Brexit Damage Limitation: Tariff-jumping FDI and the Irish Agri-Food Sector

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20 MARCH 2020
DECLARATION

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THE momentous Brexit has been attracting worldwide attention since the United Kingdom announced its intention to leave the European Union after the national referendum on 23 June 2016. Despite the tortuous negotiations during the past two and a half years, the future relationship between the UK and EU is still uncertain to date. It is likely that no-deal Brexit will occur at the end of October 2019, especially since Boris Johnson took office as the British prime minister in June. Whatever agreements the UK will conclude with the EU, Brexit would have a particularly detrimental impact on agricultural trade between the two economies without any doubts.

The agri-food sector of Ireland would be among the first to suffer due to its close trade relations with the UK. Moreover, Ireland is the only country that has a land border with the UK. It has been observed that some Irish agri-business firms have engaged in precautionary tariff-jumping into the UK market in the last few decades. In contrast, FDI in the UK’s financial services flows into Ireland in the form of establishing or expanding operations to insure against the anticipation of the UK losing access to the European Single Market. This is a precautionary ‘non-tariff barrier jumping’ FDI.

Since agricultural products are easy to incur the highest tariff rates, this research is motivated to provide an insight into reducing Brexit damage by attracting tariff-jumping FDI from the UK into Ireland. By comparing export structure and comparative advantage of the UK and the Irish beef products and dairy products, three paper finds: First, the UK is the most critical export market for both Irish beef products and dairy products. Second, it should be possible for the Irish beef sector to capture the potential EU market vacuum caused by Brexit. However, losses will still arise because of differences in market size. Third, it provides a way to limit the Brexit damage on the Irish dairy sector by targeting tariff-jumping foreign investment from the UK into Ireland in order to allow UK firms to retain access to the EU market.
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LIST OF ABBREVIATIONS

CAP: Common Agricultural Policy
CCT: Common Customs Tariff
CETA: Comprehensive Economic and Trade Agreement
CMA: Competition and Markets Authority
CN Code: Combines Nomenclature
CSO: Central Statistics Office
CU: Customs Union
DAFM: Department of Agriculture, Food and Marine
DUP: Democratic Unionist Party
EC: European Community
EEA: European Economic Area
EEC: European Economic Community
EFTA: European Free Trade Association
ESI: Export Similarity Index
EU: European Union
EUCU: European Union Custom Union
FDI: Foreign Direct Investment
FTA: Free Trade Agreement
HFDI: Horizontal Foreign Direct Investment
HS Code: Harmonized Commodity Description and Coding Systems
IFA: Irish Farmers’ Association
IFSC: International Financial Services Centre
IMF: International Monetary Fund
M&A: Mergers and Acquisitions
MFN: Most Favoured Nation
MNE: Multinational Enterprise
MNC: Multinational Corporation
MPs: Members of Parliament
NI: Northern Ireland
OECD: Organisation for Economic Cooperation and Development
PM: Prime Minister
PTAs: Preferential Trade Agreements
R&D: Research and Development
RCA: Revealed Comparative Advantage
ROW: Rest of World
TBT: Technical Barriers to Trade
TRQs: Tariff Rate Quotas
VER: Voluntary Export Restraints
VFDI: Vertical Foreign Direct Investment
WTO: World Trade Organisation
Brexit, referring to Britain leaving the European Union, has been a hot topic since an in-out national referendum was held in 2016. It has caused extensive discussions among academia, especially about its potential economic impact on the European area. Ireland, the only European country that has the land border with the UK, would be among the first to suffer. In contrast to financial services, seldom attention has been paid to the Irish agricultural industry. However, the UK is the single most important trade partner for Irish agricultural products. There is no doubt that Brexit would have a profoundly negative effect on it because of trade barriers. Tariff-jumping FDI has been widely applied as an alternative of export to avoid tariffs walls in the host country. Compared with the possible negative impacts on the agri-business sector, there are more optimistic estimates for influence on Ireland’s international financial services industry. Brexit would likely provide an opportunity to attract more tariff-jumping FDI from the UK into Ireland, which is typical for the financial services sector in the past few decades. This thesis aims at exploring the potential to attract tariff-jumping FDI from the UK into Ireland to mitigate its negative impact on the Irish agri-food sector.
1.1 Background and Motivation

The UK announced its intention to leave the European Union after the national referendum on 23 June 2016. When I started my research journey in the same year, Brexit news was pouring from seemingly every corner of the world. There is an interesting phenomenon in the financial services industry: many multinational corporations have begun to take steps to move their EU headquarters from London to Dublin, such as JP Morgan, Bank of America, and Wells Fargo. This has aroused my curiosity: what will happen to the Irish agricultural industry in the post-Brexit era? In order to figure out the above question, the preliminary investigation was conducted to provide some background knowledge about Irish trade since joined the EU, the importance of agriculture to the Irish economy, and trade with the UK.

1.1.1 The basic information of Irish trade

Over the past four decades, Ireland’s merchandise exports grew by an average rate of more than 11.5%, while the annual growth rate of imports reaches 8.5%, according to the Central Statistics Office (CSO).

![Figure 1.1: Merchandise trade in Ireland, 1973-2016 (Euro thousand)](https://www.cso.ie/en/index.html)


2 This is to give a brief description of the topic. Therefore, data are collected from different databases based on research purposes.
Similarly, the annual growth rate of service exports (10.4%) is almost identical to service imports (10%) over the past 13 years (CSO).

![Graph showing services trade in Ireland, 2003-2015 (Euro million)](https://www.cso.ie/en/index.html)

Figure 1.2: Services trade in Ireland, 2003-2015 (Euro million)

Furthermore, Ireland has run large trade surpluses in merchandise trade since 1985. Especially in recent years, Ireland’s trade surplus started widening again. Although Ireland has been running a trade deficit in service trade, both the merchandise trade and service trade have shown a good tendency of development since Ireland joined the EU in 1973.

### 1.1.2 Trade with the UK

It can be clearly seen from Figure 1.3 that Irish agricultural exports are more dependent on the UK as the destination market compared to industrial produce and forestry and fishing produce.
1.1.3 Employment in Irish Agri-sector

Although the percentage of employment in the agri-food sector has been declining since 1983, there has been a recovery in recent years.
More specifically, 173,400 people are working in the Agri-Food sector, accounting for 8.6% of the total employment on average in 2016. Among these, the majority of people are involved in Agriculture, Forestry, and Fishing, about 112,900. Fifty-six thousand six hundred people work in Food and Beverages, while only 4000 people are in Wood Processing (DAFM, 2017).

Figure 1.5: Total Agri-Sector Employment, 000s (2016)
Source: Department of Agriculture, Food and the Marine, Brexit Fact Sheet-Irish Agri-Food Sector, 2017. Available at: https://www.agriculture.gov.ie/media/migration/publications/2017/BREXITFactSheet290517.pdf

In summary, agriculture plays a vital role in the Irish economy. Although the Irish economy has presented a high growth situation in the past few decades, Brexit would hurt its agricultural industry. Taking a page from the financial service sector, this thesis aims at providing a potential solution to mitigate the damage of Brexit on the Irish agri-food sector.
1.2 Research Question

Brexit refers to the UK’s decision to leave the European Union on June 23\textsuperscript{rd}, 2016. As one of the closest trading partners, Ireland is deeply influenced by Brexit every aspect of life. Above all, the UK’s withdrawal from the European Union has a substantial impact on the Irish economy, especially on the agri-business sector and financial services sector. On the one hand, Brexit would probably have a positive impact on Ireland’s international financial services industry since the UK would probably lose access to the European Single Market, which is an opportunity for Ireland to attract more inward flows of financial service FDI. On the other hand, it is widely recognized that the influences on Irish agriculture and agri-business are likely to be more severe as the ‘Agriculture, Food and Beverages and Basic Metals are relatively more dependent on exports to the UK’ (Barrett et al., 2015, p9).

However, scholars and researchers are more concerned about the possible economic implications of Brexit on the Irish financial industry rather than other sectors. In fact, agriculture and agri-business are far greater in size. The International Financial Services Centre (IFSC) employs about 30,000 people, while more than 100,000 people are employed in agriculture, forestry and fishing, and almost 60,000 in Food & Beverages (Figure 1.5).

In addition to a larger scale in the agri-business sector, regional-disparities is another issue to pay attention to. The distribution of the international financial services industry is concentrated in Dublin while agri-business is mainly outside Dublin. The different impacts of Brexit on these two sectors would likely worsen regional problems in Ireland. An even deeper issue for Ireland is its implications for Irish farmers and agri-business employees. Therefore, these complex problems require much more attention to reduce the likelihood of a backlash occurring and improve the whole development of the regional social economy.

Based on the successful experience of tariff-jumping FDI in the international financial services industry, this paper aims to discuss the potential to minimize the likely detrimental effect of Brexit on the Irish beef sector and dairy sector through tariff-jumping FDI.

Two main research questions are addressed in this thesis.
1. What is the comparative advantage and competitiveness of Irish agri-food trade in the EU market: the RCA approach?
2. To what extent is it appropriate for Ireland to pursue tariff-jumping FDI in order to limit the damage of Brexit?

1.3 Main Findings and Contributions

This paper focuses on empirical contributions, trying to use the historical experience to solve current problems. Previous studies about the impact of Brexit on the Irish economy focus on the macroeconomic influence. It has been found that there is a negative impact on Ireland’s GDP in both the short run and the long run. This research will contribute to the literature by providing an in-depth study of Brexit’s impact on sectors – beef sector and dairy sector, which is of great importance to Ireland’s agri-business. Moreover, This paper points to the potential of this channel to ameliorate some of the damage likely to be induced by Brexit. This suits the traditional modus operandi of the IDA, but inter-agency co-ordination is required.

Based on the analysis of Ireland’s trade conditions and its competitiveness in the agri-food industry, this paper concludes that tariff-jumping FDI is a possible way to limit Brexit damage in both the beef sector and dairy sector. The situation, however, is much different.

In the beef sector, it is easy to draw the conclusion from the high export similarity index between Ireland and the UK that these two countries export very similar beef products to the EU market. Furthermore, Ireland has a stronger revealed comparative advantage on its main beef export product than any other EU country. Therefore, if there is a hard Brexit that the UK loses its access to the EU market, it is likely for Ireland to capture the market that the UK left. However, Ireland’s beef export to the EU market is nearly four times the UK’s. The potential market vacuum caused by Brexit is too small to cover the difference. In order to mitigate the loss, Irish beef export-oriented firms are recommended to jump to the UK market.

Things are seen very differently in the dairy sector. Ireland and the UK export different dairy products, which can be inferred from the low export similarity index. Although Ireland has a revealed comparative advantage of some products, none of them are the UK’s main dairy export. Moreover, Ireland is not in a very competitive position
in the UK’s main dairy export products compared to other dairy exporters in the EU market. If the UK loses its access to the EU market, Ireland is less likely to capture the market that the UK left. Instead, it is a better way to attract the UK’s dairy firms to relocate to Ireland in order to access the EU market, which is a win-win way for both Ireland and the UK.

1.4 Thesis Structure

The rest of the paper structures as follows.

Chapter 2 provides a comprehensive literature review on the topic of tariff-jumping FDI.

Chapter 3 illustrates relevant background knowledge about Brexit and generalises the potential impact of Brexit on the agriculture industry.

Chapter 4 describes the methodology and data source.

Chapter 5 collects firm-level evidence on precautionary tariff-jumping FDI in the beef sector and dairy sector.

Chapter 6 presents the outcomes of the beef sector at the 6-digit HS level.

Chapter 7 and Chapter 8 illustrate the results of the dairy sector at the 6-digit HS level and 8-digit CN level.

The final chapter concludes the preliminary findings of this research and discusses limitations and future works.
Foreign direct investment is an investment made by a foreign investor in the host country (the recipient) through constructing new facilities, mergers and acquisitions (M&A), or intracompany loans. It falls into many categories according to different standards. For example, FDI can be divided into horizontal FDI and vertical FDI in terms of multinational enterprises’ activities, inward FDI, and outward FDI in line with the capital flow. Tariff-jumping FDI is a variant of horizontal FDI, which is to avoid trade barriers. This chapter provides a comprehensive literature review on tariff-jumping FDI. The first two sections introduce FDI and clarify relevant concepts. Five questions are addressed in this section: First, does high import tariffs actually induce FDI? Although the tariff-jumping argument has been widely accepted, some academics dispute this. Second, what is the relationship between export and FDI: substitution or complement? Third, what influence multinational firms’ choice between export and tariff-jumping FDI: proximity-concentration hypothesis? Fourth, what are welfare implications for tariff-jumping FDI? Will it be beneficial to welfare? If yes, what is the optimal tariff in the presence of tariff-jumping FDI? Finally, what are the sectoral effects of tariff-jumping FDI?
2.1 FDI Concepts

This section briefly clarifies the relevant concepts and positions tariff-jumping FDI in the relevant FDI literature.

2.1.1 The Definition of FDI

According to the definition made by the International Monetary Fund (IMF)\(^3\):

*Foreign Direct investment is a category of international investment that reflects the objective of a resident in one economy (the direct investor) obtaining a lasting interest in an enterprise resident in another economy (the direct investment enterprise). The lasting interest implies the existence of a long-term relationship between the direct investor and the direct investment enterprise, and a significant degree of influence by the investor on the management of the enterprise. A direct investment relationship is established when the direct investor has acquired 10 percent or more of the ordinary shares or voting power of an enterprise abroad.*\(^4\)

Put simply, foreign direct investment is an investment made by a foreign investor in the host country (the recipient) through constructing new facilities, mergers and acquisitions (M&A) or intracompany loans. There are, however, some details worth noting. It is not necessary to involve control of the enterprise as the threshold is only 10 percent. This control of ownership is a way to discriminate FDI from foreign portfolio investment, which is usually in the form of purchasing a local firm’s securities such as stocks and bonds without managing the firm.

The development of foreign direct investment is always associated with multinational enterprises (MNE)\(^5\). With the advent and increasing importance of multinational enterprises, trade is not the only choice when serving a foreign market. Instead, more and more enterprises engage in foreign direct investment. Multinational enterprises are also expressed as multinational companies or corporations. Here enterprise is used to show the top level in the hierarchy of an organisation as a subsidiary can also be a multinational firm, as suggested by Cave (1996).

\(^3\) This definition is consistent with the one made by the Organization for Economic Cooperation and Development (OECD). More details are available in OECD *Benchmark Definition of Foreign Direct Investment*, fourth edition.


\(^5\) Multinational enterprises are also expressed as multinational companies or corporations. Here enterprise is used to show the top level in the hierarchy of an organisation as a subsidiary can also be a multinational firm, as suggested by Cave (1996).
enterprises are, to some degree, equivalents of foreign direct investment as they are the direct forms of FDI.

2.1.2 FDI Categories

FDI falls into many categories according to different standards. New trade theory divides foreign direct investment into horizontal foreign direct investment (HFDI) and vertical foreign direct investment (VFDI) (Helpman, 1984; Markusen, 1984). The traditional investment theory illustrates horizontal foreign direct investment usually takes place in countries which have the same level of factor endowments and technology, in the formation of setting up subsidiaries abroad in order to supply the location market. Multinational enterprises replicate the same production procedures in the host country to provide final products. It is usually motivated by decreasing trade costs such as tariffs and transportation costs to access the destination market. Therefore, it is also regarded as market-seeking FDI (Dunning and Lundan, 2008).

In contrast, vertical FDI occurs in countries with different levels of factor endowments. The production activities are broken down into several stages and are distributed in different countries in order to improve their competitiveness. Unlike horizontal FDI, vertical FDI sells products in the home country. It is also called efficiency-seeking FDI (Dunning and Lundan, 2008).

However, with the development of globalisation, the boundaries between these two kinds of FDI become vaguer. Multinational enterprises allocate resources in the worldwide, seeking for market and form a new type - export-platform FDI (Ekholm et al., 2007). Instead of selling products in the home country and host country, the output of export-platform FDI is largely sent to the third market.

Put it differently, Martens (2008) explains it from the perspective of a multinational enterprise, which is in the form of a parent enterprise and a foreign affiliate. Horizontal FDI is when the parent enterprise replicates the same production abroad as it operates at home. Vertical FDI can further be subdivided into backward vertical FDI and forward vertical FDI. If the parent enterprise supplies components and intermediate products for its affiliate, it is backward vertical FDI. Forward vertical FDI transpires when the parent enterprise sells the final product of its affiliate.
In terms of the direction of capital flows, FDI is composed of inward FDI and outward FDI. Inward FDI refers to foreign capital is invested in the home country while outward FDI is when local capital is invested in other countries.

Tariff-jumping FDI, as you can tell from the name, is to invest in the host country (either in the way of greenfield FDI\(^6\) or mergers and acquisitions) in order to circumvent trade barriers (Cole and Davies, 2011). It is broadly defined as ‘barrier-jumping,’ which jumps over not only tariffs but also non-tariff barriers. Tariff-jumping FDI is regarded as the export substitution in the face of high import tariffs for the first time to establish an affiliate in the destination country. If it has already set up local production, tariff-induced FDI mainly manifests as increasing in oversea production. Therefore, tariff-jumping FDI is also considered as a variant of horizontal FDI (Demirhan and Masca, 2008).

![Figure 2.1: Different types of FDI](image)

Source: Author’s own work based on understanding.

### 2.2 Main FDI Theories

Various theories can be found in FDI literature. This paper only illustrates four representative FDI theories from the perspectives of international trade and investment theory and industrial organization theory.

#### 2.2.1 The Monopolistic Advantage Theory

Hymer (1960) firstly introduces imperfect competition into the field of foreign direct investment and puts forward the monopolistic advantage theory to explain the U.S

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\(^6\) Greenfield FDI is to invest new ventures in the host country, which is in contrast to mergers and acquisitions.
enterprises’ behaviour of investing abroad. Kindleberger (1969) makes a further supplementary of this theory. Market imperfections include imperfection in the goods markets, an imperfection in the factor markets such as capital and technology, imperfection caused by internal and external economies of scale and by governments’ interference such as tariffs and taxes. The first three market imperfections equip multinational enterprises with a monopolistic advantage while the government’s control provides an opportunity for MNEs to take full advantage of their firm-specific ownership. Therefore, the monopolistic advantage theory holds the view that firm-specific ownership plays a significant role in multinational enterprises’ decisions to serve a foreign market. These assets are more valuable to invest abroad than domestic production, which makes multinational enterprises able to compete with domestic firms in the host country. Furthermore, market imperfections are beneficial to retain the monopolistic advantage.

Since put forward, the monopolistic advantage theory has been extended and improved by many scholars. Johnson (1970) confirms the importance of knowledge transfer to foreign production. Caves (1971) points out that the monopolistic advantage mainly embodies differential products to satisfy the demands of consumers at different levels.

**2.2.2 The Internalization Theory**

The concept of internalization originates from Coase (1937), who indicates that firms are likely to internalize the market if lower transaction costs can be achieved in the context of market failure. In view of this concept, Buckley and Casson (1976) put forward the internalization theory. It is further modified and extended by Rugman (1986). Buckley and Casson (1976) take transaction costs into account when analysing oversea production. The internalization theory stresses the impact of imperfections in intermediate product markets. These intermediate products include knowledge related to research and development (R&D) and components required in each production process. In order to protect their proprietary knowledge, firms select to establish a foreign subsidiary rather than licensing. These intellectual property rights are easily appropriated via licensing or outsourcing production. Unlike the monopolistic advantage theory, Buckley and Casson (1976) argue it is the internalization of the market that firms are able to transfer these advantages with lower costs.
Figure 2.2: Alternatives to serve a foreign market
Source: Author’s own work based on understanding.

2.2.3 The Product Life Cycle Theory

Vernon (1966)’s product life cycle theory describes five stages of production: introduction, growth, maturity, saturation and decline. Based on these five stages, products are divided into three categories: new products, mature products and standardized products. The product innovation firstly occurs in developed countries. At this stage, low sales and immature products are responsible for local production. With the development of technology, foreign-market penetration takes place horizontally in developed countries with similar levels and consumption structures. It is then followed by foreign production in less developed countries with lower labour and material costs. Although the product life cycle theory elaborates on the timing of foreign direct investment, the reasons for two-way investments between developed countries and developing countries are still unclear.

2.2.4 The Eclectic Theory of International Production

Given the monopolistic advantage theory and the internalization theory, Dunning (1977) absorbs the location factor and puts forward the eclectic theory of international production. Three advantages could account for multinational enterprises’ decisions of foreign-market penetration. They are ownership-specific advantages, internalization advantages and location-specific advantages (OLI model). Only when a firm possesses all three advantages can it take part in foreign direct investment. When a firm only has ownership-specific advantages, licensing is the first choice. If a firm lacks locational advantages, it can adopt domestic production and trade with others.
2.3 The Tariff-jumping Argument and the Occurrence of FDI

2.3.1 The Tariff-jumping Argument

Mundell (1957)⁷ is the first one to investigate the interplay between tariffs and capital movement formally. In the framework of the Stolper-Samuelson theorem, the result describes that increasing capital moves toward a labour-abundant (capital-scarce) country if this country imposes tariffs on import products. The restrictions to capital movement, in turn, promote trade. The extreme case is that no trade happens under perfect factor mobility. Therefore, tariffs could finally eliminate trade if firms invest abroad along a specific route (Rybczynski-line), which unveils a substitution relation between trade and FDI. This opinion has shed substantial light on the tariff-jumping FDI studies.

Brander and Spencer (1987) make a more precise illustration about tariff-jumping FDI that foreign firms undertake direct investment in the destination market and set up local production instead of export when a country imposes a high import tariff. In a nutshell, the optimal duty is more attractive than the optimal tax to induce foreign direct investment. This tariff-jumping argument reveals that trade and FDI are replaceable in the face of a tariff wall.

