to the EU single market and custom union, Brexit could affect it imports for manufactured goods, particularly automobile parts from Germany. Also, third party countries that have trade agreement with the EU would be tempted to reduce trade with the UK and direct trade to other EU countries to avoid overlapping the EU rules of origin requirements.

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3.2.2 TRADE DIVERSION

Trade diversion usually means that a preferential trade diverts production away from a more efficient supplier outside the CU and into a less efficient supplier within the CU. In some cases, trade diversion would reduce the national welfare of a country but in other cases, given the trade diversion, national welfare can improve.

From Figure 3, where countries and B will form a union, but country C remains outside the union. The price of good in country C, B and A cost $1.00, $1.20 and $1.50 respectively, but country A has an existing 50 percent tariff. Based on this scenario, country A will import 50 units (180 units - 130 units) goods from country C because the price plus tariff is cheaper as compared to country B. Under the CU where the tariff is removed for country B but maintained for country C, country A imports 100 units (200 units - 100 units) of goods at $1.20 from country B rather than importing from country C with tariff-inclusive price of $1.50 ($1.00+0.5($1.00)). The CU makes country C uncompetitive in country A's market, resulting in trade diversion.

Figure 3: Trade Diversion
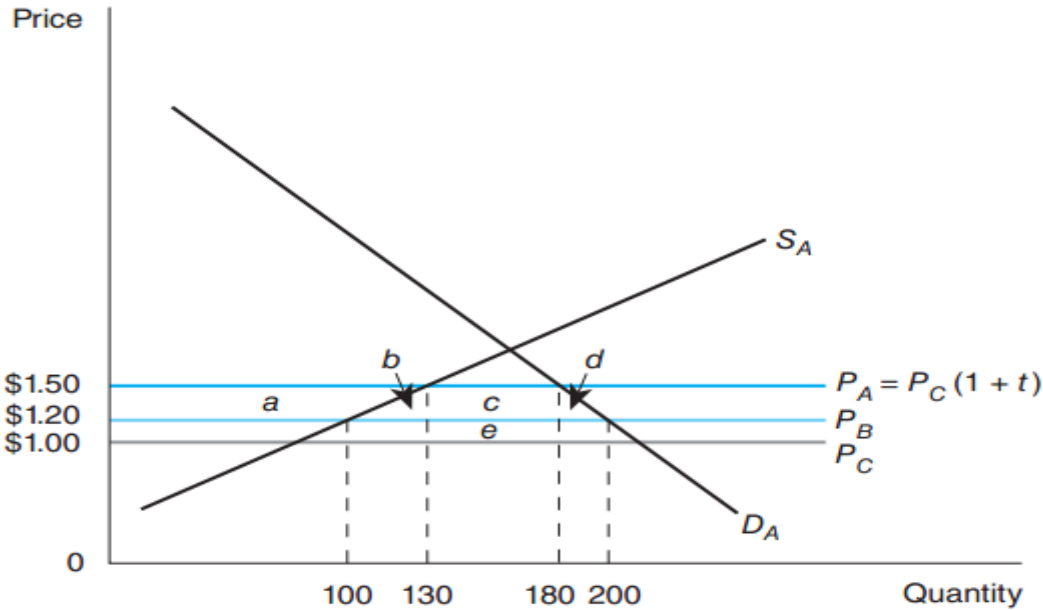
Source: Appleyard & Field (2014)

Consequently, the net welfare of economic integration generated from CU between country A and B depends on the sum (b+d-e). Area (b+d) capture positive effect as a result of lower price transferred to consumers in country A and area (e) capture government revenue loss as a result of CU. Based on Figure3, country A's welfare will reduce because area b+d amount to a gain of $7.50 but area (e) amounts to a larger loss of $10.00.

Carbaugh (2009) finds that upon the UK's entry to the EEC in 1973, it turned away cheaper agricultural goods from former colony and purchased from EU countries at more expensive price. Thus, the tariff and quotas set against non-EU members made goods produced outside the EU expensive, thereby ending the UK's former colonies access to Britain market.

3.3 EMPIRICAL REVIEW

The effect of economic integration and trade agreements on trade flows, is not empirically straightforward when compared to the theoretical arguments surrounding trade flows among countries. Traditional trade theory focuses on international exchange of commodities based on comparative advantage. The theory of comparative advantages argues that, countries with GDP below developed countries must focus on trading goods that are relatively cheap to transport (Krugman and Obstfeld, 2011). Traditional international trade models generally disregard the cost of transport. The gravity model has an empirical advantage over traditional international trade models because it includes transaction cost of good. The objective of the gravity model is to demonstrate prospective bilateral trade ties in the absence of trade barriers other than transportation costs. The gravity model allows for isolation of trade barriers and incorporation of factors such as language, colonial ties, contiguity, distance and real exchange rate effects on trade flows between countries.

Economic integration and exchange rate dynamics are two important determining factors of bilateral trade flows between countries. Economic integration in the form of trade agreements that enhance bilateral trade flows because it removes trade barriers and tariffs. It is assumed

that exchange rate stability minimizes currency volatility between trading countries as a means of increase trade flows. Frankel and Wei (1993) examine the EEC and European Exchange Rate Mechanism (ERM) using dummy variables to assess the impact of trade unions and exchange rate stability on bilateral trade flows from 1980 to 1990. The study results show trade union increase trade flows while exchange rate stability had a small effect on trade flows. The results further explain that, when economic size and distance variables are excluded from the gravity model, an extra 68 percent occurred between two EEC countries and there was 11 percent less among non-EEC countries in 1990. In terms of the exchange rate, the ERM's stabilization increased bilateral trade flows but the variable was not statistically significant compared to the impact of trade union. The lack of statistical significance of ERM's stabilization on trade flows is explained as a result of 20 century exchange rate dynamics that generally focus on gold standard and the Bretton Woods System.

Eichengreen and Irwin (1996) argue that there is substantial increase in intra-regional trade before the emergence of trading blocs and as a result using dummy variable to account for trading blocs is misleading. This argument suggests Frankel and Wei (1993) mistakenly overestimated the impact of trade blocs on bilateral trade. To account for the mistake, Eichengreen and Irwin (1996) introduced a lagged trade variable from 1949 to 1964, they find that without lagged trade variables the gravity model overestimates the effects and proved that historical factors are important determinants of bilateral trade flows between two countries.

Stay and Kulharni (2015) examine the UK's 177 trading partners using annualized data in a gravity model to measure the impact of GDP, colonial ties and distance on bilateral trade flows in 2004. They observe that a simple form of gravity model is accurate in predicting trade flows between the UK and her bilateral partners. The results show a strong correlation of GDP to trade flows where the higher a bilateral partners' GDP, the higher the trade with the UK. The study also finds a relatively weak inverse relationship between trade flows and distance when

compared to relationship between GDP and trade flows. By using 55 colonial countries and 122 non-colonial countries, they find that trade with former colonies was higher than average flows with non-colonies.

The Centre for European Reform (2016) employed gravity model by applying fixed effect technique to measure the EU's role in trade creation and diversion between the UK, the EU and the top 30 non-EU trading partners using annualized data from 1992 to 2010. By incorporating and controlling the effects variables such as GDP, real exchange rates, population, distance into the model, the study finds that the UK's trade with EU countries is 55 percent higher than expected. The results also show that, the UK's membership of the EU increased trade with the 30 non-EU countries but the value was not statistically significant.