2.3.2 Tariffs and the Occurrence of FDI

Although tariff-jumping FDI was formally put forward in 1987, the influence of trade policy on foreign production has drawn scholars’ attention since the early 1970s. The mainstream of international trade theory demonstrates that high tariff motives foreign firms to jump over the protected market by setting up local production due to incremental costs of exporting, which is in line with the tariff-jumping FDI (Bhagwati, 1980; Brecher and Findlay, 1983; Brander and Spencer, 1987; Ellingsen and Wärneryd, 1999). It has been written in Bhagwati’s book that a country may design the trade barrier precisely to induce foreign investment. Brander and Spencer (1987) find that a state may strategically impose the optimal tariff to make foreign investment more

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⁷ It is differences in factor endowment that foreign investment substitutes for export in the Mundell model.
attractive for multinational corporations. Ellingsen and Wärneryd (1999) also agree that high tariff tends to stimulate international firms to invest directly in the protected market. Since the tariff-jumping argument is put forward, it has been widely applied to the literature related to tariff-jumping welfare, the cost-induced effect of tariff-jumping FDI, and location-induced effect of tariff-jumping FDI (Brecher and Findlay, 1983). Other studies emphasize the impact of time on multinational activities (Bende-Nabende, 2002; Nonnemberg and de Mendonça, 2004). The positive effects of tariffs on FDI may be weaker in the long run (Chan and Wong, 2003).

In addition to import tariffs and quotas, the study of antidumping duties provides additional insight into tariff-jumping FDI. A large volume of studies in the late 1990s focus mainly on Japanese FDI response to the antidumping policy of the EU and the United States with different aggregated data and confirm the existence of tariff-jumping FDI. It has been found that technological sourcing and tariff-jumping are two vital drivers of the US and Japan FDI in the 1980s (Neven and Siotis, 1996). Barrell and Pain (1999) use a country-level study to conclude with a positive correlation between antidumping duty and Japanese FDI into the two markets. The same finding is reported by Blonigen and Feenstra (1996) with 4-digit SIC industry-level data. Belderbos (1997) further disaggregates data into firm and product level and draws the same conclusion that antidumping duties both in the US and EU have a positive impact on Japanese FDI, although much stronger in the EU. Not only in the US and EU, but the increasing number of Japanese firms in the UK also reveals antidumping duty stimulates foreign investment (Girma et al., 2002). However, tariff-jumping is only found in developed countries owing to considerable multinational experience (Blonigen, 2002). A further study about the welfare effect of antidumping-jumping FDI finds greenfield FDI has a more serious negative impact on domestic firms’ profits than other forms (Blonigen et al., 2004). In short, various studies of Japanese responses to the EU and the US antidumping duties reflect the existence of tariff-jumping FDI.

More empirical studies have found strong evidence to support the hypothesis that tariff-jumping acts as the motive of FDI in the United Kingdom (Dunning, 1958; Girma et al., 2005; Girma et al., 2002), in Australia (Brash, 1966), in Canada (Horst, 1972a), in Korea (Singh and Jun, 1999), in Pakistan (Khan and Nawaz, 2010), in Africa (Grunfeld and Svindal, 2000).

More recently, a study by Ghazi (2018) investigates the determinant of FDI in Indonesia during the period 2011 to 2016. It has been found that the degree of openness
has a considerable impact on attracting inward FDI, and thereby most FDI in Indonesia is tariff-jumping FDI. Among all the literature, the high level of FDI is found to be the result of tariff-jumping incentives in both developed countries and developing countries.

However, there are groups of people who oppose the tariff-jumping argument. Contrary to the traditional analysis, Orr (1975) argues that no obvious relation is found between trade protection barriers and FDI. This is agreed by Smith (1986) when investigating the interaction between trade policy and foreign direct investment in an oligopolistic model. He argues it depends on different oligopolistic equilibrium. Moreover, a tariff is likely to discourage rather than encourage foreign direct investment. On the basis of Smith’s analysis, Motta (1992) assumes that local producers are allowed to enter the market. In the context of high tariffs, a foreign firm may be forced to give up the protected market, giving rise to more competitive pressure among domestic firms. In particular, incremental trade costs increase local producers’ bargaining power, thereby making it less possible to jump over barriers through mergers and acquisitions. Therefore, no evidence shows that mergers and acquisitions are motivated by tariff-jumping (Tekin-Koru, 2005). More evidence can be found in Argentina (Cuadros et al., 2004), and Sub-Saharan (Razafimahefa and Hamori, 2005).

Literature in the political economy modifies the tariff-jumping FDI with tariff-threat-defusing FDI, where FDI is driven by defusing the possibility of future protectionist threats, not avoiding. A series of studies by Bhagwati (1985; Bhagwati et al., 1987; Bhagwati et al., 1992) argues that tariff-defusing is a universal phenomenon compared to tariff-jumping. FDI may be firstly induced by high tariffs or other barriers, and then be used as an efficient way to alleviate the high threat of protection (Blonigen and Feenstra, 1996). Other opinions include that tariffs act as an incentive of FDI only with a proper level of protection (Beladi et al., 2009; Blonigen et al., 2004).

Although high tariffs are in favour of tariff-jumping FDI in general, various trade barriers end with different results. Raising tariffs will encourage tariff-jumping FDI and discourage foreign export on the condition of high-level initial protection (Ding, 2018). In addition to high import tariffs, the low tax rate is considered to be a significant policy incentive to attract FDI. However, Brander and Spencer (1987) develop a model to consider the tariff as an endogenous variable and also take credibility constraints and unemployment into consideration. They find that the optimal tariff is more likely to attract FDI than the optimal tax. In other words, a high tariff would facilitate FDI. In contrast, a price-undertaking dampens FDI. Vandenbussche et al. (1999) adopt a three-
stage model to analyse the choice of the EU administration between an antidumping duty and a price-undertaking. A price-undertaking is chosen as duty may lead to FDI, which would result in fierce price competition and place local firms in a very challenging situation. Belderbos et al. (2004) also find that price-undertaking decreases the motivation to undertake FDI. However, a duty-jumping will occur if firm-specific assets are transferable.
Table 2.1: Literature related to the impact of tariffs on FDI

<table>
<thead>
<tr>
<th>Opinions</th>
<th>Representative studies</th>
<th>Empirical studies</th>
</tr>
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<tbody>
<tr>
<td>High import tariffs induce FDI.</td>
<td>Bhagwati, 1980;</td>
<td>Japan</td>
</tr>
<tr>
<td></td>
<td>Brecher and Findlay, 1983;</td>
<td>Belderbos, 1997; Blonigen and Feenstra, 1997;</td>
</tr>
<tr>
<td></td>
<td>Ellingsen and Wärneryd, 1999;</td>
<td>Barrell and Pain, 1998;</td>
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<td></td>
<td></td>
<td>Blonigen, 2002; Blonigen et al, 2004;</td>
</tr>
<tr>
<td>Tariffs do not necessarily motivate FDI.</td>
<td>Orr, 1975; Smith, 1987;</td>
<td>Argentina</td>
</tr>
<tr>
<td></td>
<td>Motta, 1992; Tekin-Koru, 2005;</td>
<td>Cuadros et al., 2004;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-Saharan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Razafimahefa and Hamori, 2005;</td>
</tr>
<tr>
<td>It stresses the importance of tariff-defusing FDI, or ‘quid pro quo FDI’.</td>
<td>Bhagwati,1985; Bhagwati et al., 1987; Bhagwati et al., 1992;</td>
<td>Japan Blonigen and Feenstra, 1996;</td>
</tr>
</tbody>
</table>

Source: Author’s own work based on understanding.
2.4 The Relationship Between Trade and FDI

The relations between trade and FDI have stirred up extensive discussions and debates in international trade and investment literature. The popular opinion is that the increase in trade costs (e.g., import tariffs) is likely to motivate foreign firms to shift to direct investment. Therefore, the development of trade would deter multinational entry in the host country. In other words, there is a substitution relationship between trade and FDI. However, industrial organization studies provide an alternative view that high export cost is not necessary to induce horizontal FDI, and a complementary relationship is also found in some countries. Other studies demonstrate an uncertain relationship between the two.

2.4.1 Horizontal FDI and Export Substitution

The tariff-jumping argument and proximity-concentration hypothesis provide strong support for the substitution relationship between FDI and trade. Traditionally, it has been argued that tariff-jumping is one of the most important motives of FDI. According to the tariff-jumping argument, high tariffs or other trade protection policies discourage export and thus encourage firms to jump to the protected market by establishing affiliates, giving the appearance of the substitution between trade and tariff-jumping FDI (Taylor, 2000). Tariff-jumping FDI, therefore, is also known as export-substituting FDI. They are all regarded as a variant of horizontal FDI (Demirhan and Masca, 2008).

The first serious discussion and analyses of tariff-jumping FDI emerged during the 1960s with the opinion that tariff has a significant impact on MNE’s locational decisions (Brash, 1966). In the face of a high external tariff, MNEs choose to establish local production rather than export in order to acquire more profits. This argument has been further confirmed by a large volume of anecdotal and empirical studies both in developed countries and developing countries.

Empirical studies have reported trade-FDI substitution relationships in developed countries. As early as the 1930s, scholars found that many U.S MNCs established or expanded affiliates during the Great Depression when foreign countries erected a tariff wall (Wilkins, 1974). Similar conclusions can be drawn from the study of US export to Canada (Horst, 1972a). When studying Japanese production activities in North
America and Europe in the 1980s, Wakasugi (1994) and Barrell and Pain (1999) find the motive of Japanese FDI is to avoid export barriers such as voluntary export restraints (VER) and antidumping measures. Similarly, Belderbos and Sleuwaegen (1998) affirm that Japanese FDI in the electronics industry has substituted for exports. It has also been found in European countries (Swedenborg, 1979; Svensson, 1996). However, a further study by Tekin-Koru (2005) confirms that there is no evidence that M&A is motivated by tariff-jumping in Sweden during 1987-1998 at the firm level. Moreover, firm-specific assets do not affect cross-border mergers and acquisitions.

Evidence has also been presented in emerging countries, though. An empirical study of FDI between 28 African countries and the OECD countries from 1980-1992 shows that tariff-jumping is a strong motive if FDI in Africa (Grunfeld and Svindal, 2000) and substitution has been found between export and FDI (Aizenman and Noy, 2006). Cuadros et al. (2004) investigate inflow FDI in Latin America and the Caribbean countries and draw the conclusion that export depresses FDI in Brazil. However, exports explain FDI in Mexico.

More literature on this topic includes the characteristics of individual firms. This substitution relationship between exports and local production is shown in single-product firms in the theory of international involvement of firms under the conditions that if a firm has ample firm-specific assets and sufficient locational advantages for operating a plant abroad (Hirsch, 1976; Dunning, 1981; Caves and Caves, 1996). Not only in single-product firms, but the substitution also exists in multi-product firms. Several studies have attempted to explain the preconditions for multinational companies to substitute FDI for exports.

Cost is one influencing factor for firms’ decisions to switch from export to FDI. The tariff-jumping FDI describes the high trade cost of external tariffs gives rise to foreign investment. However, Buckley (1982) argues that the optimal timing for foreign firms to shift to direct investment depends on the costs of operating in the host market, its demands as well as the growth of the destination market. If the demands in the foreign market could make up the fixed costs caused by direct investment, firms tend to invest abroad immediately rather than export. This kind of FDI is termed horizontal FDI by Markusen (1984). The proximity-concentration hypothesis is widely used to explain MNCs’ horizontal expansion. MNCs’ decision to direct investment is motivated by proximity to consumers at the cost of a reduced scale with differentiated products in an oligopoly or monopolistic market (Krugman, 1983; Horstmann and Markusen,
1992; Brainard, 1993). Therefore, FDI prevails over export in the condition of higher transport costs and trade barriers as well as lower plant scale economics and investment barriers. Moreover, the opposite moving direction between affiliate sales and trade with increasing advertising intensity implies that advertising-intensive products are more likely to jump to the host market by setting up a local presence (Brainard, 1993).

Productivity is another determinant of the modes of servicing oversea markets. Melitz (2003) provides a dynamic industry model to use productivity levels to explain heterogeneous firms’ decisions to serve the domestic market or export. He finds that only the most productive firms engage in export. This is further proved by Helpman et al. (2004), who introduce heterogeneous firms into the proximity-concentration hypothesis to examine the relations between productivity and horizontal FDI. The model developed by Helpman, Melitz and Yeaple assumes the decision between export and FDI depends only on the purpose of market access, which implies all investments are horizontal FDI. The results demonstrate that the most productive firms choose to invest abroad while the least productive firms only focus on the domestic market. Firms with moderate productivity levels take part in export. More empirical studies have been done in the United States (Yeaple, 2009), UK (Girma et al., 2005), Japan (Head and Ries, 2003; Tomiura, 2007), and France (Chen and Moore, 2010) to further prove these findings. It can be concluded that the productivity level is positively related to the propensity to FDI and negatively related to export.

However, export substitution does not exist in every country. For instance, Blomstrom et al. (1988) do not find evidence to support export substitution in Sweden although it exists in several US industries. The inconsistency can be explained by other forms of FDI, such as export-platform FDI and vertical FDI (Belderbos and Sleuwaegen, 1998). The former aims to export to other foreign countries by establishing affiliates in one foreign country while the latter motivates the demands of components, thus leading to increases in exports. In addition, the spill-over effect generated by creating customer loyalty prompts multi-product companies to export more other products. This is further confirmed with the study of Japanese FDI into the EU to evade antidumping policy (Belderbos and Sleuwaegen, 1998). If firms invest in distribution activities and acquire European firms, and if there is a vertical production-specialization system within Keiretsu, firms will substitute components exports for FDI.

Another exception is that the FDI response to antidumping is different from other barriers. In the presence of antidumping policy, although some foreign firms have an
advantage in FDI over exporting, they may do the opposite to increase exports. This is the behaviour of protection-building trade, which is to put pressure in the host country to rule out other foreign rivals by increasing export (Blonigen and Ohno, 1998). This action, on the one hand, protects the domestic industry. It may cause more substantial losses for the host country, however.

2.4.2 Vertical FDI and Export Complements

Mundell (1957) describes a substitution relation between trade and FDI. However, this conclusion is only valid under the assumption that factors are the same, and only factor proportions are different in the Heckscher-Ohlin model (Markusen, 1983). Factor movement and commodity trade act as complements in a more general idea.

Helpman (1984) introduces multinational firms into factor endowment model and put forward vertical FDI, which stresses the impact of factor endowment on firms’ choice. If there is little factor difference, the factor price can be equalized through trade. FDI takes place in countries with enormous factor difference. Multinationals export intermediate products to the host country, and the final products would be supplied to both the home country and the host country. Therefore, there is a complementarity between vertical FDI and export. However, they are still substitutes for final products.

Although numerous empirical studies have validated the tariff-jumping argument and confirmed the substitution relation between trade and FDI, recent evidence suggests that tariffs are negatively related to FDI (Hollander, 1984; Pfaffermayr, 1996). For instance, a complementary relationship has been found between FDI and exports in seven Austrian industries (Pfaffermayr, 1996). In the bilateral trade and FDI between the US and Japan, outward FDI is positively associated with exports for both (Eaton and Tamura, 1994). Contrary to the findings of Swedenborg (1979), Blomstrom et al (1988) demonstrate that a high level of foreign production increases Swedish export to that market. More specifically, the study of Swedish MNCs’ activity suggests that foreign production and exports of finished goods are alternatives, and foreign production and exports of intermediate goods are complements. Contrary to previous empirical studies, the net effect is significant in European countries (Svensson, 1996).

Similar relationships also exist in the United States. Lipsey and Weiss (1981) find that US foreign production tends to increase its export to the market by a cross-section
study both at the country level and industry level, which indicates a complementary relationship between export and direct investment. On balance, there is a positive relationship between US foreign output and its exports of intermediate goods and final goods to the market. However, FDI is only positively related to exports of intermediate goods in other countries (Lipsey and Weiss, 1984). It is not surprising that foreign investment promotes the export of intermediate goods to the market. However, Lipsey and Weiss (1984) have confirmed it also increases the export of finished goods to that market.

More evidence can be found in emerging countries (Nonnemberg and de Mendonça, 2004; Faini, 2004; Aizenman and Noy, 2006; Ghosh, 2007). One the one hand, less-developed countries devote to protecting domestic industries through elevating tariffs. One the other hand, they intend to attract more inflow FDI to contribute to economic growth, which is the opposite of a developed country. Therefore, it gives great significance for emerging countries to figure out the relation between tariffs and FDI. Evidence presented so far includes the positive relationship between trade and FDI both in single countries and regions. For instance, it has been proved in China by a bilateral data with 19 countries and regions (Liu et al., 2001), Mexico (Cuadros et al., 2004), Turkey (Ghosh, 2007; Erdal and Tatoglu, 2002), Pakistan (Hakro and Ghumro, 2007). Studies also provide evidence in the Asia-Pacific economies by a cross-sectional study (Stone and Jeon, 2000), Latin America (Addison and Heshmati, 2003), manufacturing sector of APEC countries (Lee and van der Mensbrugghe, 2001), sub-Saharan and other Africa countries (Asiedu, 2002; Bende-Nabende, 2002; Kandiero and Chitiga, 2006; Onyeiwu and Shrestha, 2004), southeast European countries (Botrić and Škufljić, 2006).

Trade liberalisation plays an essential role in the complementary trade-FDI relationship. With the development of economic globalization and regional integration, tariffs have been significantly reduced to seek cooperation. Therefore, tariff-jumping, which prevails in the era of protectionism, is not the main motive of FDI anymore. Instead, FDI is motivated by resources and efficiency (Dunning and Lundan, 2008). A complementary relationship between export and investment exists widely in vertical FDI, which breaks up the production value chain and separates different stages in different locations. More specifically, most FDI in emerging countries is backward vertical FDI (Faini, 2004). Therefore, foreign investment increases exports of intermediate products. In addition, the complementary relationship can be explained by
differences in technology (Martens, 2008) and market sizes or proximity of sources of demand (Tadesse and Ryan, 2002).

Table 2.2: Literature about the relationship between FDI and export.

<table>
<thead>
<tr>
<th>Opinions</th>
<th>Representative studies and theories</th>
<th>Empirical studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Horizontal FDI and Export Substitution</strong></td>
<td>The tariff-jumping argument: Mundell, 1957; Brander and Spencer, 1987; Proximity-concentration hypothesis: Krugman, 1983; Horstmann and Markusen, 1992; Brainard, 1993;</td>
<td>US Horst, 1972a; Wilkins, 1974; Japan Wakasugi, 1994; Belderbos and Sleuwaegen, 1998; Barrell and Pain, 1999; Europe Swedenborg, 1979; Svensson, 1996; Africa Grunfeld and Svindal, 2000; Aizenman and Noy, 2006; Latin America Cuadros et al., 2004;</td>
</tr>
<tr>
<td><strong>Vertical FDI and Export Complements</strong></td>
<td>Helpman, 1984;</td>
<td>Austria Pfaffermayr, 1996; Japan Eaton and Tamura, 1994; Sweden Blomstrom et al., 1988; US Lipsey and Weiss, 1981; 1984; China Liu et al., 2001; Mexico Cuadros et al., 2004; Turkey Erdal and Tatoglu, 2002; Ghosh, 2007; Pakistan Hakro and Ghumro, 2007; Asia-Pacific Stone and Jeon, 2000; Latin America Addison and Heshmati, 2003;</td>
</tr>
</tbody>
</table>

Source: Author’s own work based on understanding.

### 2.5 The Choice between Tariff-jumping FDI and Export

#### 2.5.1 Proximity-concentration hypothesis

There has been a heated dispute about a foreign firm’s strategic choice between tariff-jumping FDI and export in an oligopolistic model (Smith, 1986; Brander and Spencer, 1987; Horstmann and Markusen, 1987, 1992). From the perspective of cost, the main costs of exporting are iceberg-type transportation cost and ad valorem tariff. By contrast, multinational firms are faced with a fixed cost and marginal production cost when setting up affiliates in the destination market to jump over barriers. Since FDI could
evade all tariffs, save transportation costs as well as respond flexibly and agilely to market changes, it is regarded as a better choice to undertake FDI. This is widely analysed in the literature related to the cost-induced effect of tariff-jumping FDI and proximity-concentration hypothesis as a typical example (Brainard, 1993; Markusen and Venables, 2000; Helpman et al., 2004).

The proximity-concentration hypothesis generates essential insights into the way for multinational firms to serve a foreign market. It reveals a trade-off between access to the destination market (horizontal FDI) and scale economies caused by concentrating production in the home country (export). Horizontal FDI takes place whenever market access exceeds economies of scale to become the primary purpose for multinational firms.

Brainard (1993) puts forward the proximity-concentration hypothesis to explain a firm’s choice to serve a foreign market. She claims that whether exporting or FDI is a trade-off between gains from proximity to consumers and concentrating production. In a two-sector two-country model, Brainard draws a conclusion that a higher level of transportation costs and trade barriers lowers plant-level fixed costs relative to firm-level fixed costs, making FDI more attractive. It is more beneficial to establish plants under the circumstance of higher firm-level fixed costs. When the market size increases in the host country, more demands on production will lower plant-level fixed costs. Therefore, horizontal FDI is more likely to be adopted by firms if firm-level fixed costs are very high and the market size is sufficiently big.

Markusen and Venables (2000) introduce market size and factor endowments into the proximity-concentration model to emphasize the importance of these two factors in determining oversea production or export. It has been found that FDI is more prevalent in a country with a bigger market size and more similar factor endowment. With the horizontal expansion, multinational firms replace export by replicating the same production activities in the host country and supply for the local market.

Although Brainard (1993) and Markusen and Venables (2000) provide valuable insights into the proximity-concentration hypothesis, their conclusions are drawn under the assumption of firm homogeneity. Therefore, firms act as either pure exporters or oversea producers within the same industry. It is impossible to export and invest abroad at the same time, which is contrary to the facts. Put it differently, it could not give a reasonable explanation of why firms in the same industry adopt different strategies to serve a foreign market.
As early as the research on the intra-industry impacts of international trade, Melitz (2003) notices the importance of heterogeneity on a firm’s export choice. When productivity is added to a dynamic industry model in monopolistic competition, only the most productive firms can afford transportation costs and other trade costs to export to the market. The least productive firms exit the market with the development of trade. Firms that lie somewhere in between focus merely on the domestic market.

Similarly, Helpman et al. (2004) include heterogeneous firms in the proximity-concentration model and reach a similar conclusion: In the framework of heterogeneous firms, FDI prevails over export among the most productive firms although they can undertake both. Due to profitable volume sales, the most productive producers are more attracted by tariff-jumping FDI. Firms with a moderate level of productivity serve foreign markets by exporting. The least productive firms give up foreign markets. This finding is further proved by Head and Ries (2004) when studying 1070 Japanese firms’ decisions of export or FDI. Moreover, investors are predicted to be more productive than exporters if there is no cost advantage in the host country.

Within the same framework of firm heterogeneity, FDI is further subdivided into greenfield foreign direct investment and cross-border mergers and acquisitions by Nocke and Yeaple (2007). They come to the conclusion that the nature of firm heterogeneity plays an important role in firms’ foreign entry modes. Cross-border M&A is usually selected by investors either with the highest or lowest level of productivity. Besides, cross-border M&A is more beneficial to the host market, while greenfield FDI benefits welfare in the home country.

In summary, the proximity-concentration hypothesis makes a contribution to explain foreign firms’ modes of entry from the perspective of cost and productivity. The higher trade barriers and transportation costs, the more efficient firms are likely to undertake tariff-jumping FDI. Generally speaking, firms with lower marginal costs actively engage in horizontal production expansion, either through greenfield FDI or cross-border mergers and acquisitions. In contrast to the marginal cost, Cole and Davies (2011) pay more attention to heterogeneous fixed costs by bringing it and ad valorem tariff into the Help-Melitz-Yeaple (HMY) model (Helpman et al., 2004). If the benefits of evading high import tariff exceed the fixed cost of setting up subsidiaries, the choice of tariff-jumping FDI is over export.

Whether marginal costs or fixed costs, the viewpoints mentioned above stress the importance of cost on entry modes. However, Motta (1992) holds the opposite view that
cost variables have no influence on the choice between FDI and export. The conventional second-order selection effects provide another insight that it is a trade-off depending on profits rather than the marginal cost (Mrázová and Neary, 2013). Although this opinion agrees that more productive firms engage in activities with lower marginal costs, the critical thing is whether FDI is more profitable. Ding (2018) believes whether FDI or export is a trade-off between a fixed cost and marginal production cost of setting up affiliates and iceberg-type transportation cost and ad valorem tariff of export. A firm with a higher marginal cost is likely to invest abroad, as long as the operating profits of FDI outweigh export profits (Ding, 2018).

2.5.2 Quality difference

In addition to marginal costs, the quality difference of foreign products also profoundly impacts firms’ tariff-jumping FDI choice (Wang et al., 2011). It has been found that increasing foreign products’ quality requirements encourage firms to invest abroad instead of exporting, while the higher quality requirements of domestic products increase the possibility of foreign firms’ export. Therefore, under the same tariff level, firms producing high-quality products are more likely to engage in FDI. This provides another insight into the unbalanced flow between developing countries and developed countries.

2.6 Tariff-jumping FDI and Its Welfare Implication

This section focuses on the impact of tariff-jumping FDI on the host country’s welfare, including positive effects and negative influence. Owing to the problem of data collection and differentiating FDI, scholars have been lack of research on this topic. Only a few have systematically investigated the occurrence of tariff-jumping FDI.

Most literature has considered tariff-jumping FDI as an endogenous variable. The usual way of examining welfare is to compare welfare under tariffs with free trade. One the one hand, the tariff-jumping activities lead to fierce domestic competition and thus weaken the market power of local firms, curtailing the welfare payback of the primary trade protection policy (Haaland and Wooton, 1998). On the other hand, the opinion of improving welfare would lead the related research to the optimal tariff. Although some scholars have explored the influence of tariffs on welfare (Jørgensen and Schröder, 2006; Demidova and Rodriguez-Clare, 2009), they rule out the possibility of FDI.
Mundell (1957) evaluates that there is no change in host-country welfare when the capital inflows by a tariff. Welfare remains the same as the pre-inflow of capital under free trade if no specialization.

### 2.6.1 Undermine Welfare

During the period of the 1960s to 1980s, the paradox of the welfare caused by tariff-induced capital inflow has aroused heated debate in academia. On the one hand, the theory of immiserizing growth is widely recognized among scholars. They held the view that the tariff-induced capital inflow leads to a reduction in welfare. Johnson (1967) indicates that the possibility of immiserizing a small country’s growth by the inflow of capital in the presence of tariffs. This is further examined by Bhagwati (1973) and Brecher and Alejandro (1977), who prove it is consistent with the theory of immiserizing growth to some degree. Jones (1984) and Neary and Ruane (1988) also find the adverse effects of endogenous capital flows motivated by a protective tariff in a small open economy. On the other hand, others argue that the theory of immiserizing occurs under certain conditions (Tan, 1968). If the growth is induced by capital accumulation, Johnson’s paradox of immiserizing growth takes place (Bertrand and Flatters, 1971).

Tariff-jumping FDI is detrimental to a small receiving country from the perspective of neoclassical economic theory (Bhagwati, 1973; Brecher and Alejandro, 1977). Under the classic two-product two-factor two-country model, the inflows of untaxed tariff-induced capital would result in the loss of the host country’s welfare if the specialization is incomplete. The results also indicate the importance of capital taxation to national welfare. The welfare would be improved if taking the taxation of foreign profits into consideration (Bhagwati, 1973). This outcome is further confirmed by Brecher and Findlay (1983). Their findings stress the negative influence of untaxed foreign investment on welfare.

When domestic firms are allowed to free entry or exit the market, FDI induced by high tariffs decreases the welfare in the host country (Horstmann and Markusen, 1992). Motta (1992) further proves that tariff-jumping FDI is beneficial to welfare only under the condition that domestic firms would not enter the market under free trade. Motta does not deny the possible welfare-improving effect with moderate tariffs, though.
Tariff-jumping FDI decreases domestic firms’ profits. Blonigen et al. (2004) adopt an event study methodology to examine the impact of US antidumping policy on domestic firm profits. These profits are mitigated when tariff-jumping FDI is possible. Other factors also play an essential role in national welfare, such as production costs, relocation costs, and demands in the protected market (Blonigen et al., 2004). Moreover, the negative impact of greenfield FDI is more extensive compared to any other type of tariff-jumping FDI.

2.6.2 Improve Welfare

There is no doubt that tariff-jumping FDI is beneficial to individual firms. However, whether tariff-jumping FDI could improve social welfare is uncertain.

The welfare is primarily influenced by entry modes where tariffs play a crucial role. Irarrazabal et al. (2013) introduce intra-firm trade into the HMY model to study the multinational production of the manufacturing industry in Norway. A corollary of their findings is that cutting off FDI has only a minor effect on the welfare loss in the home market. However, Ding (2018) stresses the importance of FDI to welfare implication. He takes ad valorem tariff and horizontal FDI into account. Based on the HMY model, high import tariffs rule out the least productive firms to focus only on the domestic market while making the most productive firms shift to FDI from export. Therefore, high tariffs will induce more tariff-jumping FDI, reduce the aggregate foreign firms, and thus generate a pro-competitive environment for domestic firms. In addition, the existence of non-cooperative tariffs protects low-productivity firms to some degree (Cole and Davies, 2011). Unlike previous research where foreign firms act as either multinationals or pure exporters, Cole and Davies build a model where these two roles coexist in equilibrium. By studying the endogenously chosen tariffs, they find that FDI increased Nash equilibrium welfare through alleviating the pressure of tariff competition (Cole and Davies, 2011). Ding (2018) finds a new way to reduce the non-cooperative tariff to improve welfare by the decrease of misallocation, while the traditional opinion is that a tariff will distort resource allocation (Brecher and Findlay, 1983).

Although it is very costly to invest abroad, tariff-jumping FDI could improve welfare in the presence of a significant spill-over effect (Xu, 2001). The advanced technologies and know-how brought by foreign investment accelerate industrialization
in the developing countries. Once indigenous firms have learned from foreign firms, it is suggested to the host country to lower tariffs to liberalize.

Contrary to conventional wisdom, it is possible to improve the economy of the receiving country on the premise with a tax on mobile capital (Dehejia and Weichenrieder, 2001). This is because the tax revenue may lead to a fiscal externality. However, it is criticized as a 'beggar thy neighbour effect.

2.6.3 The Optimal Tariff in the Presence of Tariff-jumping FDI

A protective tariff is one of the tools for developing countries to attract foreign investment. Gastanaga et al. (1998) collect comprehensive panel data of 49 less-developed countries during 1970-1995 to test the tariff-jumping FDI hypothesis. The results show that foreign investment in less-developed countries is more strongly induced by tariff-jumping rather than export potential, although import tariff harms FDI in the long term. Therefore, trade liberalization would replace tariff-jumping as an essential motive for FDI.

However, the principal purpose of tariff-jumping FDI is to avoid trade barriers. The most common way is to establish new plants in the host country, which would possibly have a severe impact on domestic firms. If the phenomenon of tariff-jumping FDI is inevitable, the optimal trade protection policy is a vital problem to be solved by the government. Previous strategic tariff literature has emphasized the importance of tariff-jumping in welfare implications (Horst, 1971; Smith, 1986; Motta, 1992). However, the optimal tariff has been ignored.

The surge of FDI inflow would lead to fierce competition in the destination market. Domestic firms are not well-positioned to compete with these multinational enterprises equipped with lots of experience and advanced technology. Contrary to conventional wisdom, indigenous firms prefer a limit level of protection to high import tariffs (Ellingsen and Wärneryd, 1999). This is because high import tariffs are more likely to foster tariff-jumping FDI. Instead, it has been proved that the optimal tariff is just low enough to deter the entry of foreign investment. However, limit level protection is not equal to zero tariffs. Although it has been advocated by many organizations and countries to liberalize trade, zero tariff is not the best choice due to its strike to small local firms. Ding (2018) proves that consumer’s preference has a significant impact on the optimal zero tariffs. When the relative demands for differentiated products are
sufficiently high, the positive effect on consumers could overcome the negative impact on firms.

In addition to tariffs, other forms of trade barriers play a vital role in entry modes. Voluntary export restraints are more effective than tariffs in deterring the entry of foreign investment and thus protect indigenous firms. However, it is criticized by Blonigen and Cole (2011) with the opinion that no foreign investment exists in the equilibrium. This is the result of a firm homogeneity assumption.

Belderbos et al. (2004) posit price undertakings as a better way. EU administration prefers price-undertakings over duties for the purpose of maximizing local producer surplus, which attracts more exports. Price-undertaking has a similar effect with voluntary export restraints (VER), while FDI gives rise to price competition. When a direct foreign investment is possible, Levinsohn (1989) draws a conclusion that the effects of optimal tariffs and quotas are the same under the context of an oligopolistic market.

2.6.4 Implication of Trade Liberalization

Trade liberalization is the reduction of tariffs or non-tariff barriers to promote the free movement of goods and services. Trade liberalization or degree of openness could be measured in various ways. First, the most common way to examine trade liberalization is the ratio of total exports and imports of goods and services to GDP (Benassy-Quere et al., 2000; Asiedu, 2002; Kandiero and Chitiga, 2006; Addison and Heshmati, 2003; Onyeiwu and Shrestha, 2004; Nonnemberg and de Mendonça, 2004; Razafimahefa and Hamori, 2005; Aizenman and Noy, 2006; Botrić and Škuflić, 2006; Hakro and Ghumro, 2007) or its logarithmic form (Ghosh, 2007). Second, external tariffs and its mathematical transformation are used to define trade liberalization, such as a log of nominal average import tariffs in the target market (Grunfeld and Svindal, 2000; Lee and van der Mensbrugghe, 2001; Faini, 2004). Other forms include the net export to the host country, imports or the ratio of export to import (Erdal and Tatoglu, 2002; Bende-Nabende, 2002; Liu et al., 2001; Cuadros et al., 2004).

In terms of the tariff-jumping argument, this kind of FDI is motivated by high tariffs. Therefore, tariff-jumping FDI prevailed in the age of trade protectionism. However, with the development of economic globalization and regional integration, more and more countries engage in either bilateral relations or multilateral cooperation.
Tariff-jumping FDI is expected to be reduced in light of this trend (Blomström and Kokko, 1999; Nunnenkamp, 2002). On the one hand, liberalisation policy encourages foreign firms to take the form of joint ventures rather than tariff-jumping FDI when entering the host country, which is more profitable (Beladi et al., 2009). On the other hand, multilateral trade liberalisation would induce firms to adopt export-platform FDI rather than export directly due to the high transport cost by considering a Cournot duopoly model (Collie, 2011).

The tariff-jumping FDI argument suggests that preferential liberalization would demotivate investment in the host country. Contrary to an institution, Medvedev (2012) examines the influence of the preferential trade agreements on FDI inflows, and the results show a positive relationship in the period of the 1990s to 2000s, which is driven by a developing country. However, Blomström and Kokko (1999) and Nunnenkamp (2002) argue that the effect of trade liberalization on FDI depends on the motives. A decrease in FDI is in response to the motivation of tariff jumping. By contrast, an increase is likely to be in vertical FDI, whose motive is to make the most of intangible assets.

Preferential trade agreements (PTAs) also have a significant impact on MNCs’ strategy. It motivates multinational firms to alter their strategy from greenfield investment to cross-border M&A, although greenfield investment is more likely to improve the welfare in the host country (Kim, 2009). In addition, the early tariff-jumping FDI intensively exists in the manufacturing industry while now is the service industry. FDI in the manufacturing industry seeks efficiency rather than avoid barriers (Nunnenkamp, 2002).

Although trade liberalization has dramatically reduced tariffs, importing countries could apply non-tariff barriers. For instance, the Agreement on Technical Barriers to Trade (TBT), which was issued by WTO in 1995, allows countries to establish standards for products for customer safety and environmental protection (Wang et al., 2011). However, little attention has been paid to the effect of product quality on tariff-jumping FDI. Compared to low-quality product-producing firms, firms producing high-quality products are more likely to adopt FDI (Wang et al., 2011).

In summary, the tariff-jumping motive of FDI prominently exists in early research (Taylor, 2000). The greater openness, especially in developing countries, makes tariff-jumping less attractive to induce FDI in a protected market (Kokko, 2002). Trade
liberalization would replace tariff-jumping as the more critical motive of FDI (Gastanaga et al., 1998).

2.7 Tariff-jumping FDI and Its Sectoral Effects

Most FDI research is conducted at the country-level and industry-level. However, firm-level studies have found foreign direct investment has different sectoral impacts. The early product life cycle theory proves that firms with more research and development input tend to invest abroad compared to those who focus only on domestic production (Vernon, 1971). Horst (1972b) draws a similar conclusion on the U.S. affiliates in Canada. Moreover, the opposite moving direction between affiliate sales and trade with increasing advertising intensity implies advertising-intensive products are more likely to jump to the host market by setting up a local presence (Brainard, 1993).

More recently, Barry et al. (2016) find that foreign direct investment is more prevalent in some sectors of the economy than in others. FDI tends to be commonplace in advertising-intensive sectors (where brands need to be protected) and Research & Development-intensive sectors (where forms of IP need to be protected). However, there are some exceptions. For instance, textiles and clothing are neither advertising-intensive nor R&D-intensive but attract substantial inward FDI in Ireland. In contrast, the construction sector hosted a few large indigenous multinational companies in Ireland, which is outward FDI. Management experience and supply chains could probably account for this phenomenon – why a country’s comparative advantage is another factor determining FDI-intensity (Barry et al, 2016). These idiosyncratic factors can be explained by the importance of ‘learning-by-doing’ (OECD, 2010).

Interestingly, Tobacco, Alcoholic and Soft Drinks, Confectionery and Dairy are included in advertising-intensive sectors while Meat Products are not, according to the classification provided by Davies et al. (1996). However, meat products are of great importance to the total export of Irish agri-business sectors. According to data provided by CSO, meat and meat preparations are the most important export products, accounting for 35.6% in 2016. There is a doubt whether the meat product sector is one of these exceptions. Provided that the UK beef producers have export links with EU markets, there is a considerable possibility to attract these UK firms to invest in Irish agri-business companies, which is likely to limit the damage of Brexit on Ireland’s agri-business sector.
Table 2.3: Advertising- and R&D- intensive industries, late 1980s

<table>
<thead>
<tr>
<th>Type 2A</th>
<th>Type 2R</th>
<th>Type 2AR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oils and fats</td>
<td>Basic chemicals</td>
<td>Paint and ink</td>
</tr>
<tr>
<td>Dairy products</td>
<td>Industrial and agricultural chemicals</td>
<td>Pharmaceuticals</td>
</tr>
<tr>
<td>Fruit and vegetable products</td>
<td>Domestic and office chemicals</td>
<td>Soaps and detergents</td>
</tr>
<tr>
<td>Confectionery</td>
<td>Man-made fibres</td>
<td>Tractors and agricultural machines</td>
</tr>
<tr>
<td>Animal foods</td>
<td>Machine tools</td>
<td>Radio and television</td>
</tr>
<tr>
<td>Other foods</td>
<td>Textile machinery</td>
<td>Domestic electrical appliances</td>
</tr>
<tr>
<td>Distilling</td>
<td>Transmission equipment</td>
<td>Motor vehicles</td>
</tr>
<tr>
<td>Wine and cider</td>
<td>Paper/wood machinery</td>
<td>Optical instruments</td>
</tr>
<tr>
<td>Beer</td>
<td>Other machinery</td>
<td>Clocks and watches</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>Computers and office machinery</td>
<td></td>
</tr>
<tr>
<td>Tobacco</td>
<td>Insulated wires and cables</td>
<td></td>
</tr>
<tr>
<td>Musical instruments</td>
<td>Electrical machinery</td>
<td></td>
</tr>
<tr>
<td>Toys and sports</td>
<td>Electrical equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Telecom and measuring equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electric lights</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Motor vehicle parts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Railway stock</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cycles and motor cycles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aerospace</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measuring instruments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medical instruments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rubber</td>
<td></td>
</tr>
</tbody>
</table>

Source: Davies and Lyons, Industrial organization, app. 2, pp. 258–60.

Compared with tariff-jumping FDI in the financial services industry, agri-business has been less extensively researched regarding tariff-jumping and Brexit. Although there are many uncertainties about Brexit, one thing is certain: it will be costly both to the firms and to the Irish economy. Since the UK agri-business firms have idiosyncratic advantages such as management experience, business networks and supply chains, they will not merely be replaced by Irish products. The question is that if the UK could relocate its factories in Ireland and use it as an export platform to access to the EU market, which is beneficial to both the UK and Ireland. Therefore, it is crucial to figure out the similarity between the Irish and UK agri-business export sectors.

Differences in geography and climate probably rule out areas such as Fish & Seafood, and Cereals sub-sectors. In addition, in the beverages sector, Scotch comprises the bulk of UK exports. As the EU has set tariffs at zero for whiskey imports, this sector will not be affected unless the UK loses access to other markets with which the EU has negotiated free trade agreements: e.g. South Africa, South Korea, Peru (PWC, 2016). The vast possibilities appear in the Meat and Dairy sectors, which are Ireland’s most active sectors.

Broadly speaking, tariff-jumping FDI includes three different forms, which are to establish a new foreign subsidy, to convert an existing foreign branch or establishment into a subsidy and to move jobs or activities form the parent company to a foreign subsidiary or form one subsidy to another. Although there three different forms, all the tariff-jumping FDI so far seems to have been Irish MNCs buying into the UK (i.e.
Northern Ireland) companies. For instance, Kerry and Glanbia and others already have substantial UK operations, which they can ramp up or down. If UK firms possess idiosyncratic advantages that have allowed them to make these strong sales into EU in the past, the strategy would be to bring them to Ireland to process here using Irish rather than UK inputs. Also, the focus of IDA in recent decades has been on large MNCs, but recall from the 1960s and 1970s that smaller FDI-inexperienced firms were the easier ones to attract. More details are discussed in chapter 5.

2.8 Summary

A large and growing body of literature has investigated FDI theories. With the rapid development of multinational enterprises, most studies take them into general equilibrium theory framework to investigate the influence of economies of scale and incomplete market structure on foreign direct investment.

Hymer’s privately-owned monopolistic advantage theory firstly discriminates foreign direct investment and foreign portfolio investment by introducing the firm’s control into FDI theory. Based on the Heckscher-Ohlin model and industrial organization theory, the monopolistic advantage theory affirms market imperfection is the key to acquire competitive advantages and gives a reasonable explanation of reciprocal investments among developed countries. However, this theory cannot interpret the investment behaviours of developing countries since they do not possess these monopolistic advantages. Second, this theory ignores the effect of FDI location selection. Furthermore, it is unclear why firms with technological know-how prefer direct investment to license.

The internalization theory in the 1970s focuses on imperfections in intermediate product markets. It makes a clear explanation of multinational enterprises’ choice among export, FDI, and licensing. Besides, it interprets the occurrence of FDI in developing countries to some degree. Although the theory of internalization of the market has been widely accepted to illustrate the motives and determinants of FDI, it ignores the positive impact of the market on FDI and MNEs’ location selection.

Many scholars attempt to formulate a clear structure of FDI theories in the 1980s and 1990s (Helpman, 1984; Markusen, 1984; Krugman, 1983; Ethier, 1986). The eclectic theory takes both structural market imperfection (the monopolistic advantage theory) and natural market imperfection (the internalization theory) into consideration.
and provides an essential insight into the motive of FDI. However, there is no single theory that could perfectly explain the MNEs’ behaviour of FDI.

Opinions on the relationship between trade and tariff-jumping FDI are deeply polarised. In the prevalence of protectionist, it is hardly surprising that a great deal of attention has been given to tariff-jumping FDI since the 1970s (Horst, 1971; Smith, 1986; Motta, 1992). The early concern is the influence of trade protection policies on multinational corporations’ strategic choice between export and local production. Although the tariff-jumping argument presents a reasonable explanation about it, some scholars take issue with this argument that high tariff does not necessarily induce foreign direct investment (Orr, 1975; Motta, 1992; Smith, 1986; Tekin-Koru, 2005). The literature in political economy revisits the tariff-jumping argument with tariff-defusing FDI, or quid pro quo FDI (Bhagwati et al., 1987; Bhagwati et al., 1992; Blonigen and Feenstra, 1996). Above all, although the tariff-jumping argument has been widely recognized, the causality between tariff and FDI is still disputed.