Osnago et al. (2017) used a gravity model by applying Poisson pseudo maximum-likelihood (PPML) estimation technique to investigate the effect variables such as EU membership and preferential trade agreements (PTAs) on the UK's trade sector. They use annualized data from 1995 to 2011 of the UK and 27 other EU member countries. They observed that, deep trade integration raises goods and services trade by 42 percent, and averagely, value-added trade increased by 14 percent. EU membership has doubled the UK's services trade and has raised the global value chain trade by 30 percent. Based on these findings, they evaluated post Brexit-EU trade under several scenarios. Their findings show that, under all scenarios, the UK-EU trade will decline between 6 and 28 percent in terms of trade in value added. They concluded that the reduction would be sharper for trade in services and global value chain trade.

HM Treasury (2016) adopted a gravity model to examine the long-term impact of Brexit on the UK trade flows. By creating dummies to capture variables such as EU membership, EU trade diversion, FTA membership, EEA membership, GDP and population were included in the model and the model was estimated by using 200 countries annualized data from 1948 to 2013, they apply a fixed effect technique to estimate the model. They assume a hard Brexit scenario

where WTO trade rules becomes post-Brexit relationship with the EU and find that trade would be reduced by approximately 20 percent. Under a soft Brexit scenario where FTA exist between the UK and EU, trade would be reduced smaller by 17 percent.

The significance of distance and border frontiers as determinants of bilateral trade flows can be described by the reflection of various trade barriers. Distance and border effects do not only influence geographical barriers between bilateral trade partners, but also for different costs that suppliers account for when moving goods to their final consumption destination. Anderson and Wincoop (2004) translated trade costs into a tax equivalent. That tax amounts to around 170 percent among rich countries, 74 percent at the international level and 55 percent is as a result of local distribution cost. They calculated total trade cost by summing all cost (transportation, tariffs, trade barriers, currency cost etc.) accounted from the producer to final consumer. The study finds that out of 170 percent tax on trade, transportation account for 21 percent. Moreover, Blum and Goldfarb (2004) shows that, distance may also reduce consumers taste and preferences even when the cost of trade is zero. However, the distance effect magnitude varies from country to country and the specific period or year under consideration. In addition, as result of economic integration, increasing globalization and improve in transport through technology, one may expect the magnitude of distance effect to decline over time, but empirical studies has not been able to provide conclusive measurement of distance effect with respect to trade.

Among all the previous empirical studies reviewed, this thesis would be similar HM Treasury (2016) study to some extent. The difference between their study and this thesis is; HM Treasury (2016) examined the UK's past trade flows based on soft and hard Brexit scenario to shed light about the implications of post-Brexit trade deal options on the UK's trade sector. Whereas, this thesis will only examine the UK's trade bilateral flows as a means of understanding the implications of Brexit but would not empirically examine the effects of post-Brexit trade deal

options on the UK's trade flows. In next chapter, the study will discuss the methodology that would be adopted to examine the UK's trade flows.

CHAPTER FOUR
DATA AND METHODOLOGY

4.1 DATA

The study dataset contains information on bilateral trade between the UK and 50 trading partner countries over forty years, 1978–2018. The data is gathered from several sources and contains nominal bilateral trade flows (exports and imports), UK's GDP and population, and bilateral partner countries' GDP and population, distance between UK and partner country, a dummy variable for the years in which the UK has been integrated within the EEC or EU, a dummy variable for years in which bilateral partner countries is a member of the EU or not, bilateral real exchange rate, common language, contiguity, and colony.

The UK's bilateral trade, export and import values with partner countries are the dependent variables. The data obtained are nominal bilateral export and import values from the (IMF, 2020a) direction of trade statistics (DOTS) for the UK and 50 countries during the period 1978–2018. The bilateral export value, based on free on board (FOB) data and the bilateral import value, based on cost, insurance, and freight (CIF) are reported in US dollars. To generate real trade flows for data analysis, the data are deflated by the consumer price index (CPI). The data on the real exchange rate are sourced from the IMF (2020b) international financial statistics database. The data are already in real value based on CPI and measured in US dollars. The UK's currency is divided by bilateral partner countries currency to obtain the bilateral real exchange rate. GDP and population data are sourced from the World Bank (2020) database for the UK and 50 for the sample period, 1978-2018. The GDP data obtained are in nominal value and measured in current U.S. dollars. To generate real GDP, the data are deflated by the CPI. Bilateral distance is included as a means of measuring transportation cost between the UK and each bilateral trade partner countries. Distance is calculated in kilometres between London, the largest city of the UK, and the capital city of the trading partner. Data on distance are sourced from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII, 2015) in the

GeoDist database. Furthermore, dummy data on bilateral partner countries EU membership, common language, contiguity and colonial ties are sourced from the GeoDist database. However, the dummy variable for the years in which the UK has been integrated within the EEC or EU was developed by the author.

Analysis of the data will start with descriptive and econometry analysis. The descriptive analysis provides summary statistics of the entire study period and years in which the UK was integrated with the EEC and year the UK was integrated with the EU. Econometric analysis are used to examine the UK trade flow patterns as means of examining whether wider and deeper integration with the EU affects the UK's trade sector. The dependent variables in this study are bilateral trade, export and imports value between the UK and bilateral partner countries. The explanatory variables are the UK's GDP and population, bilateral partner countries GDP and population, bilateral distance, integration period, bilateral partner countries EU membership, real exchange rate, common language, contiguity and colony.

The study employs a panel regression model to examine the effects of EU integration on the UK's trade sector. As such, the study presents three different results highlighting the factors that influence the UK's overall trade, export and import value. All data are estimated using STATA version 15.

4.2 THEORETICAL FRAMEWORK OF THE GRAVITY MODEL

The gravity model as the name implies, is a model of international bilateral trade based on Newtonian physics theory by which multiplicative effects of economic size and distance are examined. After the introduction of the model by Tinbergen (1962), it has been a workhorse for examining factors that affect bilateral trade flows. Tinbergen (1962) stipulates that trade between two countries is proportional to the size (GDP) of the countries and inversely proportional to their distance. If the UK were unsuccessful negotiating a trade agreement with the EU, the UK could replace the lost trade from the EU with trade worth commonwealth

nations and emerging markets countries. However, the *Economist* (2016) argued that, the UK should revisit the basic theory of trade and referred to the gravity model intuition. The *Economist* (2016) explained the EU is close, the rest of the world is far and advised the UK to be mindful of distance because it export more to the EU than to the US. The gravity model is employed to analyse bilateral trade trends as a means of investigating regional trading blocs, trade creation and trade diversion cost resulting from economic integration (Frankel and Romer, 1999) and Hamilton and Winters, 1992).

The theoretical basis of the gravity model was subject to extension before 2000. Anderson and Van Wincoop (2004) extended the standard equation of gravity based on the first assumption that countries with large economic size trade more since they produce and demand more. The second assumption was that, trade cost increase with distance. Based on these two assumptions, they find that bilateral trade cost between two regions is influenced by each region's trade cost with the rest of its bilateral trade partners and analyse border effects using non-linear least square estimation (NLS). Through this, they introduced the ideas of multilateral trade resistance (MRT), which is the trade friction and frontiers between bilateral trade partners (Kepaptsoglou et al., 2010). A standard econometric gravity model for international trade is as follows:

$$\text{X}_{ijt} = \beta_0 Y_{it}^{\beta_1} Y_{jt}^{\beta_2} Dist_{ijt}^{\beta_3} e^{U_{ijt}} \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

where, X_{ijt} is the export value from country (i) to country (j) in year (t), Y_{it} is the GDP of country (i) in year (t), Y_{jt} is the GDP of country (j) in year (t), $Dist_{ijt}$ is the distance between countries, ε_t is the error term, and U_{ijt} are the other factors such as border effects, language, trade agreement etc. that influence trade flows.

Trade may also be influenced by a wide variety of other factors and these can be included in the calculation of gravity model equation. Some studies included bilateral landlocking, common

currency, border or language, and past colonial relations as means of seeing time invariant that influence bilateral trade flow (Feenstra et al., 2001, Lederman and Ozden, 2004).

The objective of this thesis is to examine the impact of EU's integration on UK's bilateral trade flows patterns; therefore, the study employs the gravity model using panel data to examine the UK's trade flows during 1978-2018. Empirical studies such as Wilson et al. (2002) and Brun et al. (2005) employ a gravity model in panel setting to examine trade flows. The panel econometric estimation techniques is simply having say, T number of observations on say country N, hence the total observations becomes T multiplied by N. Equation (2) yield a simple standard stochastic gravity model for international trade, as follows:

$$\ln T_{ijt} = \beta_0 + \ln\beta_1 Y_{it} + \ln\beta_2 Y_{jt} + \ln\beta_3 Pop_{it} + \ln\beta_4 Pop_{jt} + \ln\beta_5 Dist_{ij} + \beta_6 UKint_{i_t} + \beta_7 EUint_{j_t} +$$
$$\beta_8 RER_{ij_t} + \beta_9 Contig_{ij_t} + \beta_{10} Comlang_{ij_t} + \beta_{11} Col_{ij_t} + \alpha_{it} + \alpha_{jt} + \alpha_{ijt} + \varepsilon_{ijt} \dots\dots\dots\dots\dots(2)$$

where the subscript i represents the UK, j represents the UK's 50 trading partners and t refers to time (the years of the study 1978-2018). When the export value is the dependent variable $\ln T_{ijt} = \ln X_{ijt}$ and when considering import as dependent variable $\ln T_{ijt} = \ln M_{ijt}$. The alpha coefficients $\alpha_{it}, \alpha_{jt}, \alpha_{ijt}$ are exporter time varying fixed effects, importer time varying fixed effects, exporter and importer paired time varying fixed effects. The ε_{ijt} term is the error term. The variable Y_{it} and Y_{jt} are the UK and bilateral partner countries real GDP, respectively for a specific year. GDP data are transformed into logarithmic form for simple interpretation coefficient estimates since logarithmic coefficient are elasticities. Thus, the estimated GDP parameter in a logarithm in a gravity model is the elasticity of trade relative to GDP. The model is expected to estimate positive GDP coefficients. The variable Pop_{it} and Pop_{jt} are the UK and bilateral partner countries population, respectively, in a specific year. Population increases bilateral trade flows and specialization as a result of producing gains. Rodrik (1998) finds that large populated countries trade more with each other than smaller ones do as a result of strong

potentials to export more and import more. The model is expected to estimate positive population coefficients.

The variable $Dist_{ijt}$ is bilateral distance between the UK and partner countries. Distance is expected to be inversely related to trade due to transportation cost. Thus, the further the distance the higher the transportation cost. The coefficient estimates of distance is expected to be negative. Also, $UKint_{it}$ is a dummy variable taking the value 0 for years (1978 to 1992) in which the UK was integrated within EEC and the value 1 for the years (1993 to 2018) in which the UK was integrated within EU. The coefficient estimate is expected to be positive. $EUint_{jt}$ is a dummy variable taking the value 0 for years (1978 to 2018) in which bilateral partner countries was a member of the EEC or EU and the value 1 for the years (1978 to 2018) in which bilateral partner countries was a member of the EEC or EU. The coefficient estimate is expected to be positive. The variable RER_{ijt} is bilateral real exchange rate between the UK and partner countries. Real exchange rates depict market competitiveness as a means of reflecting one country's relative prices, costs and efficiency with respect to the rest of the world. Qiao (2007) shows that exchange rate depreciation worsens the trade balance account of the importing country. This means that, if the importing country local currency continues to depreciate relative to exporting country, goods become expensive for the importing country and trade could divert to another where goods are cheaper.

The variable $Contig_{ijt}$ is a dummy that take the value 0 if the UK do not share land or maritime border with bilateral partner countries and value 1 if the UK share land or maritime border with bilateral partner countries. Trade is easily facilitated when countries share a border because goods can be placed on a truck or ship and sent to consumers in both countries. McCallum (1995) find that Canadian provinces trade with each other about 22 times more than trade with the US states given same distance. A positive coefficient sign is expected. $Comlang_{ijt}$ is a dummy that take the value 0 if the UK do not speak same language with bilateral partner

countries and value 1 if the UK speak same language with bilateral partner countries. Common language facilitate trade, especially trade in service. Ku and Zussman (2010) finds that English language has influenced and promoted global international trade. A positive coefficient estimate sign is expected. Col_{ij_t} is a dummy that take the value 0 if the UK do not share colonial ties with bilateral partner countries and value 1 if the UK share colonial ties with bilateral partner countries. Colonial ties increase trade due to existence of common language, culture, legal framework and in some cases a pegged currency. However, if the colonial relationship between the UK and bilateral partner countries ended up hostile, trade is expected to be small. A positive coefficient estimate sign is expected.

Furthermore, a panel model estimation approach will be adopted for this study because it provides the freedom to control biased results generated by heterogeneity effects across countries. The estimation technique starts with pooled ordinary least square (POLS). The estimation is a combination of both cross-section and time series data. Hence, it is certainly subject to presence of multicollinearity, heteroscedasticity and serial correlation problems. One way to mitigate heteroscedasticity is using robust standard errors method that provides regression parameters standard errors which are robust to heteroscedasticity and serial correlation.

Also, it is possible some countries may not be observed and as a result it will reflect in the error term (unobserved heterogeneity). To circumvent this problem, the study employs the fixed effect (FE) transformation approach. This approach transforms the data across individual countries by assuming a correlation between the unobserved variables and the explanatory variables to eliminate the correlation effect or time invariant effects. Also, if the individual heterogeneity term is correlated with the explanatory variables, then the model is estimated using a FE transformation. However, FE model may result in most of the important variables being omitted from the model as result of collinearity. As such, a random effect (RE) model is

introduced if the variables of interest are constant over time and there is no correlation between the unobserved variables and the regressors. In comparison, RE models provides much freedom over FE model because it allows time invariant variables (contiguity, language, colony etc.) to be included in the model (Woodridge, 2016).

However, since the data includes time invariant variables which could correlate with each other, correlated random effect (CRE) is adopted to unify RE and FE by accounting for correlation. Woodridge (2016) explains that CRE estimated coefficients are similar or marginally different to FE coefficients and provide estimated coefficients for variables omitted by FE as result of collinearity. It also provides a formal way of selecting the appropriate model between the FE and RE model.

The decision to select the best model is based on the correlation results between unobserved variables and regressors. Suppose the unobserved variables are correlated with the regressors, then the choice of model is FE. Otherwise is the RE model is adopted. The correlation results use a Hausman Chi-Square test with degrees of freedom equal to the total number of regressors. The Hausman Chi-Square test has a null hypothesis of zero correlation which implies the RE is more desirable. Hence, the rejection of the null hypothesis at the five percent level of significance implies that the FE model is appropriate with consistent estimators. In particular, the usual Hausman test as implemented in STATA 15, assumes homoscedastic errors (no adjustment for clusters). As a result, Wald test is adopted on the CRE model to account for the cluster adjusted covariance estimator including heteroskedasticity (Woodridge, 2016). The Wald test has a null hypothesis that the RE model is appropriate approach which it rejects the null hypothesis at the five percent level significance the FE model concluded to be the more appropriate model.

CHAPTER FIVE

RESULTS AND DISCUSSION

5.1 DESCRIPTIVE ANALYSIS

This section briefly discusses descriptive statistics of the non-categorical variables (trade exports, imports, GDP, population, distance and real exchange rate) included in the model for the 50 countries within and outside the EU over 1978-2018. Trade, exports, imports and GDP are reported in real value terms. The statistics includes means, standard deviation, minimum, maximum and correlation. Table 5 present summary statistics that investigate the characteristic of the variables over the entire study period, the period in which the UK was integrated with the EEC and the integration period with the EU.