The trade-FDI relationship is an old topic in this field. Most early studies assume that firms are homogeneous. Under this hypothesis, firms within the same industry undertake either export or direct investment to serve foreign markets, implying the opposite relation between trade and foreign direct investment. This is not factually correct. Helpman et al. (2004) take firm heterogeneity into consideration to study the influence of different levels of productivity on firms’ choice. It is Cole and Davis (2011) who solve the puzzle by bringing heterogeneous fixed cost into Help-Melitz-Yeaple (HMY) model, and they find pure exporters and multinational corporations coexist in the equilibrium. However, it is still disputed whether export and FDI move towards the same or opposite directions.

In short, the relationship between trade and FDI is inconclusive. The theoretical literature implies that it could be either substitutes or complements or both, depending on the assumptions (Lee and van der Mensbrugghe, 2001). Most literature on the tariff-jumping argument underlies the framework of the classical 2*2*2 Heckscher-Ohlin trade model of factor endowments. Only if the assumptions are satisfied can trade and FDI be substituted (Martens, 2008). Although the tariff-jumping argument indicates substitution trade-FDI relation, it could be influenced by technology, market size (Tadesse and Ryan, 2002), or even the level of disaggregated data (Orr, 1975).

8 Two commodities, two factors and two countries.
Recent literature provides insight into the complementary trad-FDI relationship both in developed countries and emerging countries, which indicates the prevalence of vertical FDI.

In summary, scholars and economists have investigated tariff-jumping FDI from different perspectives during the past three decades, including the area of international trade theory and game theory, the location theory, decision-makers from multinational companies to government (Hwang and Mai, 2002). Due to the availability of data, the relevant research focused on the country-level and industry-level at the early stage. However, the rapid growth of multinational corporations and the breakdown of data shifted the focus to microdata at firm-level. From the perspective of countries, research was firstly conducted in developed countries such as the U.S., Japan and European countries. Later on, more scholars pay attention to developing countries.

Although more recent research has focused on the provision of trade-FDI relationships at firm-level, seldom pays attention to the agricultural industry. This paper disaggregates data into the 8-digit level to figure out the Irish-UK Agri-trade relationship under the condition of a no-deal Brexit. The story of how FDI developed so fast in the Irish agricultural industry is one of the high tariffs and non-tariff barriers. The argument that the substitution relationship between trade and FDI rests chiefly on the fact that precautionary tariff-jumping FDI has already been observed in the beef sector and dairy sector, as shown in chapter 5. Moreover, attracting FDI from the UK into Ireland is a potential solution for the Irish sector to fight its way out of trouble on the grounds of a no-deal Brexit.
This chapter consists of four sections: Section 3.1 gives a general introduction of Brexit. It answers three questions. First, what is Brexit? Second, why does the UK leave the European Union? Third, how does the UK withdraw from the European Union? Section 3.2 illustrates the event journal of Brexit, including both the process of the UK joining the EU and the timeline of withdrawing from the EU. Section 3.3 demonstrates the heated discussion of the future relationship between the UK and the EU. Section 3.4 generalises the potential impact of Brexit on the agriculture industry.
3.1 An introduction to Brexit

3.1.1 The momentous Brexit

The UK held a national referendum to decide to continue its membership in the European Union or not on 23 June 2016. The leave camp won by a narrow majority, with 51.9 percent votes for leaving the EU. Following the voting results, the UK triggered Article 50 of the Treaty on the European Union on 29 March 2017, starting a two-year transition period until it exits from the EU on 29 March 2019. However, the deadline for leaving the EU has been postponed to 31 October 2019 owing to the disagreements within the UK\(^9\). This is the momentous Brexit, a portmanteau of ‘British’ and ‘Exit’.

3.1.2 The procedures to withdraw from the European Union.

The procedures to leave the European Union should be made in strict accordance with Article 50 of the Treaty on the European Union. Firstly, the UK should invoke Article 50 and notify the European Council of its decision to leave the union. Then the UK has been given two years to formalise the new relationship with the EU (known as the Withdrawal Agreement), although this transition period can be extended if the European Council unanimously agrees on it. The EU27 European Council then provides guidelines after discussions. It is followed by a two-year negotiation process on the details of the withdrawal agreement between the UK and European Commission. With the consent of the European Parliament, the European Council concludes the agreement at the end.

\(^9\) The European Council can make a decision to extend the deadline of negotiation. See Article 50 of the Treaty on European Union(TEU): The Treaties shall cease to apply to the State in question from the date of entry into force of the withdrawal agreement, or failing that, two years after the notification referred to in paragraph 2, unless the European Council, in agreement with the Member State concerned, unanimously decide to extend this period, https://www.europarl.europa.eu/RegData/etudes/BRIE/2016/577971/EPRS_BRI(2016)577971_EN.pdf, accessed 15 July 2019.
Within the European Union, the decision-making process works in the following way. European Commission usually proposes a draft law. This draft law will then be amended by the EU Council and the European Parliament. After acquiring their approval, the law will be finally implemented by the European Council. In the process of Brexit negotiation, the European Council provides guidelines for the European Commission, which represents the EU to negotiate with the UK. The European Commission will report to the European Council and inform the European Parliament. After amendments, the European Commission then continues its negotiation with the UK.
Figure 3.2: The process of decision-making within the European Union

3.2 An event journal of Brexit

3.2.1 The process of joining the EU

The UK has experienced a long time to join the present European Union since its first application in 1961. After two rejections by French President Charles de Gaulle, the UK finally became an EU member in 1971 after De Gaulle’s resignation.

Table 3.1: The process of joining the EU

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 August 1961</td>
<td>UK Prime Minister Harold Macmillan submits a formal application</td>
</tr>
<tr>
<td></td>
<td>to join the European Economic Community (EEC), the predecessor of</td>
</tr>
<tr>
<td></td>
<td>the European Union (EU). However, this is rejected by French</td>
</tr>
<tr>
<td></td>
<td>President Charles de Gaulle in 1963 and in 1967.</td>
</tr>
<tr>
<td>In the 1970s</td>
<td>UK Prime Minister Edward Heath re-negotiates Britain’s entry to the</td>
</tr>
<tr>
<td></td>
<td>EEC after winning the 1970 general election.</td>
</tr>
<tr>
<td>1 January 1973</td>
<td>With the consistent effort of Prime Minister Edward Heath, Britain</td>
</tr>
<tr>
<td></td>
<td>joins the European Economic Community (EEC), together with Ireland</td>
</tr>
<tr>
<td></td>
<td>and Denmark.</td>
</tr>
</tbody>
</table>

Source: Author’s own work based on understanding.
3.2.2 The Timeline of Brexit

Brexit refers to the referendum of the UK’s decision to leave the European Union on June 23rd, 2016. However, this is not the first time for the UK to vote for leaving the EU. As early as in 1975, two and a half years after Britain joining the EEC, Prime Minister Harold Wilson held the first national referendum to decide if the UK remains in the European Community (EC) or not, which is known as the United Kingdom European Communities membership referendum. Sixty-seven percent of the public voted yes, and the UK could continue its membership in the EC. After this referendum, Britain’s membership has been repeatedly mentioned without any actual progress. Until 23 January 2013, Prime Minister David Cameron made a public commitment to hold an in-out referendum on EU-UK relationship if winning the 2015 general election. As promised, the national referendum was held on 23 June 2016, and the results announced the UK’s intention to withdraw from the EU. In terms of Article 50 of the Lisbon Treaty, the UK submitted a letter to formally notify EU President Donald Tusk, which has been approved by Britain’s parliament.
Table 3.2: The timeline of Brexit

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 February 2016</td>
<td>Prime Minister David Cameron announces the vote date is scheduled on 23 June.</td>
</tr>
<tr>
<td>23 June 2016</td>
<td>The leave camp win by a narrow majority in the referendum. 51.9 percent votes for Brexit while 48.2 percent votes to remain. However, David Cameron resigns after the referendum.</td>
</tr>
<tr>
<td>13 July 2016</td>
<td>Theresa May replaces David Cameron as prime minister. Although Theresa May votes to remain, she declares to complete Brexit and make every effort to work out the problem. Prime Minister Theresa May also promises to adopt a stricter immigration strategy, lessening the possibility of a soft Brexit.</td>
</tr>
<tr>
<td>17 January 2017</td>
<td>Prime Minister Theresa May delivers a Brexit speech and sets out a Brexit plan, announcing that the UK will leave the single market in order to regulate EU immigration.</td>
</tr>
<tr>
<td>2 February 2017</td>
<td>The British government releases the White Paper to introduce the procedures for Brexit officially.</td>
</tr>
<tr>
<td>29 March 2017</td>
<td>In a letter to notifying EU President Donald Tusk, Prime Minister Theresa May triggers Article 50 of the Lisbon Treaty and formally starts the process to leave the EU, which has been approved by Britain’s Parliament. The UK announces to withdraw from the EU within two years on 29 March 2019.</td>
</tr>
<tr>
<td>29 April 2017</td>
<td>The EU summit on Brexit responses with ‘Guidelines Following the Unites Kingdom’s Notification Under Article 50’ and updates its negotiating strategy with the UK.</td>
</tr>
<tr>
<td>8 June 2017</td>
<td>Prime Minister Theresa May loses the parliamentary majority in the general elections and has to form a minority government with the support of the Northern Irish Democratic Unionist Party (DUP).</td>
</tr>
<tr>
<td>19 June 2017</td>
<td>The first round of Brexit negotiations ends with a deadlock between David Davis, the UK’s Secretary of State for Exiting the European Union, and Michel Barnier, the Chief Negotiator nominated by the EU.</td>
</tr>
</tbody>
</table>
8 December 2017 The UK and EU reach a withdrawal agreement after six negotiation rounds in the first phase. The agreements include:

- citizens’ rights;
- the border problem between Northern Ireland and the Republic of Ireland;
- the financial settlement.

29 January 2018 The European Council updates negotiating directives on a transition period after Brexit. The second phase of negotiation begins.

19 March 2018 The UK and the EU reach a consensus on the draft Withdrawal Agreement. The UK will enjoy the benefits as if it were the EU member without participating in any decision-making affairs during the transition period, which will end on 31 December 2020. A backstop plan is also accepted by the UK to avoid a harder border between Northern Ireland and the Republic of Ireland.

20 June 2018 The Withdrawal Act is approved by Parliament and officially becomes law on 26 June 2018. However, the UK’s foreign secretary Boris Johnson and Brexit secretary David Davis resign owing to disagreement on Theresa May’s soft Brexit plans.

12 July 2018 The UK publishes the White Paper on future relations with the EU. It proposes a framework on the economic partnership, security partnership and cross-cutting cooperation.

14 November 2018 The UK and the European Commission reach a consensus on the draft Brexit Withdrawal Agreement regarding future EU-UK relationships at negotiators’ level, which has been agreed by the British cabinet.

25 November 2018 The Withdrawal Agreement is approved by other EU members.

15 January 2019 The Brexit deal is rejected by the Parliament with 432 votes (202 votes Yes).

12 March 2019 The Brexit deal is rejected again.

29 March 2019 The UK is supposed to withdraw from the EU, but the deal is rejected by the Parliament for the third time. The EU agrees to postpone it until April 12th.
<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 April 2019</td>
<td>The UK and the EU agree a deal to extend Article 50 until 31 October 2019.</td>
</tr>
<tr>
<td>2 July 2019</td>
<td>New European Parliament meets.</td>
</tr>
<tr>
<td>24 July 2019</td>
<td>New Prime Minister Boris Johnson, who is in favor of a hard Brexit.</td>
</tr>
<tr>
<td>31 October 2019</td>
<td>The new Brexit deadline.</td>
</tr>
<tr>
<td>31 December 2020</td>
<td>End of transition.</td>
</tr>
</tbody>
</table>

Source: Author’s own work based on understanding.

However, it remains uncertain whether the UK exits with or without a deal to this day. Standing the UK’s point of view, there are still a lot of obstacles during the negotiation process, both from the internal and external. Although the draft withdrawal agreement has been published, there are vast disagreements within the UK regarding citizens’ rights, the financial settlement, and the border problem. The Labour Party requires that remaining the Customs Union or the EU Single Market must be included in the deal while the Conservative Party rejects the Irish backstop agreement.
3.3 Brexit scenarios

The UK-EU relationship in the post-Brexit has aroused great concern in the world. In view of existing patterns of collaboration between the EU and other countries or organizations, five options have been offered to the UK. They are the EU-Norway model, EU-Turkey model, EU-Canada model, EU-Switzerland model, and WTO model. However, it is very confusing when figuring out the differences among these options. Therefore, this section starts with the relevant concepts to develop a clear picture of the future relationship between the UK and the EU. In general, various trade relationships are different in the integration level with the European Single Market.

3.3.1 Introduction

*Free Trade Agreement, Customs Union, the Single Market*

It can sometimes be very tricky to make a difference among free trade agreements, customs unions, and the single market, especially on some minor details. To put it simply, free trade agreements are concluded to eliminate tariffs among member states. In addition to exemption from tariffs, customs unions establish common tariffs towards third countries. Not only abolishing tariffs, but the single market also devotes to eliminating all barriers and is characterised by the free movement of goods, services, capital, and people among member states.

<table>
<thead>
<tr>
<th>Table 3.3: Comparisons between FTA, CU and the Single Market</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tariffs among member states</strong></td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td><strong>Common tariffs towards third countries</strong></td>
</tr>
<tr>
<td><strong>Indirect trade restrictions</strong></td>
</tr>
</tbody>
</table>

Source: Author’s own work based on understanding.
EFTA, EU, EEA, EUCU and Brexit

European Free Trade Association (EFTA) is an intergovernmental organisation which was built to promote the liberalisation of trade among its members. It only involves economic integration while excludes political integration. EFTA does not establish a customs union, and thus its member states are allowed to conduct bilateral free trade agreements. So far, EFTA has four members: Norway, Iceland, Liechtenstein and Switzerland.

Unlike EFTA, the European Union (EU) not only strengthens economic cooperation but promotes political integration. As the highest level of economic integration organisation in the present world, the EU establishes a customs union, forms common agriculture and fisheries policies, adopts monetary union and gradually develops a single internal market. Except for the UK, EU has 27 members up to now, which includes Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

The European Economic Area (EEA) was established in order to extend the European Single Market to non-EU countries. There is an overlap between EEA and EFTA. Liechtenstein, Iceland and Norway, three members of EFTA, joined the EEA to approach the single market. Switzerland is not a member of the EEA as it was rejected. However, all members of the EEA and EFTA are in the European Single Market (also known as the Common Market). EEA members join the EU Single Market in terms of
the EEA Agreements while Switzerland through individual bilateral treaties. In fact, EFTA membership is approximately equal to EU membership except for no political representation.

The European Union Customs Union (EUCU) is a trade agreement to eliminate tariffs on products among member states and shape common tariffs towards other countries’ products flowing into the internal market. All the EU members stay in the customs union. In addition, Turkey, Andorra, San Marino and Monaco participate in the customs union via separate bilateral agreements. Notably, all EFTA members are in the single market but not in the customs union. In contrast, Turkey and the other three countries are out of the single market while in the customs union.

Figure 3.5: The relationship between the EU and the European Union Customs Union
Source: Author’s own work based on understanding.

What happens after the UK leaving the EU? First, it will leave the EEA according to Article 126 of the EEA Agreement. It is clearly stated in the EEA Agreement that membership is only attainable for either EU or EFTA member states\(^\text{10}\). If the UK leaves the European Union, it will withdraw from the EEA automatically since the UK is not a member of EFTA. Second, it is uncertain if the UK leaves the Single Market or Customs Union since no deal has been concluded up to now.

\(^{10}\) Article 126 of the EEA Agreement: The Agreement shall apply to the territories to which the Treaty establishing the European Economic Community is applied and under the conditions laid down in that Treaty, and to the territories of Iceland, the Principality of Liechtenstein and the Kingdom of Norway.
Figure 3.6: The relationship between Brexit and EEA  
Source: Author’s own work based on understanding.

All above, Brexit refers to the UK leaving the European Union, meanwhile, leaving the EEA. However, it is unsure if the UK will remain in the Single Market or Customs Union. This leaves the UK's future relationship with the EU uncertain, where different Brexit scenarios come in view of the existing collaborations between the EU and other countries. The off-the-shelf models consist of retaining in the European single market but leaving the customs union (EU-Norway), leaving the European single market but staying in the customs union (EU-Turkey), signing bilateral agreements with the EU (EU-Canada and EU-Switzerland) and conducting trade under World Trade Organisation rules.

A hard Brexit vs a soft Brexit

A hard Brexit, or no-deal Brexit, refers to the UK will not be able to conclude any deal with the EU before it leaves on 31 October 2019. In this case, the UK is not only leaving the European Union but also the European Single Market and the European Customs Union, suggesting that the UK is only allowed to conduct trade under World Trade Organisation rules. By contrast, a soft Brexit takes place when any deal can be concluded by the UK to maintain its membership in the Single Market.

3.3.2 EU-Norway scenario

The UK could follow the example of Norway to join the European Single Market through the EEA Agreement, which has been advocated by the Labour. It can be clearly
seen from the above figure that Norway stays in the single market but out of the European Union Customs Union. The full access to the common market grants Norway frictionless trade with the EU. In return, Norway makes significant contributions to the EU budget.

Taking a page from Norway, the UK would be able to keep a close trade relationship with the EU at the extreme. This deal has been widely considered as a soft Brexit. First, retaining the single market guarantees the free movement of goods, services, capital and labours. One the one hand, this is beneficial to the UK’s service industry including the financial sector, which is the economic backbone of this country. On the other hand, the free movement of people crosses the UK’s red line to restrict immigration. Under the scenario of EEA, Article 112 of the EEA agreement \(^{11}\) gives its members the right to impose control on migrants, which is possible in theory but is difficult in practice. Although Liechtenstein has successfully applied Article 112 on the grounds of the capacity of small country size to massive influxes of people, it is less likely for the UK in view of its size and economic development level, let alone the complicated procedures. It has to be unanimously agreed by other EEA members and reviewed every three months.

Second, it appeals to the UK as the European Court of Justice (ECJ) would have no jurisdiction in the UK except for the relevant single market rules. Instead, the UK would have been ruled by the EFTA Court due to its membership, intruding the UK’s foreign judges. In addition, Norway does not take part in the Common Agriculture Policy and the Common Fisheries Policy. Therefore, the UK would be able to make its own decisions on agricultural and fishery industry.

However, the EU-Norway deal has been criticized for many reasons. First and foremost, the hard border between Northern Ireland and the Republic of Ireland is inevitable as Norway is out of the customs union. Secondly, Norway is obliged to make considerable contributions to the EU Budget as always, although the bill is probably lower than before. It entails the cost of the operational programs that Norway engages in, such as research, which is usually paid by proportions. Additionally, Norway contributes to the Financial Mechanism in order to promote economic and social

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\(^{11}\) If serious economic, societal or environmental difficulties of a sectorial or regional nature liable to persist are arising, a Contracting Party may unilaterally take appropriate measures under the conditions and procedures laid down in Article 113.
integration within the EEA area (Matthews, 2015). Moreover, the UK is required to follow EU rules without participating in forming them.

In a nutshell, the EU-Norway deal is the least damaging form if the UK withdraws from the European Union. However, avoiding a hard border between Northern Ireland and the Republic of Ireland is a major concern for the UK. In order to solve this thorny problem, the Norway Plus (also known as Common Market 2.0) has been put forward by a group of Labour and Conservative Members of Parliament (MPs) as an alternative plan. The ‘Plus’ refers to special customs union arrangement with the EU. In this case, the UK would stay in both the single market and customs union. If so, the UK has less influence on its ability to negotiate its own trade deals. Although the Norway Plus option has received great support from the Tory and Labour Benches, it is less likely in reality. On simple reason is that third-country customs union is incompatible with the EFTA membership according to Article 56 of the EFTA Convention. Moreover, Norway has no interest in inviting the UK to join the EFTA.

**3.3.3 EU-Turkey scenario**

If the UK wants to retain access to the single market without accepting the four freedoms as Norway, the UK could also take lessons from Turkey to stay in the European Customs Union and leave the Single Market. This deal essentially abolishes customs checks and tariffs on all industrial goods traded between Turkey and the EU. Some processed agricultural goods, such as confectionery, are also covered in the deal. Another benefit of this option is that Turkey does not need to pay a hefty fee. More importantly, the UK is allowed to impose control on the free movement of people, which is a contentious issue. Staying in the customs union means the hard border problem between Northern Ireland and the Republic of Ireland is easily solved to a great extent.

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12 Article 56 of EFTA Convention: Any State acceding to this Convention shall apply to become a party to the free trade agreements between the Member States on the one hand and third states, unions of states or international organisations on the other.

However, numerous obstacles and drawbacks make this option unappealing to the UK. Although the customs union involves all industrial products, it does not extend to services or finance, which plays a vital role in the British economy. Agricultural products are not included, either. Instead, it is managed by separate preferential agreements between Turkey and the EU. What discriminates EU-Turkey model from the EU-Norway model is that Turkey has to adhere to its trade policy with the EU’s and implement common external tariffs. This implies that the UK cannot conduct free trade agreements with countries outside the EU. Since Turkey is not involved in the decision-making process, there is no guarantee to satisfy Turkey’s interests when the EU negotiates trade deals with third countries. Moreover, EU’s free trade agreements with non-EU countries allow that country to access to Turkey’s market while its market is not necessarily opened to Turkey. The EU-Turkey arrangement, therefore, is regarded as a springboard to full EU membership to explain this bizarre deal\textsuperscript{14}.

3.3.4 EU-Switzerland scenario

The UK could learn from Switzerland to negotiate bilateral agreements with the EU. Since both Switzerland and Norway stay in the European Free Trade Association (EFTA), it is easy to lose sight of the line between the two. Although both Norway and Switzerland have access to the European Single Market, the way of market entry mode is different. As mentioned in section 3.3.1, Norway, together with Liechtenstein and Iceland, approach the European Single Market through the European Economic Area Agreement while Switzerland via individual bilateral treaties. Therefore, Switzerland has limited access to the common market for the services industry, which is different from Norway’s free movement of services. This has a very adverse effect on the UK’s financial services firms as they have no passports rights to sell services to the EU market. Extra permits would be required for services.