Considering the whole study period (1978-2018) from Table 5, the average bilateral trade with all countries was about $169 million whereas in the same period the average bilateral trade with the EU and non-EU nations was $234 million and $131 million, respectively. The maximum bilateral trades are $1.4 billion and $2.4 billion, respectively, for the EU and non-EU nations. Exports amounted to an average of $75.8 million, $104.0 million and 59.5 million for all countries, EU countries and non-EU countries, respectively. Import values amounted to $92.8 million, $130.0 million and $71.6 million for all countries, EU countries and non-EU countries, respectively. The UK's average and maximum GDP is $20.4 billion and $33.5 billion, respectively whereas bilateral countries average and maximum GDP is about $9.9 billion and $432.0 billion, respectively. The average bilateral distance is about 1278 km for EU nations and 5928 km for non-EU nations. The average real exchange rate with EU and non-EU are 1.171 and 1.275

The descriptive analysis for the whole period: the following observations can be made

- The UK import more than it exports to its bilateral trade partners.
- The UK registered more trade with the EU nations than non-EU nation.
- The UK's average GDP is larger than its bilateral trade partners.

Table 5: Summary Statistics of non-categorical variables, 1978-2018

Full Period: 1978-2018	All Bilateral Countries				Only Bilateral EU Countries				Only Bilateral Non-EU Countries			
Variables	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
$Trade_{ijt}$	169.0 M	243.0 M	552.5 H	2.4 B	234.0 M	273.0 M	3.2 M	1.4 B	131.0 M	215.0 M	552.5 H	2.4 B
$Export_{ijt}$	75.8 M	115.0 M	450.9 H	1.4 B	104.0 M	117.0 M	1.6 M	541.0 M	59.5 M	111.0 M	450.9 H	1.4 B
$Import_{ijt}$	92.8 M	137.0 M	101.6 H	1.3 B	130.0 M	161.0 M	1.0 M	917.0 M	71.6 M	115.0 M	101.6 H	1.3 B
GDP_{it}	20.4 B	5.9 B	10.3 B	33.5 B	20.4 B	5.9 B	10.3 B	33.5 B	20.4 B	5.9 B	10.3 B	33.5 B
GDP_{jt}	9.9 B	23.8 B	19.9 M	432.0 B	6.1 B	8.1 B	70.2 M	37.8 B	12.2 B	29.4 B	19.9 M	432.0 B
Pop_{it}	59.6 M	3.1 M	56.2 M	66.5 M	60.9 M	3.2 M	56.2 M	66.5 M	58.9 M	2.9 M	56.2 M	66.5 M
Pop_{jt}	78.3 M	222.0 M	192.0 H	1.4 B	20.2 M	24.1 M	362.0 H	82.9 M	107.0 M	266.0 M	192.0 H	1.4 B
$Distance_{ijt}$	4376	4251	425	18521	1278	671	425	3352	5928	4437	902	18521
RER_{ijt}	1.230	0.298	0.227	2.871	1.171	0.159	0.833	1.708	1.275	0.363	0.227	2.871
Period 1: 1978 – 1992												
$Trade_{ijt}$	150.0 M	171.0 M	2.4 M	877.0 M	282.0 M	184.0 M	48.6 M	877.0 M	109.0 M	145.0 M	2.4 M	830.0 M
$Export_{ijt}$	72.1 M	84.5 M	796.4 H	465.0 M	131.0 M	77.7 M	22.4 M	368.0 M	53.7 M	77.9 M	796.4 H	465.0 M
$Import_{ijt}$	78.3 M	92.2 M	157.3 H	527.0 M	151.0 M	110.0 M	15.9 M	527.0 M	55.6 M	72.3 M	157.3 H	522.0 M
GDP_{it}	14.5 B	2.6 B	10.3 B	17.9 B	14.5 B	2.6 B	10.3 B	17.9 B	14.5 B	2.6 B	10.3 B	17.9 B
GDP_{jt}	8.0 B	16.1 B	19.9 M	101.0 B	6.9 B	7.3 B	79.5 M	28.9 B	8.5 B	18.6 B	19.9 M	101.0 B
Pop_{it}	56.7 M	442.3 H	56.2 M	57.6 M	56.7 M	447.8 H	56.2 M	57.6 M	56.7 M	440.5 H	56.2 M	57.6 M
Pop_{jt}	66.4 M	183.0 M	192.0 H	1.2 B	26.3 M	27.0 M	362'007	80.6 M	76.1 M	202.0 M	192.0 H	1.2 B
$Distance_{ijt}$	4376	4253	425	18521	960	594	425	2482	5202	4344	902	18521
RER_{ijt}	1.247	0.349	0.227	2.871	1.268	0.163	0.984	1.650	1.237	0.406	0.227	2.871
Period 2: 1993 - 2018												
$Trade_{ijt}$	176.0 M	265.0 M	552.5 H	2.4 B	223.0 M	289.0 M	3.2 M	1.4 B	142.0 M	242.0 M	552.5 H	2.4 B
$Export_{ijt}$	77.3 M	125.0 M	450.9 H	1.4 B	98.3 M	123.0 M	1.6 M	541.0 M	62.4 M	124.0 M	450.9 H	1.4 B
$Import_{ijt}$	98.4 M	150.0 M	101.6 H	1.3 B	125.0 M	170.0 M	1.0 M	917.0 M	79.6 M	131.0 M	101.6 H	1.3 B
GDP_{it}	23.8 B	4.5 B	15.1 B	33.5 B	23.8 B	4.5 B	15.1 B	33.5 B	23.8 B	4.5 B	15.1 B	33.5 B
GDP_{jt}	10.6 B	26.2 B	42.1 M	432.0 B	5.8 B	8.3 B	70.2 M	37.8 B	14.1 B	33.3 B	42.1 M	432.0 B
Pop_{it}	61.3 M	2.8 M	57.7 M	66.5 M	62.0 M	2.7 M	57.7 M	66.5 M	60.7 M	2.7 M	57.7 M	66.5 M
Pop_{jt}	85.2 M	241.0 M	371'308	1.4 B	18.5 M	23.0 M	397.5 H	82.9 M	132.0 M	305.0 M	371.3 H	1.4 B
$Distance_{ijt}$	4376	4252	425	18521	1365	665	425	3352	6503	4428	902	18521
RER_{ijt}	1.223	0.273	0.474	2.692	1.144	0.146	0.833	1.708	1.296	0.335	0.474	2.692
i and j refer to Exporter (UK) and importer country respectively. Also, H=Thousand ($), M=Million ($), B=Billion ($) and T=Trillion ($). Distance in Kilometres.												

Source: Author's Calculation using STATA 15

To investigate how different these characteristics during the integration with EEC and integration with EU? Again, Table 5 present two sub-periods. The first period is from 1978-1992 in which the UK is integrated with EEC, and the second period is from 1993-2018 where the UK is widely integrated with the EU.

Considering the period of weaker integration (1978-1992) from Table 5, the UK recorded an average export and import value of about $131 million and $151 million, respectively, with the EU. Export and import values with non-EU countries amounted to $53.7 million and $55.6 million, respectively. The maximum exports and import value recorded with the EU are $368 million and $527 million, respectively. With non-EU partner, export and import values amounted to $465 million and $522 million, respectively. However, the UK's average GDP is $14.5 billion and is much higher than the bilateral partners GDP, with a recorded average of $8.0 billion. The maximum bilateral distance within and outside the EU during this period are 2482 km and 18521 km, respectively. The average real exchange rate with EU and non-EU countries are 1.268 and 1.237.