EU-Switzerland model has much in common with the EU-Norway model. Therefore, Switzerland is considered as a virtual member of the EEA (Matthews, 2015). First, Switzerland has to accept the free movement of people, which conflicts with the UK’s wish to impose control on immigrants. Second, it is necessary for Switzerland and Norway to make substantial contributions to the EU budget in return for EU market

access. Third, staying outside the customer union arises another heated issue – the Irish backstop. There has been a consensus between the EU and the UK to avoid guard posts and custom checks. In addition, Switzerland has no vote rights in the formulation of EU rules. However, settings all these aside, it took Switzerland two decades to conclude this deal with the EU.

3.3.5 EU-Canada scenario

EU-Canada is another template of negotiating bilateral agreements with the EU. The Comprehensive Economic and Trade Agreement (CETA) is a free trade agreement that the EU agrees to remove 98 percent of tariffs between the EU and Canada. Under the framework of these agreements, Canada is able to approach the single market partially, and financial services are included in. However, non-tariff barriers are still terrible walls between the two. All the products sent to the EU market by Canadian firms have to follow EU product standards and technical requirements. Rule of origin is another rule that Canada has to comply with. A certain proportion of the product is required to be made in Canada so as to acquire the preferential tariffs. In addition, extra quotas on crucial agricultural products implicate the UK is likely to pay a 12% tariff on most beef exports to the EU. Regardless of these, it took seven years for the whole negotiation process.

3.3.6 WTO scenario

If the UK leaves the European Union without any deal concluded, trade with the EU would be conducted under WTO rules. This is regarded as a hard Brexit due to high trade costs. Without any free trade agreement or preferential tariff agreement, the UK export firms are in the face of the EU’s common external tariff while EU firms are charged with whatever tariffs the UK would impose. Hence, the UK’s firms can hardly compete with others in the EU market since the tariffs could increase costs substantially.

15 The full text of CETA is available at this link: https://ec.europa.eu/trade/policy/in-focus/ceta/ceta-chapter-by-chapter/
3.4 The Potential Impact of Brexit on Agriculture Industry

3.4.1 Brexit scenarios and agriculture

Retaining the Customs Union is the best way for the UK to minimize economic damage from a trade perspective. On the one hand, the UK can access to the single market as before. On the other hand, the UK does not need to spend a lot of time and energy to renegotiate tariffs and agreements with the EU, which is complicated and time-consuming. However, it is not beneficial to agricultural products as Customs Union members could restrict their imports with the excuse of legitimate health and environment. Moreover, this motion would probably be opposed by most members as it is against their will to leave the EU (Grant et al., 2016).

In order to realize the benefits of free trade and movement of workers, capital, goods and services, the UK could follow the example of Norway by remaining the European Economic Area (EEA) and re-joining the European Free Trade Area (EFTA). Although it is supported by most scholars as ‘a soft Brexit scenario’, this practice is a significant threat to the UK’s agri-food sector as the CAP regime is excluded in the EEA (Matthews, 2015; Van Berkum et al., 2016). For example, Norway, Iceland and Lichtenstein, who are members of EEA, have very limited access to the single market for agri-food products. Only tariffs on the non-agricultural components for processed agricultural products are removed (Matthews, 2015). Moreover, it is unlikely to construct an EEA agreement between the UK and EU from a political perspective as the UK is required to contribute to the EU budget as always and is restricted to all relevant EU Regulations but unable to impose any influence (Van Berkum et al., 2016). Taking a step back, even if there is an EEA agreement including agriculture, the UK could hardly benefit from it owing to rules of non-Customs Union, which means ‘all trade is subject to customs procedures including country of origin checks’ (Van Berkum et al., 2016, p17). Norway is an exception as Norway has different domestic farm policy instruments, and a higher level of support is offered to producers than within the CAP (Grant et al, 2016).

The third scenario is to follow the example of Swiss to have a new bilateral trade agreement with the EU based on a case by case, without free trade service. The difference between the EU-Norway and EU-Swiss model is that Swiss is in the
European Free Trade Area (EFTA) but not in the European Economic Area (EEA). In this scenario, the UK is able to negotiate with the EU in order to have a better development for its agri-food industry. For example, Switzerland signed Bilaterals I in 1999 and Bilaterals II in 2004 to gain an advantage for its agriculture and agricultural products (Grant et al., 2016). However, both Norway and Switzerland have higher-level support for producers, twice than other countries in the EU (Grant et al., 2016), which is a big challenge for the UK. Moreover, Switzerland is also limited by horizontal policies such as environment and competition. In addition, this kind of case-by-case agreement would be time-consuming.

Although the EU-Swiss model sounds like a good choice for the UK, it is opposed by the UK public due to it is restricted to EU regulations while having little influence on them. For example, the House of Commons Foreign Affairs Committee stated that ‘we agree with the Government that the current arrangements for relations with the EU which are maintained by Norway, as a member of the European Economic Area, or Switzerland, would not be appropriate for the UK if it were to leave the EU. In both cases, the non-EU country is obliged to adopt some or all of the body of EU Single Market law with no effective power to shape it’ (House of Commons Library, 2013, p17).

Some people believe that it is likely for the EU to form a free trade agreement due to the positive trade balance with the UK, especially in total agricultural trade (Van Berkum et al., 2016; Matthews, 2015). This is because EU has already had this kind of arrangement with other countries such as the EU-Canada Comprehensive Economic and Trade Agreement (CEAT) in 2014. Under this scenario, the UK could establish a new trade policy with third countries since it is no longer a member of the Single Market. However, opponents argue that most of these arrangements are with developing and emerging countries, but the UK is a former member of the EU (Grant et al., 2016). The trade between the UK and the EU is still restricted by border arrangements such as country of origin. More importantly, the free trade agreement excludes many agricultural duties. Although the UK could construct free trade agreements with other partners such as New Zealand, Australia, Mercosur and the US (Matthews, 2015), it is detrimental to the British agri-food sector as the EU is the most important export and import destination. Tariff Rate Quotas would probably be applied to these sensitive agricultural products such as sheep and lamb meat (Van Berkum et al., 2016).
If the UK were unable to achieve an agreement with the EU, the UK would trade with the EU following the Most Favoured Nation (MFN) clause of the World Trade Organization (WTO) (Bergin et al., 2017). In the case of this scenario, the UK would apply its MFN tariffs on imports from the EU, while the EU would impose its Common Customs Tariff (CCT) on UK imports. The final effect is to increase transaction costs both in the UK and the EU. Since the UK is a net importer of agri-food products, it would probably reduce the tariffs unilaterally, which would further impair farmers’ benefit due to the lower price (Grant et al., 2016).

In summary, whether a hard Brexit or a soft Brexit, agricultural trade could hardly benefit from it as only limited preferential access has been guaranteed by separate bilateral agreements (Matthews, 2015). As mentioned by Matthews (2016), the UK got into trouble with regulatory autonomy and transaction costs. Low transaction costs imply low regulatory autonomy, while high autonomy represents high transaction costs. Matthew (2016) argues that ‘UK membership of the EU is as much about broader, political questions as it is about economics.’ In conclusion, it is very challenging for the UK to decide which trade policy to adopt in order to maximize the integral benefit. Even the UK follows a Canada-EU solution, a Norway-EU solution or a Swiss-EU solution, it would still be a hard Brexit for the UK’s agricultural trade. This paper will take the extreme cases- a hard Brexit, where Irish-based firms lose all access to the UK market, and all UK-based firms lose all access to Irish and other EU markets.

3.4.2 Relevant Literature on Irish Agri-food Sector

There is a consensus that Brexit would hurt the Irish agricultural industry no matter what deal will be put in place (Purdue et al., 2015; Matthews, 2015, 2017; Donnellan and Hanrahan, 2016; Wordin, 2018). Before the UK hold the national referendum, Matthews (2015) discusses various potential Brexit scenarios and the implications on the Irish agricultural industry. Whether from points of view of Irish producers or consumers, Brexit would have a detrimental impact on the Irish economy. A later study by Matthews (2017) further illustrates the negative influence of Brexit on the Irish agri-food sector. Thorne et al. (2017) investigate the competitiveness of the Irish agri-food sector through measuring total cash costs and total economic costs. They conclude that the major competitors of the dairy sector within the EU are Belgium, Denmark, France,
Germany, Italy, the Netherlands, and the UK. In contrast, France, Germany, and the UK are in strong competitive positions in the beef sector.
Chapter 4 illustrates the methodology and data source. Data can be collected from different databases. However, this research focuses only on Eurostat for the purpose of data consistency. More details are presented in Section 4.1. In addition, data are disaggregated at different levels. 6-digit HS code is adopted for both the beef sector and dairy sector. However, an 8-digit CN code is further used for the dairy sector as a lot of intermediate ingredients under other categories are included in the dairy sector by the Department of Agriculture, Food and Marine. Section 4.2 is about formulas used in this research, including export similarity index and revealed comparative advantage index.
4.1 Data

Data can be collected from individual countries such as the Central Statistics Office (CSO) in Ireland and also other organisations such as WTO, OECD, Eurostat etc. Eurostat is finally chosen as the only data source for two reasons. First, this study concentrates only on intra-EU trade between Ireland and other EU countries, including the UK and other 27 EU countries in the presence of Brexit. Second, discrepancies may exist between Eurostat data and national data due to the use of a different concept for the data provided to Eurostat, which refers to the country of origin and country of consignment (see table 4.1). Since this study concentrates on the export side of Ireland and the UK within the EU market, there is no need to worry about data discrepancies. The 16-year period from 2000 to 2016 will be covered in this research.

Table 4.1: Difference of concepts and definitions between CSO and Eurostat

<table>
<thead>
<tr>
<th>Database</th>
<th>Export</th>
<th>Import</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intra-EU</td>
<td>Extra-EU</td>
</tr>
<tr>
<td>Eurostat</td>
<td>Country of final destination of goods(^{17})</td>
<td>Country of consignment</td>
</tr>
<tr>
<td>CSO</td>
<td>Country of final destination of goods(^{18})</td>
<td>Country of origin(^{19})</td>
</tr>
</tbody>
</table>

Source: Author’s own work based on understanding.

In addition, this study primarily focuses on the breakdown of agricultural products at the international level, utilizing 6-digit HS code and 8-digit CN code, in which all countries classify products in the same way. 6-digit code is used by the World Customs Organization’s Harmonized System (HS) to define products. The higher number of codes allows for more specific classification of goods. 8-digit CN code is used by China's customs for classification of imports.


\(^{17}\) **Country of final destination of goods**: For exports and dispatches, the trading partner is the country (or Member State) of final destination of the good. (as it is known at the time of export/dispatch). This practice is also applied by all Member States in their national figures.

\(^{18}\) **Country of final destination**: The last country to which the goods are specifically directed on their outward movement from the State is regarded as their final destination. This is not necessarily the country in which the goods will be unshipped or that in which they will be finally consumed.

\(^{19}\) **Country of origin**: Goods obtained or produced in one country originated in that country. A product, in the production of which two or more countries were concerned, is considered as originating in the country in which the last substantial manufacturing process was done. Packing, repacking, sorting and blending are not regarded as manufacturing processes.
digits, the more detailed definitions. 6-digit HS codes are the most detailed definitions that are used as standard. Based on the 6-digit HS code, the EU’s combined nomenclature (CN) uses 8-digit codes for a more detailed categorisation, followed by a description and a duty rate (see table 4.2). The CN 8-digit code used for dairy analysis is classified by the Irish Department of Agriculture, Food and Marine (DAFM)20.

Table 4.2: Descriptions of HS code and CN code

<table>
<thead>
<tr>
<th>Code</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS2 04</td>
<td>Dairy produce; Birds’ Eggs; Natural honey; Edible products of animal origin, not elsewhere specified or included</td>
</tr>
<tr>
<td>HS4 0401</td>
<td>Milk and cream; not concentrated or containing added sugar or other sweetening matter</td>
</tr>
<tr>
<td>HS6 040110</td>
<td>Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, not exceeding 1%</td>
</tr>
<tr>
<td>CN8 04011010</td>
<td>Milk and cream of a fat content by weight of &lt;= 1%, in immediate packings of &lt;= 2 l, not concentrated nor containing added sugar or other sweetening matter</td>
</tr>
</tbody>
</table>

Source: Appendix B. More details are available at: https://ec.europa.eu/eurostat/web/international-trade-in-goods/methodology/classifications

4.2 Methods

The primary purpose of this study is to find if it is an appropriate strategy for Ireland to attract tariff-jumping FDI to limit the damage of Brexit in the beef sector and dairy sector. Assuming there is a hard Brexit that the UK loses its access to the EU market, it would be an excellent opportunity for Ireland to capture the market if there is no difference between the UK and Ireland’s products. The premise is that Ireland has a stronger comparative advantage over these products than any other country in the EU market.

Hence, the export similarity index (ESI) is used to measure the similarity between exports of the UK and Ireland to the EU market. A higher ESI represents a more similar export commodity structure. In addition, the revealed comparative advantage index (RCA) is applied to measure the comparative advantage of Ireland’s beef products and

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20 Thanks Grainne Roughan for providing the detailed list of dairy products in the IIEA seminar.
dairy products in the EU market. If the value of RCA is greater than 1, it indicates that Ireland has a comparative advantage over these products in the EU market. If the value equals 1, it shows that Ireland has a neutral comparative advantage. Otherwise, it implies that Ireland has a comparative disadvantage in these products in the EU market.

6-digit HS code analysis was firstly conducted for the beef sector and dairy sector. Due to the complexity of the dairy sector, a further study at the CN 8-digit level (tariff line) was done to support the findings. The reason why I did not disaggregate data for the beef sector at CN 8-digit is that beef products are less processed compared with dairy products. There are many intermediate components of dairy products under other categories except for HS code under ‘04’ (i.e. 19011000; 21050010; 35011090).

### 4.2.1 Export Similarity Index

Export similarity index (ESI) can be divided into two categories: product similarity index and market similarity index\(^2\), which are essentially the same. The product similarity index is widely used to measure the similarity between exports of any two countries to a third market or in the world market, which was put forward by Finger and Kreinin in 1979. It ranges from zero if they have no exports in common to 100 if their products are identical. A converging export structure between the two countries is shown if the index increases over time. In the meanwhile, a higher export similarity index implies more fierce competition between these two countries in the market. In addition to measure the product similarity between two countries, this index is also widely applied to monitor the trend of rapid economic growth and the degree of industrialization, especially for developing countries. A decrease in the index implicates a higher degree of specialization. The two countries are complementary rather than competitors.

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\(^2\)For more details, please refer to Glick and Rose (1999).
Revealed Comparative Advantage Index was put forward by Balassa (1965), which is an index to measure the comparative advantage of a product or an industry of a country in the international market. Commonly, one is used as the standard to verdict if a country has a comparative advantage or not. However, the Japan External Trade Association develops a more detailed version. If the RCA index is over 2.5, it has extremely strong export competitiveness. If RCA is between 1.25 and 2.5, it has a relatively strong export competitiveness. If RCA is between 0.8 and 1.25, it has medium export competitiveness. Otherwise, it has a weak export competitiveness.

\[
ESI = \left( \sum \text{Min}\left( \frac{x^k_{iw}}{x_{iw}}, \frac{x^k_{jw}}{x_{jw}} \right) \right) \times 100
\]

\(x^k_{iw}: The \ amount \ of \ country \ i's \ export \ of \ products \ k \ to \ the \ target \ market;\)

\(x_{iw}: The \ total \ value \ of \ country \ i's \ export \ to \ the \ target \ market;\)

\(x^k_{jw}: The \ amount \ of \ country \ j's \ export \ of \ products \ k \ to \ the \ target \ market;\)

\(x_{jw}: The \ total \ value \ of \ country \ j's \ export \ to \ the \ target \ market;\)

4.2.2 Revealed Comparative Advantage Index

Revealed comparative advantage index was put forward by Balassa (1965), which is an index to measure the comparative advantage of a product or an industry of a country in the international market. Commonly, one is used as the standard to verdict if a country has a comparative advantage or not. However, the Japan External Trade Association develops a more detailed version. If the RCA index is over 2.5, it has extremely strong export competitiveness. If RCA is between 1.25 and 2.5, it has a relatively strong export competitiveness. If RCA is between 0.8 and 1.25, it has medium export competitiveness. Otherwise, it has a weak export competitiveness.

\[
BRCA = \frac{X^i_j}{X_j} \times \frac{X^i_w}{X_w}
\]

\(X^i_j: The \ export \ of \ commodity \ i \ in \ country \ j.\)

\(X_j: The \ total \ export \ of \ country \ j.\)

\(X^i_w: The \ export \ of \ commodity \ i \ in \ the \ world.\)

\(X_w: The \ total \ export \ in \ the \ world \ market;\)
Irish and UK agri-business firms have, for the last number of years, been engaged in substantial precautionary tariff jumping into each other’s markets. This chapter gathers some evidence on Irish and UK firms’ horizontal expansion activities in each other’s markets in the beef sector and dairy sector before and after the referendum. While it is evident that all of the major Irish and Northern Irish food processing companies have already taken steps to meet the challenges caused by Brexit, tariff-jumping FDI cannot overcome all of these difficulties. The meat industry is faced with what is known in the trade as the ‘carcass balance’ issue. Many of the prime cuts of meat are sold on the UK market, while much of the remainder goes to secondary markets in the rest of the EU. How tricky an issue will depend on relative price movements in post Brexit.
5.1 Beef sector

Most of the biggest beef processors in Ireland have already located production in the UK. Therefore, they can simply ramp up or down in the destination market to avoid potential tariffs and other trade barriers. For example, the Goodman Group, which is the largest beef processor in Britain and Ireland, already has more than forty processing plants across Europe, including two in Northern Ireland, and has been expanding its capacity in the UK, including a recent major investment in Scotland, in advance of Brexit. In addition, Waterford-based Dawn has already set up some small operations in the UK, including West Devon Meats.

In addition to wholly-owned subsidiaries, Irish beef firms also actively seek cooperation in the form of a joint venture, which has been found more profitable. Goodman ABP and Fane Valley’s (Northern Ireland) meat processing arm have recently established a joint venture, including international beef processor Slaney Foods and sheep meat business Irish Country Meats. In May 2017, Irish beef processor Dawn Meats (based in Waterford) reached an agreement with Tyrone-based Dunbia, which is Northern Ireland’s top three agri-business firms with two large local plants and seven in Britain, to establish a joint venture including its UK’s operations. These mergers and acquisitions are regarded as a pre-requisite to maximise the returns and strengthen the UK supply chain in a post-Brexit era. More recently, Irish meat processor Kepak announced acquisition with 2 Sister Red Meat Ltd (UK) in 2018. This is considered as a precautionary strategy to reinforce its customer supply chain in the presence of Brexit and exchange-rate volatility.

Most of the tariff-jumping FDI so far has been capital outflow in Ireland’s beef industry, with the majority to the UK market through the formation of setting up plants and mergers and acquisitions ahead of Brexit. However, Ireland also attracts inward FDI in the food processing sector. One of the world’s largest meatpacking companies, Brazilian giant JBS, planned to relocate its headquarter in Dublin in 2016. Although it had been called off at the end of that October due to the objection of its shareholder BNDES, it may keep an eye on the south of the border again in 2019, as reported by

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However, seldom inward tariff-jumping FDI from the UK has been observed in the beef industry except for the existing subsidiaries.

5.2 Dairy sector

Multinational dairy firms have dominated the UK market, as can be seen from the table below. Most of the sizeable Irish processing firms, without exception, have a strong production presence in the UK. The subsidiaries of Ornua and Glanbia, the leading Irish dairy companies, are among the top ten largest dairy companies in the UK in terms of turnover. In the case of Kerry, its existing UK operations are already primarily oriented to the UK market.

Table 5.1: The 10 biggest dairy companies in the UK in terms of turnover

<table>
<thead>
<tr>
<th>Company</th>
<th>Turnover (£ million)</th>
<th>Ownership</th>
<th>Country of Parent</th>
<th>Key Specialism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arla Foods UK</td>
<td>2,010</td>
<td>Farmer co-operative</td>
<td>Denmark</td>
<td>Own label and branded liquid milk, yoghurt, cheese and butter</td>
</tr>
<tr>
<td>Muller UK &amp; Ireland</td>
<td>1979</td>
<td>Privately owned</td>
<td>Germany</td>
<td>Own label and branded liquid milk, yoghurt and butter</td>
</tr>
<tr>
<td>Ornua Foods UK</td>
<td>592</td>
<td>Farmer co-operative</td>
<td>Ireland</td>
<td>Own label and branded cheese, butter and dairy ingredients</td>
</tr>
<tr>
<td>Dairy Crest</td>
<td>457</td>
<td>Publicly listed</td>
<td>Canada</td>
<td>Branded cheese, butter, spreads and dairy ingredients</td>
</tr>
<tr>
<td>Meadow Foods</td>
<td>427</td>
<td>Privately owned</td>
<td>UK</td>
<td>Bulk dairy ingredients</td>
</tr>
<tr>
<td>Dale Farm</td>
<td>341</td>
<td>Farmer co-operative</td>
<td>UK</td>
<td>Own label and branded liquid milk, yoghurt, cheese and butter</td>
</tr>
<tr>
<td>Yeo Valley</td>
<td>286</td>
<td>Privately Owned</td>
<td>UK</td>
<td>Own label and branded yoghurt</td>
</tr>
<tr>
<td>Glanbia Cheese</td>
<td>279</td>
<td>Publicly listed</td>
<td>Ireland</td>
<td>Own label cheese and dairy ingredients</td>
</tr>
<tr>
<td>First Milk</td>
<td>253</td>
<td>Farmer co-operative</td>
<td>UK</td>
<td>Own label cheese</td>
</tr>
</tbody>
</table>

---

In the face of the most probable no-deal Brexit, British dairy firms do not await their doom but try to escape the potential high import tariffs through expansions in the destination market. LacPatrick, the merger of two of the oldest milk co-ops in Ireland, invested €45 million to build a new facility at Artigarvan near Strabane to process raw milk from Northern Ireland without crossing the border, which provide most milk powder for LacPatrick exports (Connelly, 2017). Muller makes an investment of £50m in the UK to expand its yogurt production line.

Not only in the way of ramp up, but M&A is also a popular strategy adopted by British dairy firms. Meadow Foods, the UK’s largest independent-owned dairy group, has reached an agreement on the acquisition of Roil Foods Limited following its strategic objective of growth. Northern Irish dairy firms are already engaging in precautionary tariff jumping into Ireland. The Northern Ireland firm Strathroy Dairies takes steps to increase its southern milk pool and “has not ruled out developing a processing base in the Republic if Brexit becomes an issue for the sector” (Farming Independent Team, 2017).

Brexit also has a significant impact on dairy firms from other countries. With the approval of the UK’s Competition and Markets Authority (CMA), Arla Food announced its UK operation acquired the local family-owned Yeo Valley Group (based in England) in 2018. More recently, Dairy Crest Group PLC (UK) was bought by Montreal-based Saputo, a Canadian company. This is the first deal for Saputo to expand in Europe, and Dairy Crest is treated as an attractive platform to conduct more business in the UK. Although the potential high import tariffs and extra trade costs caused by customs checks and border delays can be solved by tariff-jumping FDI, the vital issue is to find markets for their products. For instance, milk powders produced in Northern Ireland export mostly to west African countries with the agreement of existing EU trade deals. Therefore, multinationals expand not only in the UK market but also in other main export destinations. American multinational food firm Mondelez agrees with the

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24 See ‘Who owns the dairy industry? The 10 biggest dairy companies in the UK’, Kevin White, available at: https://www.thegrocer.co.uk/rankings/who-owns-the-dairy-industry-the-10-biggest-dairy-companies-in-the-uk/590833.article
25 See ‘Meadow Foods Acquires Roil Foods’, Available at: https://meadowfoods.co.uk/meadow-foods-acquires-roil-foods/
acquisition of its processed cheese business by Arla Foods in the Middle East and Africa.

Table 5.2: Mergers and Acquisitions among the UK’s Dairy Firms

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Country of Parent</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017.09</td>
<td>LacPatrick</td>
<td>Northern Ireland</td>
<td>Invest £30m to build new facilities in Artigarvan, Northern Ireland.</td>
</tr>
<tr>
<td>2018.02.08</td>
<td>Arla Food Limited</td>
<td>UK</td>
<td>The UK’s Competition and Markets Authority (CMA) approved Arla’s acquisition of Yeo Valley Group (deal no. 1941035683)</td>
</tr>
<tr>
<td>2018.02.28</td>
<td>Meadow Foods</td>
<td>UK</td>
<td>Meadow Foods acquires Roil Foods.</td>
</tr>
<tr>
<td>2019.03.07</td>
<td>LacPatrick</td>
<td>Northern Ireland</td>
<td>Establish a partnership with Lakeland Dairies (Ireland) to create a new venture</td>
</tr>
<tr>
<td>2019.04.15</td>
<td>Dairy Crest Group PLC</td>
<td>UK</td>
<td>Dairy Crest acquired by Canada’s Saputo Inc (deal no. 1941194936)</td>
</tr>
<tr>
<td>2019.07.23</td>
<td>Muller UK &amp; Ireland</td>
<td>UK</td>
<td>Expands three production lines in Telford, UK</td>
</tr>
<tr>
<td>Other</td>
<td>Arla Food AMBA</td>
<td>Denmark</td>
<td>Arla's cheese factory in Germany and Martin Sengele is acquired by Vache Bleue (deal no. 1941186428)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arla Foods to acquire Mondelez International’s cheese business in Middle East and Africa (deal no. 1941166393)</td>
</tr>
</tbody>
</table>

Source: Orbis

Evidence of precautionary tariff-jumping FDI can also be observed in the Irish dairy industry. Based on their close relationship with the UK, most Irish dairy firms focus on the British market in the form of setting up plants, expanding production, mergers and acquisitions. Kerry Group, the leading dairy producer, conducts a series of M&A in the world market, including China, the United States, Netherlands, Spain, the Middle East and Africa. Glanbia, a dairy giant, has a range of joint ventures in Northern Ireland that already trade into the British market. Another Irish company, Lakeland Dairies, bought the large Northern Ireland company Fane Valley Co-op one month before the Brexit referendum was held. This has been described as providing the company with “a Brexit safety net” (Hogan, 2017). Two years later, in 2019, it has
reached an agreement with LacPatrick (based in Northern Ireland) to establish a new venture in order to process dairy across the border.

<table>
<thead>
<tr>
<th>Company</th>
<th>Date</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerry Group Public Limited Company</td>
<td>2017.04.30</td>
<td>Acquires China-based Tianning Flavour &amp; Fragrance (Jiangsu) and Taste Master, Chinese biggest food ingredients companies (deal no. 1909546221)</td>
</tr>
<tr>
<td></td>
<td>2017.10.11</td>
<td>US-based Ganeden agrees the acquisition by Kerry Group (deal no. 1909616530)</td>
</tr>
<tr>
<td></td>
<td>2018.04.03</td>
<td>Acquires Spain-based Hasenosa</td>
</tr>
<tr>
<td></td>
<td>2018.05.31</td>
<td>Buys majority stake in Ojah, Netherlands (deal no. 1941093307)</td>
</tr>
<tr>
<td></td>
<td>2018.11.28</td>
<td>Acquires AATCO Food Industries and Fleischmann's Vinegar Company in the Middle East and Africa (deal no. 1941152802);</td>
</tr>
<tr>
<td></td>
<td>2017.02.22</td>
<td>Glanbia Ireland to acquire Glanbia plc's Consumer Products, Ingredients Ireland and Agri-businesses (deal no. 1909547403)</td>
</tr>
<tr>
<td>Glanbia Public Limited Company</td>
<td>2017.06.01</td>
<td>Acquires Grass Advantage in the US (deal no. 1909589424)</td>
</tr>
<tr>
<td></td>
<td>2017.06.30</td>
<td>Acquires Body &amp; Fit in the Netherlands (deal no. 1909540003)</td>
</tr>
<tr>
<td></td>
<td>2017.07.03</td>
<td>Glanbia sells its Dairy Ireland Division to Glanbia Cooperative Society (deal no. 1909547371)</td>
</tr>
<tr>
<td></td>
<td>2018.12.31</td>
<td>Acquires Florida-based Slim-Fast Foods from Kainos Capital and HNS Intermediate (deal no. 1941042802)</td>
</tr>
<tr>
<td>Ornua Limited</td>
<td>2016.11.02</td>
<td>Acquires US-based CoreFX Ingredients division of MCT Dairies (deal no. 1909535049)</td>
</tr>
<tr>
<td></td>
<td>2017.08.22</td>
<td>Acquires UK-based FJ Need from Mr Paul Need and Mrs Tracey Need (deal no. 1909534829)</td>
</tr>
<tr>
<td>Lakeland Dairies</td>
<td>2016.05.03</td>
<td>Acquires the large Northern Ireland company Fane Valley</td>
</tr>
<tr>
<td></td>
<td>2019.04.01</td>
<td>Acquires LacPatrick Dairies (based in Northern Ireland) (deal no. 1941141907)</td>
</tr>
</tbody>
</table>

Source: Orbis

It is evident that food processing firms in both Ireland and Northern Ireland have taken measures to address the challenge caused by Brexit. Although the potential high import tariffs and extra trade costs caused by customs checks and border delays can be solved by tariff-jumping FDI, there are still many problems. First, most tariff-jumping FDI in the Irish dairy sector and beef sector is outward to protect their sales and critical customer supply chain in the UK market. It might be problematic as it would reduce demand for Irish agricultural outputs and employment in Irish-based agri-business
activities. Second, the key issue for these multinationals is to find markets after completing tariff-jumping FDI. For instance, milk powders produced in Northern Ireland are exported mostly to west African countries with the agreement of existing EU trade deals. Third, the meat industry is faced with the well-known ‘carcass balance’ issue in the trade, which is caused by the unbalance between supply and demand of various cuts. In the case of the UK, many of the best cuts are sold in the local market while other EU countries carve much of the leftover. The UK’s withdrawal from the EU would disrupt British carcass balance, and the seriousness of the problem depends on relative price movement after Brexit.
This chapter analyses the intra-EU trade in the beef sector using data disaggregated at 6-digit HS code level. It contains five sections: Section 6.1 describes the general trade conditions of the UK and Irish beef sector in 2016. Section 6.2 generalizes the top five major export destinations. Section 6.3 compares product differences between the UK and Ireland. Section 6.4 emphasizes the competitiveness of Irish beef products and section 6.5 concludes the Brexit implications for the Irish beef sector.
6.1 Trading Position as of 2016

6.1.1 EU28 intra vs EU28 extra

As one of the largest regional unions with the highest level of integration in the present world, the European Union plays a decisive role in promoting trade within the internal market, especially in the agriculture industry. Although the agriculture industry makes little contribution to GDP vis a vis manufacturing industry, it is the foundation of the national economy. Favoured with the advantage of climate and soil, Ireland is famous for its beef products and dairy products in the world.

The importance of the EU market to the agriculture industry is self-evident, both for Ireland and the UK. As can be seen from the following table, Ireland exports €1897 million beef products to the EU market (including the UK), accounting for 93 percent of total beef export in 2016. Only 7 percent of Irish beef is exported to the rest of the world. This implies that Irish beef export heavily depends on the internal market.

The UK is in a similar situation, although the EU market share is not as significant as Ireland. In general, the UK exports €439 million beef products to the EU market (including Ireland), accounting for 86 percent of its total volume. The rest 14 percent are exported to outside market.

In short, the EU internal market, as the most important export destination, has a significant influence on both Ireland and the UK’s beef products. It is noticeable, however, no matter in the EU market or outside market, Ireland exports more beef products relative to the UK. This is no surprise due to the large-scale cattle-raising industry in Ireland.

<table>
<thead>
<tr>
<th></th>
<th>EU 28 Intra</th>
<th>ROW(^{26})</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>1,897,156,272</td>
<td>142,368,854</td>
<td>2,039,525,126</td>
</tr>
<tr>
<td>UK</td>
<td>439,436,908</td>
<td>69,348,700</td>
<td>508,785,608</td>
</tr>
</tbody>
</table>

\(^{26}\)EU28 intra refers to all EU members including the UK while ROW is the rest of world.

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8
6.1.2 UK vs Ireland

The EU market is further subdivided into Ireland/UK and other EU markets (EU27) to figure out the importance of the UK market and Irish market to each other. Standing in Ireland’s point of view, among all the beef export to the EU market, half goes to the UK and the other half goes to the other 27 EU countries. There is no doubt that the UK is the single most important beef export destination for Ireland, as shown in Figure 6.1.

A different story could be told of the UK. Although Ireland acts as the UK’s crucial cooperative partner, it only shares 30 percent of UK’s beef export in the EU market. The rest 70 percent is carved up by other 27 EU members. Therefore, the EU 27 market is more crucial to the UK in terms of export volume. Again, in each market, Ireland exports much more volume of beef products than the UK.

![Ireland](image1.png) ![UK](image2.png)

Figure 6.1: The share of UK and Irish beef export in the world in 2016

Source: Author’s own calculation based on Eurostat.

So far, we cast a general glimpse of trade of beef products in or between the UK and Ireland. A close trade relationship in the beef sector can be observed among the UK, Ireland, and other EU markets. More specifically, Ireland is more dependent on beef export to the UK, while the UK relies more on the EU 27 market. However, it is still unclear to what extent Brexit, which is a momentous shift, affects beef export in the UK and Ireland.
There are growing signs of no-deal Brexit. Assuming there is a hard Brexit, the UK will lose its access to the EU market (including the Irish market) for beef products. Meanwhile, Ireland cannot enter the UK market to export its beef produces without any restrictions but remains free access in other EU markets. In the best case, if Ireland exports the same beef products as the UK, if Ireland targets the same markets as the UK, and if Ireland has a stronger comparative advantage than any other EU countries, UK’s withdrawn from the EU market provides Ireland an excellent opportunity to occupy the market.

6.2 Market Segments

The EU market is further subdivided into every single market by country. It has been discussed in section 6.1 that the UK is the single most important export destination for Ireland. Likewise, Ireland is also the biggest beef export market for the UK, although the share is much smaller.
Figure 6.2: Main beef export destinations in 2016  

*Source:* Eurostat, EU trade since 1988 by HS2,4,6 and CN8

In general, both Ireland and the UK have the same markets within the EU, which include Netherlands, France, Italy, and Germany in descending order, accounting for 86 percent and 84 percent of its total export, respectively. But distributions are quite different. Regardless of the UK, exports of Irish beef distribute very evenly among these four countries, around 8 percent of its total shipping, respectively. The UK has a slightly different situation. Netherlands and France are more important relative to the other two countries. Italy and Germany account for merely 8 percent and 6 percent of total beef trade conducted by the UK, twice in France and triple in the Netherlands.
Separately, in the continental markets, Netherlands is above elsewhere in importance, accounting for 10 percent and 24 percent for Ireland and UK’s total beef export, respectively. The export share to the Netherlands and France takes up more in the UK than in Ireland, while almost the same as Italy and Germany.

Table 6.2: Top 5 beef export destinations for the UK and Ireland in the EU Market 2016 (Euro)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Source: Ireland</th>
<th>Source: UK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Share</td>
</tr>
<tr>
<td>UK</td>
<td>982,562,202</td>
<td>52%</td>
</tr>
<tr>
<td>Ireland</td>
<td>197,825,680</td>
<td>10%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>159,265,573</td>
<td>8%</td>
</tr>
<tr>
<td>Italy</td>
<td>156,736,042</td>
<td>8%</td>
</tr>
<tr>
<td>Germany</td>
<td>128,745,403</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td>1,625,134,900</td>
<td>86%</td>
</tr>
</tbody>
</table>

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

However, in every single country of the top five export destinations, Ireland exports more beef than the UK. Actually, in most EU countries, Ireland exports more beef than the UK, excluding Bulgaria, Cyprus, Finland, Greece, Latvia, Romania, and Slovenia (Table 6.2). It seems to provide an excellent opportunity for Ireland to capture these markets if there is no difference between beef products in the UK and Ireland if Ireland has a stronger comparative than any other competitors. For example, the UK exports €6 million beef to Greece compared with Ireland’s €0.3 million. This is a great temptation for Ireland. Therefore, it is of great importance to figure out product differences.

Table 6.3: Markets where the UK exports more beef than Ireland in 2016 (Euro)

<table>
<thead>
<tr>
<th></th>
<th>Bulgaria</th>
<th>Cyprus</th>
<th>Finland</th>
<th>Greece</th>
<th>Romania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>346,494</td>
<td>66,855</td>
<td>338,927</td>
<td>279,634</td>
<td>21,489</td>
</tr>
<tr>
<td>UK</td>
<td>2,586,639</td>
<td>1,318,595</td>
<td>1,258,405</td>
<td>5,966,260</td>
<td>73,683</td>
</tr>
<tr>
<td>Difference</td>
<td>2,240,145</td>
<td>1,251,740</td>
<td>919,478</td>
<td>5,686,626</td>
<td>52,194</td>
</tr>
</tbody>
</table>

Note: Data is not available in Croatia for both the UK and Ireland. In addition, no disaggregated data available in Latvia and Slovenia for Ireland.

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8
6.3 Products Segments

6.3.1 Export similarity index

It can be concluded from the previous analysis of the trading position that the UK and Ireland have the same target markets. The next question to be figured out is whether Ireland and the UK have the same beef export products. If not, even if the UK is totally out of the EU market, it has little influence on Ireland’s market share owing to product differentiation.

The Finger-Kreinin index is often used to compare product export similarity between the two countries. First, as can be seen from Figure 6.3, most of the plots fall in the 80-100 range, and only three are below 50, which reveals their beef products are very similar in these markets. On the whole, the product similarity index reaches up to 95 in the entire EU market. On average, the mean is 86 in the top 4 export, excluding the UK and Ireland.

The highest is in Slovak (98) and the lowest in Greece (23). As mentioned at the end of section 6.2, a considerable difference in beef export volume is found in trade between Greece and the two countries. However, the results show that the possibility of different beef products is exported by the UK and Ireland. The hope of replacing the UK in Greek is shattered owing to produce difference.
Second, the preliminary analysis describes the top five export destinations. Besides, one-year data of 2016 maybe not enough to illustrate the situation. Therefore, a 16-year dataset from 2000 to 2016 is collected to observe the trend of competition and product similarity in every single market. On the whole, it unveils a general convergence of Ireland and the UK’s beef export in the individual country and the entire EU market, especially since 2011. This gives a sure sign of a more identical products and export structure between these two countries, at the same time, a fiercer competition.

Figure 6.3: Export similarity index of the UK and Ireland’s beef export in various market, 2016
*Source:* Author’s own calculation based on Eurostat.

Figure 6.4: Export similarity index of beef between Ireland and the UK, 2000-2016
*Source:* Author’s own calculation based on Eurostat.
6.3.2 Main export products

So far, it is already known that the UK and Ireland export very similar beef products to the EU market. So the question remains: what are the major export products for both countries? Figure 6.5 displays the main beef export produces (excluding five categories as they only account for 0.7 percent and 0.2 percent for the UK and Ireland, respectively). Ireland and the UK have the same main export product, which is Meat of bovine animals, boneless cuts, fresh or chilled (020130), accounting for 75% and 69%, respectively.

Figure 6.5: Intra-EU trade: beef export breakdown by main products in 2016

Note: Beef products can be divided into 11 different categories at 6-digit HS code. These six categories account for 99.3% and 99.8% for the UK and Ireland’s total beef export, respectively.

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

The export price data shown in Table 6.4 suggest, however, that the two countries may export different cuts of meat to the various markets. Since the average price is

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27 More details are shown in Appendix A.
calculated by total export value divides total quantity, the price difference is likely caused by zero export of Meat of bovine animals, carcasses and half-carcasses, frozen (020210) in Ireland.

Table 6.4: Irish price as % of UK export price on 020130 in the main destinations

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland/UK</td>
<td>116</td>
<td>87</td>
<td>91</td>
<td>91</td>
<td>85</td>
</tr>
<tr>
<td>Netherlands</td>
<td>95</td>
<td>110</td>
<td>93</td>
<td>115</td>
<td>103</td>
</tr>
<tr>
<td>France</td>
<td>77</td>
<td>82</td>
<td>70</td>
<td>73</td>
<td>78</td>
</tr>
<tr>
<td>Italy</td>
<td>113</td>
<td>111</td>
<td>109</td>
<td>111</td>
<td>120</td>
</tr>
<tr>
<td>Germany</td>
<td>132</td>
<td>121</td>
<td>135</td>
<td>128</td>
<td>138</td>
</tr>
<tr>
<td>EU28</td>
<td>108</td>
<td>100</td>
<td>103</td>
<td>115</td>
<td>113</td>
</tr>
</tbody>
</table>

*Note: Price = Total value / Total volume  
Source: Author’s own calculation based on Eurostat.*

6.4 Comparative Advantage

In general, Ireland only has a comparative advantage on 020130, 020610\(^{29}\) and 020621\(^{30}\). Except for its main product 020130, the other two categories account for less than 7% of Ireland’s total beef export.

Table 6.5: Revealed Comparative Advantage of beef products in the EU market, 2016

<table>
<thead>
<tr>
<th>6-digit HS(^{31})</th>
<th>Ireland</th>
<th>UK</th>
<th>Netherlands</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>020110</td>
<td>0.46</td>
<td>0.59</td>
<td>0.64</td>
<td>1.40</td>
<td>0.91</td>
<td>0.70</td>
</tr>
<tr>
<td>020120</td>
<td>0.19</td>
<td>0.30</td>
<td>0.66</td>
<td>2.39</td>
<td>1.19</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>020130</strong></td>
<td><strong>1.57</strong></td>
<td><strong>1.44</strong></td>
<td><strong>1.33</strong></td>
<td><strong>0.36</strong></td>
<td><strong>0.88</strong></td>
<td><strong>0.77</strong></td>
</tr>
<tr>
<td>020210</td>
<td>0.00</td>
<td>0.64</td>
<td>0.00</td>
<td>0.04</td>
<td>0.00</td>
<td>0.28</td>
</tr>
<tr>
<td>020220</td>
<td>0.11</td>
<td>0.56</td>
<td>0.97</td>
<td>0.29</td>
<td>0.32</td>
<td>0.86</td>
</tr>
<tr>
<td>020230</td>
<td>0.84</td>
<td>0.96</td>
<td>0.67</td>
<td>0.56</td>
<td>1.24</td>
<td>2.15</td>
</tr>
<tr>
<td><strong>020610</strong></td>
<td><strong>1.76</strong></td>
<td><strong>1.71</strong></td>
<td><strong>1.11</strong></td>
<td><strong>0.41</strong></td>
<td><strong>1.01</strong></td>
<td><strong>0.35</strong></td>
</tr>
<tr>
<td><strong>020621</strong></td>
<td><strong>1.02</strong></td>
<td><strong>0.07</strong></td>
<td><strong>0.38</strong></td>
<td><strong>0.46</strong></td>
<td><strong>0.53</strong></td>
<td><strong>0.17</strong></td>
</tr>
<tr>
<td>020622</td>
<td>0.52</td>
<td>1.16</td>
<td>1.45</td>
<td>1.01</td>
<td>0.74</td>
<td>0.46</td>
</tr>
<tr>
<td>020629</td>
<td>0.60</td>
<td>1.23</td>
<td>0.75</td>
<td>1.33</td>
<td>1.95</td>
<td>1.22</td>
</tr>
<tr>
<td>021020</td>
<td>0.01</td>
<td>0.09</td>
<td>0.96</td>
<td>0.71</td>
<td>0.77</td>
<td>7.26</td>
</tr>
</tbody>
</table>

*Source: Author’s own calculation based on Eurostat.*

---

\(^{28}\) Please refer to Appendix A for more details.