During the years in which the UK was a member of the EU (1993-2018), the UK's average real export and imports value with the EU surged to $77.3 million and $98.4 million, respectively, for the whole study period. However, the UK export and import values with the EU decreased to $98.3 million and $125 million, respectively. By contrast, both the average export and imports value to non-EU countries increased to $62.4 and $79.6, respectively. The UK's average GDP increased to $23.8 billion and bilateral nations also recorded an increased average GDP to $10.6 billion. Based on this dynamic descriptive analysis, the following observations are established:

- The UK's trade with the EU decreased as integration widen in 1993 whereas trade with non-EU nations increased. Thus, the UK increased its trade with emerging markets countries, particularly China.
- The UK recorded an increase in GDP during the wider integration period with the EU. This could be attributed to EU single market connecting the UK supply chain to the EU markets by which increase British firms' capacity to sell and produce more.

A correlation matrix would be essential to verify consistency between the gravity model and the regression at hand. Table 6 present correlations between time invariant variables. Generally, it is observed that the correlations values in the table are consistent with the intuition behind the gravity model which suggest that distance is inversely related to trade and economic size (GDP) is positively related to trade. From Table 6, a negative correlation was registered between distance and bilateral trades, exports, and imports. This means that, as distance increases, bilateral trade, export and imports decreases. By contrast, a positive association was established between GDP and trade, exports and imports. This means that, as bilateral trade value increases, both the UK and its trading partners account an increase in GDP.

Table 6: Correlation Matrix on non-categorical variables

Variables	$Trade_{ijt}$	$Export_{ijt}$	$Import_{ijt}$	GDP_{it}	GDP_{jt}	Pop_{it}	Pop_{jt}	$Distance_{ijt}$	RER_{ijt}
$Trade_{ijt}$	1								
$Export_{ijt}$	0.957	1							
$Import_{ijt}$	0.973	0.865	1						
GDP_{it}	0.099	0.057	0.125	1					
GDP_{jt}	0.677	0.657	0.651	0.035	1				
Pop_{it}	0.083	0.033	0.117	0.724	0.056	1			
Pop_{jt}	0.234	0.141	0.293	0.044	0.378	0.042	1		
$Distance_{ijt}$	-0.165	-0.162	-0.157	-0.050	0.138	-0.046	0.195	1	
RER_{ijt}	-0.162	-0.145	-0.165	-0.087	-0.110	-0.295	-0.040	0.006	1

Source: Author's Calculation using STATA 15

The population values obtained from the correlation matrix shows that population is positively related to trade and as such large populated countries trade more with each other. The real exchange rate is negatively related to trade means that an increase (depreciation) real exchange rate reduces trade between the UK and bilateral partners. The unobserved factors are not considered in this correlation matrix calculation and do not provide grounds to conclude that causation is established. Although is useful for providing guidance, the econometric estimation is needed to capture both observed and unobserved factors that can be used to establish causality.

5.2 DIAGNOSTIC TESTS

Panel data provide some degree of freedom and greater capacity to capture complex phenomenon. As a result, the data are often exposed to several challenges which leads to statistical errors. To obtain appropriate estimation technique for analysis, the study conducted tests to verify the preference of multicollinearity, heteroskedasticity, serial correlation, normality and unit root test. Hausman Test, Breusch-Pagan LM Random Test and F-Test were conducted to select appropriate models.

5.2.1 NORMALITY AND UNIT ROOT TESTS

The variables such as trade, export, GDP, population and distance are transformed in to log forms to stabilize their variances and reduce the skewness of the distribution. The objective is to have normality in the data for easy interpretation. Since the data is combination of both time series and cross-sectional data, it is important to test for unit root or stationarity of the variables. The motivation behind unit root test is to avoid a spurious model but rather a model that can predict the dependent variables. One way to achieve this is through Im-Pesaran-Shin unit root test. The log form of trade, export and import are already stationary at lag of one. However, the log form of UK's GDP, bilateral partner GDP and population were initially not stationarity but only after taking the first difference, these variables became stationary at lag of one. The UK's population was not stationary when the first difference was calculated so second difference was calculated and finally becomes stationary.

5.2.2 MULTICOLLINEARITY TESTING

The Variance Inflation Factor (VIF) test was adopted to check the multicollinearity shown in Table 9. The VIF test revealed that all the individual variables have a value less than 10 which implies that there is minimal correlation among the regressors. The outcome of the test is relevant because it assists the study to make accurate conclusion about regressors that are statistically significant.

Table 7: Multicollinearity Testing

Regressors	All Models	
	VIF	1/VIF
GDP_{it} (Log)	1.23	0.814
GDP_{jt} (Log)	1.2	0.830
Pop_{it} (Log)	1.16	0.859
Pop_{jt} (Log)	1.53	0.652
$Dist_{ijt}$(Log)	2.71	0.369
$UKint_{it}$	1.06	0.948
$EUint_{jt}$	1.99	0.503
RER_{ijj}	1.29	0.773
$Contig_{ijt}$	1.51	0.661
$Comlang_{ijt}$	4.19	0.238
Col_{ijt}	4.94	0.202
Mean VIF	**2.07**	

Source: Author's Calculation using STATA 15

5.2.3 HETEROSKEDASTICITY

To obtain efficient estimates from the regression, the error terms must have constant variance. This is one of the underlying assumptions of ordinary least square (OLS). Secondly, variables in the regression must not be serial correlated and particularly, the error terms of the regressors should not influence each other. Heteroskedasticity and serial correlation influence the regression model to produce biased p-values as results of having great impact on the standard errors of the individual regressors. The robust standard error approach to corrects for these two effects from the model. Although robust standard error comes with the cost of losing significance on most of the regressors, it is worthy of eliminating the probability of committing Type 1 error (null hypothesis rejected wrongly). From Table 8, it can be observed that the p-value from the White test is below the five percent level. Hence, the null hypothesis that the model has constant variance is rejected which confirms the presence of heteroskedasticity.

5.2.4 HETEROGENEITY TEST

The problem of heterogeneity bias exists when a POLS regression is employed to analyse panel data. As a result, the need to test individual heterogeneity effects is essential. Table 8 presents the p-value results and this result is then used to compare and select the appropriate model between POLS and RE model. The test statistic and p-value from the three models shows that, the null hypothesis is rejected, and RE model is a more appropriate model compared with the POLS model.

5.2.5 HAUSMAN TEST

The Hausman test decides between FE and RE to select the appropriate model that fit the data for estimation. Based on the p-value results from the Hausman Test, the null hypothesis that RE is the appropriate model will either be accepted or rejected. In Table 8, the p-value results from the regression of trade, export and import models are larger than the five percent level of significance; hence, the null hypothesis is accepted, suggesting a RE model is a more appropriate model and that no correlation exist between the regressors and the individual-specific effects. According to Woodridge (2016), the estimates coefficient from CRE and FE are similar. Since FE recorded omitted variables as a result of collinearity, CRE coefficient estimates was used for the interpretation of the model. The Wald test on CRE model suggest the FE model is consistent because the p-value is below five percent level of significance. It can be observed that, the FE and CRE coefficient estimates and R-Square are similar or vary marginally and this is consistent with what (Woodridge, 2016) noted about FE and CRE coefficients.