\(^{29}\) 020610: Offal, edible; of bovine animals, fresh or chilled

\(^{30}\) 020621: Offal, edible; of bovine animals, tongues, frozen

\(^{31}\) More detailed description, please refer to Appendix B.
However, in the EU market, Ireland has a stronger comparative advantage in 020130 than any other country. In each market, Ireland has a stronger comparative advantage in 020130 than in the UK. Therefore, there is no doubt that Ireland can take over the market on 020130 product when the UK exits. Other than the UK, the Netherlands is Ireland’s main competitor in this export category in these markets. As can be seen from Figure 6.6, France, Germany, and Italy have very weak competitiveness in 020130.

Figure 6.6: Revealed Comparative Advantage in the EU market, 2016: Main beef export product (020130)

*Note: Data for Cyprus, Luxembourg and Malta are not available.
Source: Author’s own calculation based on Eurostat.*

### 6.5 Brexit implications

Exact the same markets in the continental Europe, very similar product-export structure, main export product, much stronger comparative advantage, the markets seem to be within reach for Ireland if the UK totally exits the markets. However, there is a thorny problem. The total amount of the UK’s beef export is far less than in Ireland. As
mentioned before, Ireland sells €983 million beef in the UK market while all the beef export to the entire EU market (including Ireland) by the UK adds up to no more than €440 (Table 6.6 ). Ireland’s beef export is nearly four times the UK’s. Moreover, every single country of the top 5 main beef export destinations, Ireland exports much more beef products than the UK.

Table 6.6: Beef export in EU market in 2016 (Euro )

<table>
<thead>
<tr>
<th></th>
<th>UK</th>
<th>Ireland</th>
<th>EU 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Ireland</td>
<td>982,562,202</td>
<td>914,594,070</td>
<td></td>
</tr>
<tr>
<td>Source: UK</td>
<td>132,568,251</td>
<td>306,868,657</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8*

In the best case where Ireland has a much stronger comparative advantage in every single market than any other competitors, the market vacated by Brexit is just a drop in the bucket, too small to make up for the loss in the UK market. From the perspective of the UK, it is a thorny problem to find another way out. It does not exclude the possibility for the UK to seek new trade partners such as New Zealand and the US. However, high transportation costs and inevitable non ad valorem duty cause many troubles, no matter what agreements the UK and EU come to. Above all, Brexit is a disaster for both the UK and Ireland for their beef sector.

Although Brexit is just the beginning, there are many ways to get out of trouble. Tariff-jumping FDI is one option to alleviate the damage of Brexit on the beef sector. For export-oriented firms in Ireland, it is a good opportunity to invest in the UK market to jump over tariffs and other trade barriers. Similarly, British firms could undertake tariff-jumping FDI in Ireland, although the Netherlands is arguably the next financial centre in Europe. For one reason, Ireland is the UK’s single most important beef export destination, 7 percent higher than the Netherlands. For the other, the UK has a long history of trade and cooperation with Ireland in the agriculture industry owing to geographical location and cultural background.
This chapter analyses the intra-EU trade in the dairy sector using data disaggregated at the 6-digit HS code level. It contains five sections: Section 7.1 describes the general trade conditions of the UK and Irish dairy sector in 2016. Section 7.2 generalizes the top five major export destinations. Section 7.3 compares product differences between the UK and Ireland. Section 7.4 emphasizes the competitiveness of Irish dairy products, and section 7.5 concludes the Brexit implications for the Irish dairy sector.
7.1 Trading Position as of 2016

7.1.1 EU28 intra vs. EU28 extra

The dairy sector is in a different situation compared to the beef sector. Both Ireland and the UK crucially depend on the EU market for their dairy products, while the difference in total export volume of dairy products to the EU market is not as vast as beef exports. In total, Ireland exports €1296 million dairy products to the EU market (including the UK), accounting for 74 percent of total dairy export in 2016, almost the same as the UK’s dairy export (€1109 million, 70 percent).

Table 7.1: Dairy export in 2016 (Euro)

<table>
<thead>
<tr>
<th></th>
<th>EU 28 Intra</th>
<th>ROW</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Ireland</td>
<td>1,296,037,468</td>
<td>446,977,162</td>
<td>1,743,014,630</td>
</tr>
<tr>
<td>Source: UK</td>
<td>1,109,229,892</td>
<td>473,075,222</td>
<td>1,582,305,114</td>
</tr>
</tbody>
</table>

*Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8*

7.1.2 UK vs. Ireland

About half of both UK’s and Ireland’s dairy products go to the EU 27 market. The other half is exported to each other.

Table 7.2: Dairy export in EU market in 2016 (Euro)

<table>
<thead>
<tr>
<th></th>
<th>UK</th>
<th>Ireland</th>
<th>EU 27</th>
<th>EU28 Intra</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Ireland</td>
<td>689,687,634</td>
<td>606,349,834</td>
<td>1,296,037,468</td>
<td></td>
</tr>
<tr>
<td>Source: UK</td>
<td>466,990,565</td>
<td>642,239,327</td>
<td>1,109,229,892</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8*

Ireland’s dairy export is heavily dependent on the UK market, very similar to its beef sector. However, the UK exports more dairy products to the EU27 market relative to Ireland.
In short, no matter in the beef sector or dairy sector, the UK market is far more important for Ireland than continental Europe. In contrast, the UK relies more on the continental market, both for dairy exports and beef exports.

### 7.2 Market Segments

It has already been manifested that the UK is the most important export destination for Ireland’s dairy sector. Although the UK crucially depends on the continental market, Ireland is still the single most important dairy trade partner.

Again, Ireland and the UK target the same markets for dairy products, which are Netherlands, France, Belgium, Germany. This outcome is very similar to the main beef markets, except that Belgium replaces Italy becoming the leading dairy export destination. In total, these markets account for 92 percent and 84 percent of dairy export to the entire EU market for Ireland and the UK, respectively, showing once again the close trade relationships in the agriculture industry.

However, the position of the other three countries is different in the UK and Ireland. Netherlands, as the second most important trade partner, plays a significant role in the beef sector and dairy sector for Ireland and the UK. Moreover, the Netherlands is also a strong competitor in the continental market. The third-largest export destination...
is France for the UK while Germany for Ireland. In France and Belgium, the UK’s dairy export exceeds Ireland’s. Overall, the UK is neck and neck with Ireland in market shares.

Table 7.3: Top 5 dairy export destinations for the UK and Ireland in the EU Market 2016 (Euro)

<table>
<thead>
<tr>
<th>Markets</th>
<th>Source: Ireland</th>
<th>Source: UK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Share</td>
</tr>
<tr>
<td>UK</td>
<td>689,687,634</td>
<td>53%</td>
</tr>
<tr>
<td>Ireland</td>
<td>189,157,881</td>
<td>15%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>97,246,831</td>
<td>8%</td>
</tr>
<tr>
<td>France</td>
<td>73,926,177</td>
<td>6%</td>
</tr>
<tr>
<td>Belgium</td>
<td>140,232,099</td>
<td>11%</td>
</tr>
<tr>
<td>Germany</td>
<td>1,190,250,622</td>
<td>92%</td>
</tr>
</tbody>
</table>

*Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8*

7.3 Products Segments

7.3.1 Export similarity index

Compared with the high similarity in beef products, the UK and Ireland have less identical dairy products in the markets in terms of low export similarity index. Even in the entire EU market, the index is only 54, far less than 95 in the beef sector. In the other four main dairy export markets, the ESI is also very low: Netherlands (49), France (54), Belgium (38), and Germany (49).
Figure 7.2: Export similarity index of the UK and Ireland’s dairy export in various market, 2016
*Source:* Author’s own calculation based on Eurostat.

In the Netherlands, ESI between the UK and Ireland displays a decreasing trend over time, implying the increasing difference in dairy products. This is probably due to specialization. However, it shows a convergence recently, especially since 2013.

Figure 7.3: Export similarity index of dairy between Ireland and the UK, 2000-2016
*Source:* Author’s own calculation based on Eurostat.
7.3.2 Main export products

There is a big difference in dairy export between the UK and Ireland, which has already been exemplified by the low export similarity index in the EU market. Ireland’s dairy export distributes mainly in several products, while the UK is more dispersal.

The top 4 main dairy exports (in descending order) for the UK include:

040690: *Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406;*

040120: *Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 1% but not exceeding 6%;*

040610: *Dairy produce; fresh cheese (including whey cheese), not fermented, and curd;*

040510: *Dairy produce; derived from milk, butter;*

The top 4 main dairy exports (in descending order) for Ireland include:

040510: *Dairy produce; derived from milk, butter;*

040690: *Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406;*

040630: *Dairy produce; cheese, processed (not grated or powdered);*

040210: *Dairy produce; milk and cream, concentrated or containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content not exceeding 1.5% (by weight);*
Figure 7.4: Intra-EU trade: dairy export breakdown by main products in 2016

Note: These ten categories account for 91% and 96% for the UK and Ireland’s total dairy export, respectively. What can be clearly seen from this figure is the much smaller overlap in dairy export products.

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

7.4 Comparative Advantage

In general, Ireland has a comparative advantage in seven categories while the UK has ten. In particular, the RCA index reaches up to 3.8 on its major dairy export (040510). Contrary to the intuition, Ireland has weak competitiveness in its second-largest export (040690), with an RCA index of 0.95. Similarly, the UK is not competitive in its largest export (040690).
Table 7.4: Revealed Comparative Advantage of dairy products in the EU market, 2016

<table>
<thead>
<tr>
<th>HS 6 Code</th>
<th>Ireland</th>
<th>UK</th>
<th>s</th>
<th>France</th>
<th>Belgium</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>040110</td>
<td>0.39</td>
<td>0.43</td>
<td>2.71</td>
<td>0.63</td>
<td>0.96</td>
<td>0.85</td>
</tr>
<tr>
<td>040120</td>
<td>0.11</td>
<td>1.73</td>
<td>0.48</td>
<td>0.67</td>
<td>1.07</td>
<td>1.06</td>
</tr>
<tr>
<td>040130</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>040210</td>
<td>1.16</td>
<td>1.10</td>
<td>0.42</td>
<td>0.96</td>
<td>1.48</td>
<td>1.78</td>
</tr>
<tr>
<td>040221</td>
<td>2.20</td>
<td>1.02</td>
<td>1.29</td>
<td>0.97</td>
<td>1.60</td>
<td>1.00</td>
</tr>
<tr>
<td>040229</td>
<td>0.02</td>
<td>6.07</td>
<td>0.22</td>
<td>3.93</td>
<td>0.55</td>
<td>0.07</td>
</tr>
<tr>
<td>040291</td>
<td>0.01</td>
<td>0.98</td>
<td>1.05</td>
<td>0.87</td>
<td>1.42</td>
<td>1.85</td>
</tr>
<tr>
<td>040299</td>
<td>0.12</td>
<td>0.17</td>
<td>1.41</td>
<td>0.14</td>
<td>4.91</td>
<td>0.66</td>
</tr>
<tr>
<td>040310</td>
<td>0.38</td>
<td>0.86</td>
<td>0.04</td>
<td>1.33</td>
<td>0.36</td>
<td>1.51</td>
</tr>
<tr>
<td>040390</td>
<td>0.34</td>
<td>0.67</td>
<td>0.12</td>
<td>1.83</td>
<td>2.67</td>
<td>1.21</td>
</tr>
<tr>
<td>040410</td>
<td>1.03</td>
<td>1.14</td>
<td>0.56</td>
<td>0.89</td>
<td>0.35</td>
<td>1.32</td>
</tr>
<tr>
<td>040490</td>
<td>0.59</td>
<td>0.35</td>
<td>0.68</td>
<td>2.12</td>
<td>0.80</td>
<td>0.66</td>
</tr>
<tr>
<td>040510</td>
<td>3.80</td>
<td>1.05</td>
<td>1.62</td>
<td>0.43</td>
<td>1.78</td>
<td>0.68</td>
</tr>
<tr>
<td>040520</td>
<td>1.65</td>
<td>1.75</td>
<td>0.17</td>
<td>0.67</td>
<td>5.56</td>
<td>0.69</td>
</tr>
<tr>
<td>040590</td>
<td>1.43</td>
<td>3.05</td>
<td>2.31</td>
<td>0.61</td>
<td>2.49</td>
<td>0.54</td>
</tr>
<tr>
<td>040610</td>
<td>0.23</td>
<td>1.19</td>
<td>0.13</td>
<td>0.84</td>
<td>0.65</td>
<td>1.36</td>
</tr>
<tr>
<td>040620</td>
<td>0.46</td>
<td>0.34</td>
<td>2.19</td>
<td>0.63</td>
<td>1.22</td>
<td>0.30</td>
</tr>
<tr>
<td>040630</td>
<td>1.95</td>
<td>1.10</td>
<td>0.13</td>
<td>1.24</td>
<td>2.19</td>
<td>1.19</td>
</tr>
<tr>
<td>040640</td>
<td>0.07</td>
<td>0.65</td>
<td>0.05</td>
<td>1.66</td>
<td>0.16</td>
<td>0.70</td>
</tr>
<tr>
<td>040690</td>
<td>0.95</td>
<td>0.67</td>
<td>1.54</td>
<td>1.19</td>
<td>0.45</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Source: Author’s own calculation based on Eurostat.

It seems that Ireland has a strong performance on its main dairy export products, however, as Table 7.5 shows, Ireland does not have a revealed comparative advantage in any of the UK’s top three dairy export categories.

Table 7.5: Top 4 UK dairy export categories

<table>
<thead>
<tr>
<th>% of UK dairy exports</th>
<th>Irish RCA</th>
<th>Dominant RCA countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>040690</td>
<td>22</td>
<td>0.95</td>
</tr>
<tr>
<td>040120</td>
<td>17</td>
<td>0.11</td>
</tr>
<tr>
<td>040610</td>
<td>15</td>
<td>0.23</td>
</tr>
<tr>
<td>040510</td>
<td>9</td>
<td>3.80</td>
</tr>
</tbody>
</table>

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8
7.5 Brexit implications

The preceding analysis shows that Ireland has the same target markets as the UK. However, they export different dairy products to the continental markets. Although Ireland has a strong performance on its major dairy products, no competitiveness has been found in any of the UK’s top three export categories. With the hypothesis of a hard Brexit, the conclusion is that, unlike in the case of beef, Irish firms are not well-positioned to capture the market share vacated by the UK.
Given the complexity of the dairy sector, a further study at CN 8-digit level (tariff line) was conducted to support the findings. Compared with beef products, more intermediate components are included in the dairy sector. It contains five sections: Section 8.1 describes the general trade conditions of the UK and Irish dairy sector in 2016. Section 8.2 generalizes the top five major export destinations. Section 8.3 compares product differences between the UK and Ireland. Section 8.4 emphasizes the competitiveness of Irish dairy products, and section 8.5 concludes the Brexit implications for the Irish dairy sector.
8.1 Trading Position as of 2016

In general, Ireland exports €2,037 million dairy products to the EU market (including the UK), accounting for 51 percent of its total dairy export in 2016. The UK exports €1,255 million dairy products to the EU market, accounting for 69 percent of total dairy export. The UK is more crucially dependent on the EU market.

Among all the dairy exported to the EU intra market, 22 percent of Irish dairy products go to the UK while Ireland accounts for nearly 29 percent of the UK’s total dairy exports. In a word, the UK relies more on the Irish market than Ireland.

Table 8.1: Dairy export breakdown by destinations at CN8 level in 2016 (€ Million)

<table>
<thead>
<tr>
<th>Source</th>
<th>UK</th>
<th>Ireland</th>
<th>EU27</th>
<th>EU extra</th>
<th>EU intra</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>€859</td>
<td>€1,178</td>
<td>€1,954</td>
<td>€2,037</td>
<td>€3,991</td>
<td></td>
</tr>
<tr>
<td>Source: UK</td>
<td>€533</td>
<td>€722</td>
<td>€564</td>
<td>€1,255</td>
<td>€1,818</td>
<td></td>
</tr>
</tbody>
</table>

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

Note: This result is in line with Annual Review and Outlook for Agriculture, Food and the Marine 2018

8.2 Market Segments

Both the UK and Ireland have almost the same dairy export markets, which are the Netherlands, France, and Germany. These results are consistent with the 6-digit level analysis. It implicates that the UK and Ireland target the same markets, meanwhile, a possible fierce competition.

Separately, there is not much difference in the UK’s main dairy export destinations compared with previous results. However, Poland replaces Belgium becoming the fifth largest export destination for Ireland.

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32 Thanks Grainne Roughan for providing a detailed list of dairy product, which is classified by the Irish Department of Agriculture, Food and Marine (DAFM). It includes 173 categories, which is more detailed compared to 20 categories at HS6 code.
### Table 8.2: Top 5 dairy export destinations for the UK and Ireland in the EU Market 2016 (€million)

<table>
<thead>
<tr>
<th>Country</th>
<th>Source: UK</th>
<th>Source: Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>€533</td>
<td>€859</td>
</tr>
<tr>
<td>Netherlands</td>
<td>€155</td>
<td>€369</td>
</tr>
<tr>
<td>France</td>
<td>€150</td>
<td>€276</td>
</tr>
<tr>
<td>Belgium</td>
<td>€106</td>
<td>€160</td>
</tr>
<tr>
<td>Germany</td>
<td>€95</td>
<td>€108</td>
</tr>
</tbody>
</table>

*Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8*

As can be seen from the above table, Ireland is still the UK’s single most critical trading partner, far more important than any other EU country.

### 8.3 Products Segments

When the data for dairy is disaggregated into the 8-digit level, it shows a much more significant difference between the UK and Ireland. Except for 040691, 04051019 and 19019099, there is no overlapping between the UK and Ireland’s dairy export to the EU market. This outcome is consistent with the 6-digit HS result. All of these three categories account for 25 percent and 46 percent in the UK and Ireland’s total dairy export, respectively.

04069021: Cheddar (excl. grated or powdered and for processing).

04051019: Natural butter of a fat content, by weight, of >= 80% but <= 85% (excl. in immediate packings of a net content of <= 1 kg, and dehydrated butter and ghee).

19019099: Food preparations of flour, groats, meal, starch or malt extract, not containing cocoa or containing cocoa in a proportion by weight of < 40%, calculated on a totally defatted basis, and food preparations of milk, cream, butter milk, sour milk, sour cream, whey, yogurt, kephir or similar goods in heading 0401 to 0404, not containing cocoa or containing cocoa in a proportion by weight of < 5%, calculated on a totally defatted basis, n.e.s. (excl. malt extract and preparations for infant food, put up for retail sale, mixes and doughs for preparation of bakers’ wares and goods in subheading 1901.90.91)

The other top dairy export products for the UK include:

04012099: Milk and cream of a fat content by weight of > 3% but <= 6%, not concentrated nor containing added sugar or other sweetening matter (excl. in immediate packings of <= 2 l).

04061080: Fresh cheese "unripened or uncured cheese", incl. whey cheese and curd of a fat content, by weight, of > 40%.
21050010: Ice cream and other edible ice, whether or not containing cocoa, not containing milkfats or containing < 3% milkfats.

The other top dairy export products for Ireland include:

19011000: Food preparations for infant use, put up for retail sale, of flour, groats, meal, starch or malt extract, not containing cocoa or containing < 40% by weight of cocoa calculated on a totally defatted basis, n.e.s. and of milk, sour cream, whey, yogurt, kephir or similar goods of heading 0401 to 0404, not containing cocoa or containing < 5% by weight of cocoa calculated on a totally defatted basis, n.e.s.

35011090: Casein for the manufacture of foodstuffs and fodder and other types of casein (excl. the manufacture of artificial textile fibres and other industrial uses)

04051011 Natural butter of a fat content, by weight, of >= 80% but <= 85%, in immediate packings of a net content of <= 1 kg (excl. dehydrated butter and ghee)

Table 8.3: The UK and Ireland's main dairy export products in the EU market in 2016 (€million)

<table>
<thead>
<tr>
<th>CN code</th>
<th>Source: UK</th>
<th>Source: Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Share</td>
</tr>
<tr>
<td>04069021</td>
<td>184</td>
<td>15%</td>
</tr>
<tr>
<td>04012099</td>
<td>138</td>
<td>11%</td>
</tr>
<tr>
<td>04061080</td>
<td>102</td>
<td>8%</td>
</tr>
<tr>
<td>21050010</td>
<td>88</td>
<td>7%</td>
</tr>
<tr>
<td>04051019</td>
<td>79</td>
<td>6%</td>
</tr>
<tr>
<td>19019099</td>
<td>53</td>
<td>4%</td>
</tr>
<tr>
<td>Sub-total</td>
<td>643</td>
<td>51%</td>
</tr>
<tr>
<td>Total</td>
<td>1,255</td>
<td></td>
</tr>
</tbody>
</table>

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

It can be seen from Table 8.4 that the UK is more important as an import destination compared to export. More than half of the total dairy products were imported from the UK. The major import product is 0401209933. Actually, 99.8% of this product was imported from the UK.

Table 8.4: Irish dairy export and import in 2016(€ Million)

<table>
<thead>
<tr>
<th>Source: Ireland</th>
<th>Export to the world</th>
<th>Export to UK</th>
<th>Import from World</th>
<th>Import from UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source: Ireland</td>
<td>€3,991</td>
<td>€859</td>
<td>€710</td>
<td>€448</td>
</tr>
</tbody>
</table>

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

33 Milk and cream of a fat content by weight of > 3% but <= 6%, not concentrated nor containing added sugar or other sweetening
From the perspective of the UK, 94% of the total 04012099 export went to Ireland (table 8.5). Moreover, this category is the second-largest export product of UK dairy products, accounting for 11% of the UK’s total export. In other words, if there is a hard Brexit, UK will not be able to find a market large enough for this main export product in the short term. Therefore, the possible way for UK firms is to jump into Ireland.

Table 8.5: UK’s export of 04012099 in 2016 (million)

<table>
<thead>
<tr>
<th>Source: UK</th>
<th>Ireland</th>
<th>EU27</th>
<th>EU extra</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td>€134</td>
<td>€4</td>
<td>€5</td>
<td>€143</td>
</tr>
<tr>
<td>Percentage</td>
<td>94%</td>
<td>3%</td>
<td>3%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Eurostat, EU trade since 1988 by HS2,4,6 and CN8

8.4 Comparative Advantage

As can be seen from the above table, both Ireland and the UK have a revealed comparative advantage on their main dairy products. However, it is uncertain if Ireland is competitive in the UK’s main exports.