5.3 EMPIRICAL RESULTS AND DISUSSION

Table 8 presents the results for the trade, export and import models. The POLS coefficient of determination (R-squared) registered are 15.9 percent, 18.5 percent and 14.4 percent respectively in trade, export and import models. Similarly, the FE, CRE and RE coefficient of determination (R-squared) are 10 percent, 8 percent and 8.9 percent respectively in the trade, export and import models. The R-square value explain the variations in trade, export and import value that can be explained by the variations in the regressors. The R-squared value registered in all the models are

low, indicating a low correlation between the regressors and the dependent variables (trade, export and import). Since the Hausman test algorithm in STATA 15 assumes homoscedastic error and no adjustment for cluster, the interpretation and discussion of the results in Table 8 will emphasize on the CRE method because the Wald test on CRE model takes into account the cluster adjusted covariance estimator including heteroskedasticity.

The UK's GDP from the trade, export and import model is positive and statistically significant at 1% and 5% level. However, the estimated coefficients mean, a percentage increase in UK's GDP raises the value of trade, export and import receipts by about 59.3 percent, 76.7 percent and 52.4 percent, respectively. Thus, since the UK's economic size determines trade flows, it must focus on innovation and specialization to produce goods and services in order to keep it trade sectors relevant to the rest of the world.

Bilateral partners GDP is negative and statistically significant at 10% and 1% level, respectively, for overall trade and export model. Thus, bilateral partners GDP reduces the trade and export by 19.5 percent and 29.8 percent, respectively. By contrast, Stay and Kulharni (2015) found that bilateral partners' GDP increases trade with the UK. The first reason for the difference in results could be because their work covers only the year 2004 where the world economy was booming. Contrary, this study covers from 1978 to 2018 which entails periods where the EU was not widely integrated and has few trade agreements with third party countries making it difficult for countries outside the bloc to access the UK market. The second reason could be as bilateral partners GDP increase, they specialize and begun produce most imports from the UK's.

The UK and bilateral partners population was not statistically significant at all levels.

The coefficient for distance was negative and statistically significant at 1% level for trade, export and import. A percentage increase in distance reduces overall trade, export and import by 64.8 percent, 64.4 percent and 62.1 percent, respectively. This imply that, as distance between partners increase, trade is reduced as a result of transaction cost. This result is consistent with Stay and

Kulharni (2015) who find that distance is inversely related to the UK's trade. Based on this findings and argument that the EU is closer to the UK, which implies that an unsuccessful post-Brexit trade agreement with EU would increase trade cost and overtime trade could decline.

The dummy variables capturing the UK's integration period with the EEC and EU is positively related to trade and statistically significant at the 10% level. This means that, a percentage increase in the UK's wider integration with the EU raises the UK's trade flows by 21.3 percent and 24.6 percent, respectively. This result is consistent to Frankel and Wei (1993) who found that, the UK's integration with the EEC increase trade flows. Thus, the wider integration removed trade barriers (tariff and quotas) and increase the UK's trade flows by enabling free access to bilateral partners such as Austria and eastern European countries markets through the EU single market and custom union. The UK's supply chain is closely integrated to the EU single market which allows free movement of goods EU market without stringent custom overview.

Also, bilateral partners EU membership was statistically significant at 10% level and raises the UK's overall trade by 24.6 percent. The accession of eastern European countries provided cheaper goods and services from the EU which the UK benefited. This result is consistent to Osnago et al. (2017) who find that, the UK's economic integration with the EU increase trade in goods and services by 42 percent. Carbaugh (2009) found trade creation for the UK through EU membership and explained that, abolition of tariff and quotas within the EU provided cheap goods for the UK which led to substantial increase in imports for manufactured goods from the EU. As a result, economic integration with the EU is important to the UK's trade flows and an unsuccessful post-Brexit agreement with the EU will affect the UK's supply chain heavily as tariffs and stringent custom overview will be imposed on goods coming in or out of the UK. The manufacturing sector producing food products with short shelf-life would suffer enormous losses if there is delay at the port as a result of custom overview. Brexit also means review on existing regulations of conducting business in terms of information exchange and intelligence input, competition law and market

fragmentation which would make forecasting and planning difficult for businesses. This could all lead to job loss as some business would consider relocating from the UK to countries within EU.

The results revealed a statistical insignificant result for bilateral real exchange rate, contiguity and common language.

Lastly, colonial ties are positively related to trade and statistically significant at the 1% level for the overall trade and export model and 5% for the import model. This means that colonial ties which is particularly the commonwealth partners raises the UK's overall trade, export and imports flows by 111 percent, 121 percent, and 107 percent, respectively. The results are consistent with Stay and Kulharni (2015) who finds that, the UK's colonial relationship with bilateral partner raise its trade 55 percent above trade with non-colonial partners. Based on this finding, it means even though the UK trade sector is closely integrated with the EU, it has some allies outside the EU whom it can rely on in the case of unsuccessful post-Brexit trade deal.

Table 8: Estimates of Gravity model using FE, CRE and RE, 1978-2018.

Regressors	Trade Models				Export Models				Import Models			
	POLS	FE	CRE	RE	POLS	FE	CRE	RE	POLS	FE	CRE	RE
GDP$_{it}$ (Log)	0.730**	0.596***	0.593***	0.597***	0.993***	0.768***	0.767***	0.770***	0.599*	0.528**	0.524**	0.528**
	(0.272)	(0.180)	(0.181)	(0.181)	(0.255)	(0.147)	(0.148)	(0.148)	(0.302)	(0.217)	(0.219)	(0.218)
GDP$_{jt}$ (Log)	-0.291	-0.200*	-0.195*	-0.200*	-0.510*	-0.301**	-0.298***	-0.302***	-0.166	-0.147	-0.142	-0.147
	(0.270)	(0.108)	(0.108)	(0.108)	(0.278)	(0.113)	(0.113)	(0.114)	(0.278)	(0.138)	(0.139)	(0.139)
Pop$_{it}$ (Log)	68.44	-10.16	-10.23	-9.725	63.90	-18.84	-18.82	-18.34	75.72	-1.942	-1.989	-1.498
	(52.45)	(30.78)	(30.83)	(30.87)	(49.22)	(26.28)	(26.35)	(26.33)	(58.31)	(38.61)	(38.64)	(38.72)
Pop$_{jt}$ (Log)	11.43	7.895	7.872	8.040	18.81	9.206	9.385	9.408	2.244	6.085	5.871	6.182
	(20.15)	(5.414)	(5.332)	(5.433)	(19.25)	(6.085)	(5.874)	(6.104)	(22.27)	(5.622)	(5.575)	(5.604)
Dist$_{ijt}$(Log)	-0.155		-0.648***	-0.107	-0.216		-0.644***	-0.200	-0.0892		-0.621***	-0.0443
	(0.279)		(0.165)	(0.273)	(0.254)		(0.137)	(0.258)	(0.312)		(0.219)	(0.297)
UKint$_{it}$	-0.154	0.213*	0.211*	0.211*	-0.206	0.184	0.182*	0.182*	-0.160	0.214*	0.213*	0.212*
	(0.166)	(0.109)	(0.110)	(0.109)	(0.163)	(0.109)	(0.110)	(0.109)	(0.180)	(0.119)	(0.120)	(0.119)
EUint$_{jt}$	0.172	0.246*	0.246*	0.246*	0.282	0.178	0.179	0.179	0.126	0.266	0.266	0.265
	(0.334)	(0.132)	(0.132)	(0.132)	(0.297)	(0.116)	(0.117)	(0.116)	(0.394)	(0.162)	(0.163)	(0.162)
RER$_{ijj}$	-0.951*	-0.145	-0.145	-0.149	-0.836	-0.0615	-0.0622	-0.0661	-1.084**	-0.250	-0.251	-0.255
	(0.480)	(0.239)	(0.239)	(0.240)	(0.466)	(0.237)	(0.237)	(0.238)	(0.495)	(0.243)	(0.243)	(0.244)
Contig$_{ijt}$	1.032		0.287	1.096	0.917		0.215	1.017	1.169		0.379	1.219
	(1.083)		(0.385)	(1.051)	(0.991)		(0.357)	(0.976)	(1.218)		(0.479)	(1.171)
Comlang$_{ijt}$	1.393*		-0.194	1.292	1.486**		-0.0194	1.362**	1.330		-0.399	1.244
	(0.756)		(0.312)	(0.789)	(0.621)		(0.230)	(0.645)	(0.947)		(0.517)	(0.981)
Col$_{ijt}$	-1.505**		1.111***	-1.218*	-1.318***		1.210***	-0.975**	-1.678*		1.074**	-1.462*
	(0.660)		(0.345)	(0.676)	(0.463)		(0.290)	(0.491)	(0.883)		(0.548)	(0.884)
Constant	20.64***	18.10***	5.999***	18.85***	20.01***	17.20***	5.872***	18.59***	19.80***	17.57***	3.708	17.92***
	(2.340)	(0.293)	(2.295)	(2.125)	(2.155)	(0.299)	(1.859)	(2.068)	(2.614)	(0.298)	(2.978)	(2.257)
R-Squared	0.159	0.100	0.100	0.100	0.185	0.080	0.080	0.080	0.144	0.089	0.089	0.089
Number of Observations	1353	1353	1353	1353	1353	1353	1353	1353	1353	1353	1353	1353
White Test	0.0000				0.0000				0.0000			
Breusch LM Test	0.0000				0.0000				0.0000			
Hausman Test	0.1602				0.0690				0.2995			
Wald Test (on CRE model)	0.0000				0.0000				0.0000			

Robust Standard Errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; i and j refer to Exporter (UK) and importer country respectively.

Source: Author's Calculation using STATA 15

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 SUMMARY AND CONCLUSION

The study examines the UK's bilateral trade flows as a means of seeing whether wider integration and deeper EU membership matters for the UK's trade sector. The findings shed light about the implications of Brexit on the UK's trade flows. In addition, other factors that affect the UK's bilateral trade flows during 1978 to 2018. The study developed a panel regression model for the UK's trade sector using data on the UK's GDP and population, bilateral partners GDP and population, bilateral distance, integration period, EU membership, real exchange rate, common language, contiguity and colonial ties. To examine the trade sector, three models (overall trade value i.e., the value of export plus import and the value of exports and import separately) were developed to investigate the underlying factors that affect the pattern of the UK's trade flows. The study estimates these effects using CRE, RE, FE and POLS model but the emphasis on the interpretation and discussion is on the CRE method. All estimations were done using STATA version 15.

The estimation result show that a percentage increase in UK's GDP significantly raise its overall trade, export and imports by 59.3 percent, 76.7 percent and 52.4 percent, respectively. Thus, from 1993 to 2018, as the UK's GDP increases its overall trade increase and export market penetration index increase. Since the UK's GDP significantly raise its trade flows, then there is strong need for the UK government to empower it trade sectors with technology and innovation to produce goods and service for the local and foreign markets to continuously remain relevant to the international market during post-Brexit era. The UK's should focus on a post-Brexit deals that will give its important trade sectors and supply chain access to the EU single market and custom union in order to enable British businesses to produce and sell in the EU market. Also, a percentage increase in a bilateral partners GDP significantly reduces the UK's overall trade and exports flows.

Thus, as bilateral partners economic size expands, it becomes more independent and over time the economy disassociates the UK's trade supply chain.

The dummy variables capturing the UK's integration with the EEC and EU and bilateral partner EU membership are the two central variables that address the objective of this study. The estimate result shows that these two variables are statistically significant and positively affect the UK's trade flows. It means the UK trade sector benefited from economic integration with the EU. The translation of Brexit is, the UK will no longer participate in the EU's single market and custom union that enables free movement of goods and services with the EU. The UK service sector will also face challenges with export of services within the EU due to immigration law and financial market regulation in the form of capital controls. Therefore, post-Brexit trade deal with the EU must be a paramount objective for pro-Brexiters else its trade sector and supply chain are likely to suffer a decline in trade value. The post-Brexit deals should focus on the importance of global supply chains which provides evidence that multilateral trade deals tend to be of greater importance than bilateral trade deals. This is because firms in the international supply chains navigate their products to comply with rules of origin requirements in order to benefit from bilateral trade deals. As a result, the UK must find ways to get its bilateral partners outside the EU (particularly the US, China and emerging market countries) to agree to flexible rules of origin requirement so that they would not be restricted to amount of inputs they can purchase from the UK. Post-Brexit deal should include treaties that would enable the UK's service sector, manufacturing and other important sectors relevant and competitive in the international supply chain. Also, post-Brexit deals should address the border issues relating to Republic of Ireland and Northern Ireland. Given their historical conflict, border tensions and smuggling that happened in the 1960s is something the UK must circumvent to ensure peace if it decides to trade with the EU based on tariffs and quotas. In addition, the UK should sign a trade agreement that would benefit Northern Ireland, Wales and especially Scotland. One major pride at heart for the British people

is the United Kingdom and many of them would not like to see the union or empire fall apart. However, if post-Brexit deals do not benefit Scotland economically, they are likely to hold another referendum and maybe this time they would vote against staying in the UK.

Distance as estimated by the model significantly and inversely affect the UK's overall trade, export and import flows. An increase in bilateral distance increases the cost to export or imports goods and thereby reduces trade with bilateral partners far from the UK. Since the EU is closer to the UK, Brexit means the UK is disintegrating its supply chain from the EU market in which trade cost is low. However, the model revealed that, colonial relationship is statistically significant and positively affects the UK's trade flows. This means that, if pro-Brexiters divorce the EU with the objective of substituting (trade diversion) the EU trade contribution with colonial partners outside the EU, they must start thinking about distance as a proxy to cost of trade. Thus, an unsuccessful post-Brexit trade agreement with the EU could likely decline the UK's trade flows. To suppress the distance effect, the UK should start building strong trade relationship with the US, China and emerging market countries in the form of free trade to compensate for the cost associated with distance.

In conclusion, economic integration and EU membership matters to the UK's trade sector. Therefore, the UK should analyse and consolidate all the post-Brexit trade deals options in to one big package of treaties and strike the best trade deal with the EU that is in alignment with short- and long-term economic objectives. However, the UK should be ready to makes sacrifices because part of the trade deal would depend on the kind of trade relationship in the best interest of the EU.

6.2 RECOMMENDATIONS

Recommendation for further studies is emphasized on speculative relationship the EU would like to have with the UK and the vice versa. It is speculated that the EU would like to have a trade that would allow EU citizens to live and work in the UK without visa. This means that EU would like to have either the Norwegian or Switzerland trade model with the UK. On the other hand, the UK

prime-minister Boris Johnson is willing to reach the Canadian trade deal model with the EU. As a result, an extension for further study could be to examine the UK's post-Brexit trade flows based on the Norwegian/Switzerland model against the Canadian model to shed light on the implications of the models.

Also, further studies could include data on UK's investments in bilateral partner country since the UK's service sector is very important to the economy.

6.3 LIMITATION OF THE STUDY

Missing data values for GDP, CPI, export and imports flow are major limitation of the study. As a result, the model did not account for zero trade values which means important information which could affect the results were missing. Therefore, the study recommends Poisson pseudo maximum likelihood (PPML) estimation techniques for further study in order to capture zero trade flows.

REFERENCES

American Shipper (2019). "Explained: How and why Brexit will reshape Europe's logistics landscape".
https://www.freightwaves.com/news/explained-how-and-why-brexit-will-reshape-europes-logistics-landscape

Anderson, J.E. and Wincoop, E.V. (2004) "Trade Costs." *Journal of Economic Literature*.
https://pubs.aeaweb.org/doi/pdfplus/10.1257/0022051042177649

Appleyard, D.R. and Field, A.J.J. (2014). "International Economics, 8th Edition". *McGraw-Hill/Irwin*. ISBN 978-0-07-802167-1

Anderson, J. E. and Wincoop, V.E. (2004). "Gravity with Gravitas: A Solution to the Border Puzzle". *American Economic Review, 93(1), 170–192*.