Table 8.6: Ireland’s RCA on the UK’s main dairy export products in the EU intra market.

<table>
<thead>
<tr>
<th>UK’s export products</th>
<th>Share of total export</th>
<th>UK’s RCA</th>
<th>Ireland’s RCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>04069021</td>
<td>15%</td>
<td>6.64</td>
<td>7.06</td>
</tr>
<tr>
<td>04012099</td>
<td>11%</td>
<td>2.22</td>
<td>0.02</td>
</tr>
<tr>
<td>04061080</td>
<td>8%</td>
<td>5.43</td>
<td>0.54</td>
</tr>
<tr>
<td>21050010</td>
<td>7%</td>
<td>1.75</td>
<td>0.03</td>
</tr>
<tr>
<td>04051019</td>
<td>6%</td>
<td>1.42</td>
<td>3.12</td>
</tr>
<tr>
<td>19019099</td>
<td>4%</td>
<td>0.90</td>
<td>3.34</td>
</tr>
</tbody>
</table>

Other than 04069021, 04051019 and 19019099, Ireland does not have competitiveness. As to who the UK’s main competitors are in its main dairy export categories, this question is addressed in the following two figures:
First, in addition to Ireland, Latvia and Poland also have a strong competitive advantage in 04069021 (Latvia: 5.21; Poland: 1.35), although not as strong as Ireland. In the UK’s second-largest dairy export 04012099, Ireland has low competitiveness, while many other countries have a strong performance (i.e., Slovenia: 9.58; Estonia: 6.9; Latvia: 6.43; Czech Republic: 5.82; Hungary: 4.92; Slovakia: 2.43).

34 04069021: Cheddar (excl. grated or powdered and for processing).
Figure 8.2: UK’s main EU competitors in 04012099.35

*Source:* Author’s own calculation based on Eurostat.

The revealed comparative advantage (RCA) analysis does not appear to offer much hope to Ireland in terms of making inroads on the dairy vacuum created by the UK’s presumptive exclusion from the EU market. On most UK’s dairy export products, Ireland has no comparative advantage except for 04069021 and 04051019. In contrast, the UK has a comparative advantage in most export products. Therefore, it seems

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35 **04012099**: Milk and cream of a fat content by weight of > 3% but <= 6%, not concentrated nor containing added sugar or other sweetening matter (excl. in immediate packings of <= 2 l).
impossible for Ireland to capture these common markets even if the UK leaves the EU. Instead, it is better to attract UK to jump into Ireland since the UK has a comparative advantage.

### 8.5 Brexit implications

The analysis is more complicated in the case of the dairy sector. The UK exports substantially more dairy products to the EU than Ireland exports to the UK. Ireland, however, exports a very different range of dairy products to those exported by the UK, and Ireland has a comparative disadvantage in the main products exported by the UK. This suggests that the country would not be in a strong position to capture the market share vacated by UK-based firms. To the extent to which Irish dairy raw material inputs are substitutable for UK raw material inputs, damage from Brexit could be alleviated by the Irish development agencies’ seeking to attract the UK and UK-based downstream dairy firms to establish export platform operations in Ireland.

One beneficial factor is that significant numbers of smaller producers exist in the dairy industry, although dairy is divided into an FDI-intensive sector. Moreover, dairy is among the lowest category on the amount spent on global brands\(^{36}\). In view of an earlier era in Irish economic history, the familiarity of the Irish environment (i.e., language and legal system) plays an important role in the locational selection, especially for smaller MNCs and firms who have little experience on oversea production\(^ {37}\). Even if the Irish development agencies were to be successful in attracting downstream dairy firms to Ireland, there would be difficulties. For instance, land bridge issues will have an undue influence on an Irish base, and UK dairy export products may require continuous rather than seasonal milk production.

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This chapter summarizes the findings and presents implications for future research. Brexit is messing the trade between the UK and other European countries. Ireland is likely to be the first one to bear the brunt. There is no doubt that Brexit would have a significant impact on the Irish agri-food sector. Instead of measuring the specific long-term and short-term influences, this paper shows the scale of the problem and offers some solutions. By comparing export structure and comparative advantage of the UK and the Irish beef products and dairy products, this paper puts forward to attract inward tariff-jumping FDI from the UK into Ireland. However, this is only an idea based on trade situations. Future research could focus on the possible efficient and effective way of establishing cooperation ties between the UK and Ireland in the agri-food industry.
Brexit promotes Ireland to the front pages. It seems inevitable that the economic impact of Brexit is felt beyond. As the most critical trade partner, the Irish agri-business industry is likely to be the first to suffer. Although a question mark hangs over the future trade relations between the UK and EU, a hard Brexit for agri-business is likely under most scenarios, which implies high tariffs and non-tariff trade barriers. This paper offers a snapshot of the UK-Irish Agri-trade relationship – through a detailed analysis of the beef sector and dairy sector. Based on the revealed comparative advantage index and the export similarity index, this paper provides a lens through which to view the possible way for the Irish dairy sector and beef sector to fight their way out of trouble.

Irish beef holds all the cards in the EU market. The result has shown that the UK and Ireland have exactly the same markets in continental Europe, a very similar product-export structure, and main export products. Moreover, Ireland has a much stronger comparative advantage in beef products than any other European country. It is not too much of a stretch to say that the continental markets are within reach for Ireland if the UK totally exits. However, Ireland’s beef export is nearly four times the UK’s. It does not take a leap of imagination to find the market vacated by Brexit is just a drop in the bucket, too small to make up for the loss in the UK market. All the more so with the UK’s beef export. The UK exports €439 million beef products to the EU market (including Ireland), accounting for 86 percent of its total volume. It is a thorny problem for the UK to find another way out. Does not exclude the possibility for the UK to seek new trade partners such as New Zealand and the US. However, high transportation costs and inevitable non-ad valorem duty cause many troubles, no matter what agreements the UK and EU come to. Above all, Brexit is a disaster for both the UK and Ireland for their beef sector.

It is in both UK’s and Ireland’s interests to adopt tariff-jumping FDI to alleviate the damage of Brexit on the beef sector. For export-oriented firms in Ireland, it is an excellent opportunity to invest in the UK market to jump over tariffs and other trade barriers. Similarly, British firms could undertake tariff-jumping FDI in Ireland, although the Netherlands is arguably the next financial centre in Europe. For one reason, Ireland is the UK’s single most important beef export destination, 7 percent higher than the Netherlands. For the other, the UK has a long history of trade and cooperation with Ireland in the agriculture industry owing to geographical location and cultural background.
The dairy sector stands in stark contrast to the beef sector. Several factors are at play when it comes to the UK-Irish dairy trade. The analysis shows that Ireland has the same target markets as the UK, however, they export different dairy products to the continental markets. Although Ireland has a strong performance on its major dairy products, no competitiveness has been found in any of the UK’s top three export categories. With the hypothesis of a hard Brexit, the conclusion is that, unlike in the case of beef, Irish firms are not well-positioned to capture the market share vacated by the UK. Therefore, tariff-jumping FDI is regarded as a substitution for export.

In conclusion, it is hard to be categorical about the impact of Brexit on the Irish agricultural industry. What is good for the beef sector may be bad for the dairy sector. But it is clear that trade barrier is a symptom of economic troubles to which some see attracting tariff-jumping FDI into Ireland as the answer. However, attracting tariff-jumping FDI is a means, not an end in itself. The ultimate goal for the Irish agricultural industry should be to develop their own competitiveness in the EU market.

For all the talk of the relationship between trade and FDI, the substitution is still rife. An increase in trade costs (e.g., import tariffs) is likely to motivate foreign firms to shift to direct investment. This paper adds weight to this argument by disaggregating data into the 8-digit level to figure out the Irish-UK Agri-trade relationship under the condition of a no-deal Brexit. The story of how FDI developed so fast in the Irish agricultural industry is one of the high tariffs and non-tariff barriers. The argument that the substitution relationship between trade and FDI rests chiefly on the fact that precautionary tariff-jumping FDI has already been observed in the beef sector and dairy sector, as shown in chapter 5. Moreover, attracting FDI from the UK into Ireland is a potential solution for the Irish sector to fight its way out of trouble on the grounds of a no-deal Brexit.

There are some limitations. The results of Balassa’s revealed comparative advantage index should be taken with a pinch of salt. It is criticized for its effectiveness and predictive power due to the development of intra-industry and vertical fragmentation. More variants of RCA are put forward to satisfy the change of trade pattern (See Appendix C). Given the low level of processing of agricultural products, this research adopts Balassa’s RCA index. However, other RCA indexes that take import content of export into account can be applied to the dairy sector to improve the accuracy of prediction. Second, future research can also focus on the way and determinants of attracting FDI into the Irish agri-food industry.
The details on Ireland and the UK’s beef export in the EU market.
Table A.1: Intra-EU trade: beef export breakdown by main products in 2016 (Euro)

<table>
<thead>
<tr>
<th>02 Meat and edible meat offal</th>
<th>Ireland</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>0201 Meat of bovine animals, fresh or chilled</td>
<td>2,518,994,470</td>
<td>1,348,667,225</td>
</tr>
<tr>
<td>020110 Meat; of bovine animals, carcasses and half-carcasses, fresh or chilled</td>
<td>1,616,409,471</td>
<td>364,421,933</td>
</tr>
<tr>
<td>020120 Meat; of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), fresh or chilled</td>
<td>110,908,868</td>
<td>32,630,155</td>
</tr>
<tr>
<td>020130 Meat; of bovine animals, boneless cuts, fresh or chilled</td>
<td>1,422,401,447</td>
<td>301,278,014</td>
</tr>
<tr>
<td>0202 Meat of bovine animals, frozen</td>
<td>152,501,104</td>
<td>42,152,756</td>
</tr>
<tr>
<td>020210 Meat; of bovine animals, carcasses and half-carcasses, frozen</td>
<td>N/A</td>
<td>275,604</td>
</tr>
<tr>
<td>020220 Meat; of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), frozen</td>
<td>1,463,694</td>
<td>1,760,826</td>
</tr>
<tr>
<td>020230 Meat; of bovine animals, boneless cuts, frozen</td>
<td>151,037,410</td>
<td>40,116,330</td>
</tr>
<tr>
<td>0206 Edible offal of bovine animals, fresh chilled or frozen</td>
<td>128,090,994</td>
<td>32,403,224</td>
</tr>
<tr>
<td>020610 Offal, edible; of bovine animals, fresh or chilled</td>
<td>111,232,157</td>
<td>24,925,604</td>
</tr>
<tr>
<td>020621 Offal, edible; of bovine animals, tongues, frozen</td>
<td>1,243,750</td>
<td>18,840</td>
</tr>
<tr>
<td>020622 Offal, edible; of bovine animals, livers, frozen</td>
<td>1,146,313</td>
<td>597,367</td>
</tr>
<tr>
<td>020629 Offal, edible; of bovine animals, (other than tongues and livers), frozen</td>
<td>14,468,774</td>
<td>6,861,413</td>
</tr>
<tr>
<td>021020 Meat; salted, in brine, dried or smoked, of bovine animals</td>
<td>154,703</td>
<td>458,995</td>
</tr>
<tr>
<td><strong>Total (Beef export)</strong></td>
<td>1,897,156,272</td>
<td>439,436,908</td>
</tr>
</tbody>
</table>
Table A.2: UK and Ireland's export price on 020130 in the main destinations (Euro per 100KG)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland/UK</td>
<td>526</td>
<td>453</td>
<td>527</td>
<td>603</td>
<td>534</td>
<td>590</td>
<td>588</td>
<td>649</td>
<td>538</td>
<td>631</td>
</tr>
<tr>
<td>Netherlands</td>
<td>632</td>
<td>667</td>
<td>637</td>
<td>579</td>
<td>607</td>
<td>653</td>
<td>658</td>
<td>574</td>
<td>648</td>
<td>630</td>
</tr>
<tr>
<td>France</td>
<td>519</td>
<td>675</td>
<td>543</td>
<td>663</td>
<td>518</td>
<td>741</td>
<td>542</td>
<td>739</td>
<td>536</td>
<td>683</td>
</tr>
<tr>
<td>Italy</td>
<td>732</td>
<td>645</td>
<td>704</td>
<td>632</td>
<td>684</td>
<td>629</td>
<td>779</td>
<td>702</td>
<td>797</td>
<td>666</td>
</tr>
<tr>
<td>Germany</td>
<td>964</td>
<td>732</td>
<td>981</td>
<td>814</td>
<td>927</td>
<td>688</td>
<td>968</td>
<td>756</td>
<td>969</td>
<td>702</td>
</tr>
<tr>
<td>EU28</td>
<td>599</td>
<td>557</td>
<td>586</td>
<td>586</td>
<td>588</td>
<td>571</td>
<td>660</td>
<td>576</td>
<td>607</td>
<td>536</td>
</tr>
</tbody>
</table>

*Note: Price = Total value / Total volume

*Source: Author's own calculation based on Eurostat.*
APPENDIX B

Descriptions of Harmonized Commodity Description and Coding Systems (HS) and Combines Nomenclature (CN) in beef sector and dairy sector.
Table B.1: Beef product category at 6-digit Harmonized Commodity Description and Coding System (HS) code

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>020110</td>
<td>Meat; of bovine animals, carcasses and half-carcasses, fresh or chilled</td>
</tr>
<tr>
<td>020120</td>
<td>Meat; of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), fresh or chilled</td>
</tr>
<tr>
<td>020130</td>
<td>Meat; of bovine animals, boneless cuts, fresh or chilled</td>
</tr>
<tr>
<td>020210</td>
<td>Meat; of bovine animals, carcasses and half-carcasses, frozen</td>
</tr>
<tr>
<td>020220</td>
<td>Meat; of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), frozen</td>
</tr>
<tr>
<td>020230</td>
<td>Meat; of bovine animals, boneless cuts, frozen</td>
</tr>
<tr>
<td>020610</td>
<td>Offal, edible; of bovine animals, fresh or chilled</td>
</tr>
<tr>
<td>020621</td>
<td>Offal, edible; of bovine animals, tongues, frozen</td>
</tr>
<tr>
<td>020622</td>
<td>Offal, edible; of bovine animals, livers, frozen</td>
</tr>
<tr>
<td>020629</td>
<td>Offal, edible; of bovine animals, (other than tongues and livers), frozen</td>
</tr>
<tr>
<td>021020</td>
<td>Meat; salted, in brine, dried or smoked, of bovine animals</td>
</tr>
<tr>
<td>HS Code</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>040110</td>
<td>Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, not exceeding 1%</td>
</tr>
<tr>
<td>040120</td>
<td>Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 1% but not exceeding 6%</td>
</tr>
<tr>
<td>040130</td>
<td>Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 6%</td>
</tr>
<tr>
<td>040210</td>
<td>Dairy produce; milk and cream, concentrated or containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content not exceeding 1.5% (by weight)</td>
</tr>
<tr>
<td>040220</td>
<td>Dairy produce; milk and cream, concentrated, not containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)</td>
</tr>
<tr>
<td>040229</td>
<td>Dairy produce; milk and cream, containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)</td>
</tr>
<tr>
<td>040291</td>
<td>Dairy produce; milk and cream, concentrated, not containing added sugar or other sweetening matter, other than in powder, granules or other solid forms</td>
</tr>
<tr>
<td>040299</td>
<td>Dairy produce; milk and cream, containing added sugar or other sweetening matter, other than in powder, granules or other solid forms</td>
</tr>
<tr>
<td>040310</td>
<td>Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa</td>
</tr>
<tr>
<td>040390</td>
<td>Dairy produce; buttermilk, curdled milk or cream, kephir, fermented or acidified milk or cream, whether or not concentrated or containing added sweetening, flavouring, fruit or cocoa (excluding yoghurt)</td>
</tr>
<tr>
<td>040410</td>
<td>Dairy produce; whey, whether or not concentrated or containing added sugar or other sweetening matter</td>
</tr>
<tr>
<td>040490</td>
<td>Dairy produce; natural milk constituents (excluding whey), whether or not containing added sugar or other sweetening matter, n.e.c. in chapter 04</td>
</tr>
<tr>
<td>040510</td>
<td>Dairy produce; derived from milk, butter</td>
</tr>
<tr>
<td>040520</td>
<td>Dairy produce; dairy spreads</td>
</tr>
<tr>
<td>040590</td>
<td>Dairy produce; fats and oils derived from milk (other than butter or dairy spreads)</td>
</tr>
<tr>
<td>040610</td>
<td>Dairy produce; fresh cheese (including whey cheese), not fermented, and curd</td>
</tr>
<tr>
<td>040620</td>
<td>Dairy produce; cheese of all kinds, grated or powdered</td>
</tr>
<tr>
<td>040630</td>
<td>Dairy produce; cheese, processed (not grated or powdered)</td>
</tr>
<tr>
<td>040640</td>
<td>Dairy produce; cheese, blue-veined and other cheese containing veins produced by Penicillium roqueforti (not grated, powdered or processed)</td>
</tr>
<tr>
<td>040690</td>
<td>Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406</td>
</tr>
<tr>
<td>Code</td>
<td>Combinces Nomenclature Descriptions</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>04012099</td>
<td>Milk and cream of a fat content by weight of &gt; 3% but &lt;= 6%, not concentrated nor containing added sugar or other sweetening matter (excl. in immediate packings of &lt;= 2 l)</td>
</tr>
<tr>
<td>04051011</td>
<td>Natural butter of a fat content, by weight, of &gt;= 80% but &lt;= 85%, in immediate packings of a net content of &lt;= 1 kg (excl. dehydrated butter and ghee)</td>
</tr>
<tr>
<td>04051019</td>
<td>Natural butter of a fat content, by weight, of &gt;= 80% but &lt;= 85% (excl. in immediate packings of a net content of &lt;= 1 kg, and dehydrated butter and ghee)</td>
</tr>
<tr>
<td>04061080</td>
<td>Fresh cheese &quot;unripened or uncured cheese&quot;, incl. whey cheese and curd of a fat content, by weight, of &gt; 40%</td>
</tr>
<tr>
<td>04069021</td>
<td>Cheddar (excl. grated or powdered and for processing)</td>
</tr>
<tr>
<td>19011000</td>
<td>Food preparations for infant use, put up for retail sale, of flour, groats, meal, starch or malt extract, not containing cocoa or containing &lt; 40% by weight of cocoa calculated on a totally defatted basis, n.e.s. and of milk, sour cream, whey, yogurt, kephir or similar goods of heading 0401 to 0404, not containing cocoa or containing &lt; 5% by weight of cocoa calculated on a totally defatted basis, n.e.s.</td>
</tr>
<tr>
<td>19019099</td>
<td>Food preparations of flour, groats, meal, starch or malt extract, not containing cocoa or containing cocoa in a proportion by weight of &lt; 40%, calculated on a totally defatted basis, and food preparations of milk, cream, butter milk, sour milk, sour cream, whey, yogurt, kephir or similar goods in heading 0401 to 0404, not containing cocoa or containing cocoa in a proportion by weight of &lt; 5%, calculated on a totally defatted basis, n.e.s. (excl. malt extract and preparations for infant food, put up for retail sale, mixes and doughs for preparation of bakers' wares and goods in subheading 1901.90.91)</td>
</tr>
<tr>
<td>21050010</td>
<td>Ice cream and other edible ice, whether or not containing cocoa, not containing milkfats or containing &lt; 3% milkfats</td>
</tr>
<tr>
<td>35011090</td>
<td>Casein for the manufacture of foodstuffs and fodder and other types of casein (excl. the manufacture of artificial textile fibres and other industrial uses)</td>
</tr>
</tbody>
</table>
This chapter presents formulas of revealed comparative advantage index.
<table>
<thead>
<tr>
<th>Scholars</th>
<th>Formulas</th>
<th>Direction of the research</th>
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</thead>
<tbody>
<tr>
<td>Liesner (1958)</td>
<td>$REP_j = X^i_j / X_j$</td>
<td>Export in a country</td>
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<tr>
<td>Michaely (1962)</td>
<td>$MRCA^i_j = X^i_j / X_j - M^i_j / M_j$</td>
<td>Export and import in a country</td>
</tr>
<tr>
<td>Balassa (1965)</td>
<td>$BRCA^i_j = (X^i_j / X_j) / (X^i_w / X_w)$</td>
<td>Export in a country and the world</td>
</tr>
<tr>
<td>Laursen (1998)</td>
<td>$RSCA^i_j = (BRCA^i_j - 1) / (BRCA^i_j + 1)$</td>
<td>Asymmetric property</td>
</tr>
<tr>
<td>Proudman &amp; Redding (1998)</td>
<td>$WRCA^i_j = BRCA^i_j / (1 / N \sum_{i=1}^{N} BRCA^i_j)$</td>
<td>Asymmetric property</td>
</tr>
<tr>
<td>Hoen and Oosterhaven (2006)</td>
<td>$ARCA^i_j = X^i_j / X_j - X^i_w / X_w$</td>
<td>Asymmetric property</td>
</tr>
<tr>
<td>Yu et al (2009)</td>
<td>$NRCA^i_j = X^i_j / X_w - X_j^i / X_w$</td>
<td>Asymmetric property</td>
</tr>
<tr>
<td>Lafay (1987)</td>
<td>$LRCA^i_j = [(X^i_j - M^i_j) / (X^i_j + M^i_j) - (X_j - M_j) / (X_j + M_j)] \times (X^i_j + M^i_j) / (X_j + M_j) \times 100$</td>
<td>Export and import in a country and the world</td>
</tr>
<tr>
<td>Balassa (1989)</td>
<td>$BNXRCA^i_j = (X^i_j / X_j - M^i_j / M_j) \times 100$</td>
<td>Export and import in a country</td>
</tr>
<tr>
<td>Vollrath (1991)</td>
<td>$VRCA^i_j = BRCA^i_j - (M^i_j / M_j) / (M^i_w / M_w)$</td>
<td>Export and import in a country and the world</td>
</tr>
<tr>
<td>Esterhuizen &amp; Rooyen (1999)</td>
<td>$RTA^i_j = {[(X^i_j / X_j) / (X^i_w / X_w) - 1] - [(M^i_j / M_j) / (M^i_w / M_w) - 1] }$</td>
<td>Export and import in a country and the world</td>
</tr>
</tbody>
</table>
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