Balassa, B. (1961). "The Theory of Economic Integration". *Richard D. Irwin, Inc., Homewood*.
http://ieie.itam.mx/Alumnos2008/Theory%20of%20Economic%20Integration%20(Belassa).pdf

Blum, B.S., and Goldfarb, A. (2004). "Does the internet defy the law of gravity?" *Journal of International Economics, 2006, vol. 70, issue 2, 384-405*.

Brun, J. F., Carrere, C., Guillaumont, P. and J. de Melo (2005). "Has distance died? Evidence from a panel gravity model". *The World Bank Economic Review, 19(1), 99–120*.

Carbaugh, R.J. (2009). "International Economics, 12th Edition". South-Western Cengage Learning

Centre d'Etudes Prospectives et d'Informations Internationales (2015). "GeoDist Database"
http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=6

Centre for European Reform (2016), "The economic consequences of leaving the EU: The final report of the CER commission on the Brexit 2016". *Centre for European Reform.*

Dhingra, S., Ottaviano, G.I. P., Sampson, T. and Reenen, J.V. (2016). "The consequences of Brexit for UK trade and living standards". London School of Economics and Political Science, CEP, London, UK. *CEP BREXIT Analysis No.2 (CEPBREXIT02).*

Eichengreen, B. and Irwin, D. A (1996). "The Role of History in Bilateral Trade Flows." *NBER Working Paper Series 5565.*

Feenstra, R. C., Markusen, J. R., & Rose, A. K. (2001). "Using the Gravity Equation to differentiate among Alternative Theories of Trade." *Canadian Journal of Economics, 430-447*

Frankel, J.A. and Romer, D.H. (1999). "Does Trade Cause Growth?" *American Economic Review*. vol. 89, No. 3 (pp. 379-399)

Frankel, J.A. and Wei, S.J (1993). "Trade Blocs and Currency Blocs." *NBER Working Paper Series 4335.*

Hamilton, C.B. and Winters, L. (1992). "Opening Up International Trade in Eastern Europe". Working Papers from Stockholm - *International Economic Studies*.

HM Treasury (2016). "The Long-term economic impact of EU Membership and the Alternatives". London, UK.

Institute for Fiscal Studies (2018). "Firms' supply chains form an important part of UK-EU trade: what does this mean for future trade policy?"
https://www.ifs.org.uk/publications/10302

International Monetary Fund (2020a). "Direction of Trade Statistics (DOTS)". IMF Data Access to Macroeconomic and Financial Data.
https://data.imf.org/?sk=9D6028D4-F14A-464C-A2F2-59B2CD424B85

International Monetary Fund (2020b). "International Financial Statistics (IFS)". IMF Data Access to Macroeconomic and Financial Data. *Query*
https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b&sId=1390030341854

Kepaptsoglou, K., Karlaftis, M.G. and Tsamboulas, D. (2010). "The gravity model specification for modeling international trade flows and free trade agreement effects: a 10-year review of empirical studies". *The Open Economics Journal*.

Krugman, P.R.and Obstfeld, M. (2011). "International Economics". *Harlow: Pearson Education*.

Ku, H., and Zussman, A. (2010). "Lingua Franca: The Role of English in International Trade. *Journal of Economic Behaviour and Organization*.

Lampadarios, E. (2017). "Brexit and the UK chemical supply chain: A commentary on potential effects". *Journal of Business Chemistry.*
https://www.businesschemistry.org/article/?article=249

Lederman, D., and Özden, Ç. (2004). US Trade Preferences: all are not created equal. *Documentos de Trabajo (Banco Central de Chile), (280), 1.*

Longman, N. (2016). "Brexit could cost UK retailers millions in compliance". *Supply Chain Digital.*
https://www.supplychaindigital.com/scm/brexit-could-cost-uk-retailers-millions-compliance

McCallum, J. (1995). "National Borders Matter: Canada-U.S. Regional Trade Patterns". *American Economic Review, 85(3), 615–623.*

Mckinsey and Company (2019). "Brexit: The bigger picture—Rethinking supply chains in a time of uncertainty". https://www.mckinsey.com/featured-insights/europe/brexit-the-bigger-picture-rethinking-supply-chains-in-a-time-of-uncertainty#

Office for National Statistics (2015). "How important is the European Union to UK trade and investment?". *Office for National Statistics*, June 26, 2015.

Office for National Statistics (2018). "Who does the UK trade with?". *Office for National Statistics*, January 3, 2018.

Office for National Statistics (2019). "Changes in the economy since the 1970s". https://www.ons.gov.uk/economy/economicoutputandproductivity/output/articles/changesintheeconomysincethe1970s/2019-09-02

Office for National Statistics (2020). "UK trade: goods and services publication tables". https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/datasets/uktradegoodsandservicespublicationtables

Osnago, A., Ruta, M., and Mulabdic, A. (2017). "Deep Integration and UK-EU Trade Relations". Sixth Biennial Global Conference; Columbia Business School Research Paper No. 18-57. *Society of International Economic Law (SIEL)*.

Pogkas, D. and Diamond, J.S. (2020). "The EU Risks Tariffs on €47 Billion Without a Brexit Trade Deal". *Bloomberg*, January 28, 2020.

Qiao, H. 2007. "Exchange Rates and Trade Balances under the Dollar Standard". *Journal of Policy Modelling*.

Rodrik, D. (1998). "Why do more open economies have bigger governments?" *National Bureau of Economic Research*.

STATA Release 15. "Statistical/Data Analysis". College Station, *TX: StataCorp LLC, 2015*.

Stay, K. and Kulharni, K.G. (2015), "The Gravity Model of International Trade, a Case Study: The United Kingdom and Her Trading Partners". *Southwestern Society of Economics*.

Mueller, B. (2020). "What Is Brexit? And What Happens Next?". *The New York Times, Brexit news*. https://www.nytimes.com/interactive/2019/world/europe/what-is-brexit.html

The Economist (2016). "Free exchange: Down to earth". *Weekly edition*. https://www.economist.com/finance-and-economics/2016/09/29/down-to-earth

The Institute for Government (2017). "The options for the UK's trading relationship with the EU". *Explainers.* https://www.instituteforgovernment.org.uk/explainers/options-uk-trading-relationship-eu

The Week (2020). "What are the pros and cons of Brexit?". *Brexit news.* https://www.theweek.co.uk/brexit-0

Tinbergen, J., (1962). "Shaping the World Economy: Suggestions for an International Economic Policy"). Twentieth Century Fund, New York, *Books (Jan Tinbergen).* Retrieved from http://hdl.handle.net/1765/16826

Viner, J. (1950). "The Customs Union Issue". *Carnegie Endowment for International Peace, New York*.

Ward, M. (2018). "UK trade, 1948-2018: statistics". International Trade. *Commons Research Briefing CBP-8261*.

Wilson, J.S., Mann, C.L. and Otsuki, T. (2002). "Trade Facilitation and Economic Development: Measuring the Impact" The World Bank, Development Research Group.

World Integrated Trade Solution (2020). "Data Download: Trade Stats". *WITS* https://wits.worldbank.org/datadownload.aspx?lang=en

World Bank (2020). "World Integrated Trade Solution. Trade Statistics Database" https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=GB

Wooldridge, J. M. (2016). "Introductory Econometrics, 6e: A modern approach". *The MIT Press 0, 5(1), 5. Chicago.*