InterTradeIreland

Medium-Term **Potential Growth** of **Cross-Border Trade**

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ABBREVIATIONS

CSO	Central Statistics Office
GB	Great Britain
IE	Ireland
OLS	Ordinary Least Squares
NI	Northern Ireland
NISRA	Northern Ireland Statistics and Research Agency
NTB	Non-tariff barriers
BoP	Balance of Payments
RoW	Rest of World
SITC	Standard International Trade Classification
SME	Small and Medium Enterprises
UK	United Kingdom
UN	United Nations
UUEPC	Ulster University Economic Policy Centre
WTO	World Trade Organisation

EXECUTIVE SUMMARY

This report looks forward over the medium term to provide plausible estimates of potential trade growth between Ireland and Northern Ireland. The motivation for this study comes from the well-established relationship between trade and overall economic growth and, hence, the usefulness to business and policy-makers of having plausible growth paths to guide targets and benchmark the contribution of supports to trading activity.

The path for overall growth potential is based on macroeconomic projections for both economies and an analysis of the key drivers of trade flows based on international evidence. The analysis is undertaken at a detailed sectoral level in order to identify areas with particularly strong growth potential.

To take into account the substantial increase in trade that occurred in some goods sectors in 2021, we use a number of scenarios for our projections. These include taking the 2021 level as the starting point for the projections, adjusting the starting point down slightly (to allow for potential temporary changes such as COVID-19 impacting supply chains) and a convergence scenario (whereby the specific sectors identified as trading below the expected level generated by the gravity model predictions "catch-up" to the level predicted by the model).

The key findings of the report are:

- Growth rates for goods trade are expected to be reasonably similar in both directions of trade, averaging around 2.5% a year. In the convergence scenario, the average growth rates increase to between 3.2% and 4.2%.

- In level terms goods going from Ireland to Northern Ireland in 2020 were approximately 2.3 billion euros. By 2030, this trade is projected to reach a value of between €3.79 billion in the lowest scenario and €4.55 billion in the highest scenario (with no inflation taken into account). From Northern Ireland to Ireland, trade in 2020 starts at €2.42 billion and could increase to between €4.78 billion and €6.07 billion depending on the scenario.

- These growth rates are not even across all sectors within goods. The overall patterns from 2021 to 2030 show a shift in the composition of goods trade away from food and crude materials towards chemicals and machinery. The key areas for growth appear similar in both trade directions suggesting substantial potential for development of supply linkages across the island.

- Trade in services is projected to grow at a substantially more rapid pace than trade in goods. Although currently services trade is considerably lower than goods trade, these results would see services converging in level terms

towards an equivalent value to goods trade over the course of the decade to 2030.

- The annual average growth rate for services trade comes in at around 10% for trade from Ireland to Northern Ireland and 9.1% for services from Northern Ireland to Ireland. Cumulatively, this would result in services trade in both directions being approximately double its 2021 level by 2030.

- Although detailed data on the components of cross-border services trade is limited, comparable international evidence suggests that the growth in services trade is likely to be particularly strong in financial services and business services.

- The projections in the report are based on estimates of a number of key drivers benchmarked to international evidence. These may prove conservative as policy initiatives supporting innovation and skills development could both directly impact the trade patterns of targeted sectors and also indirectly support trade growth on aggregate through a positive reinforcement cycle with GDP, one of the key drivers of the projections in this report.

CHAPTER 1: INTRODUCTION

Trade is strongly positively correlated with overall economic and productivity growth. On the island of Ireland, cross-border trade is an important component of overall trade participation, particularly for smaller firms. In recent years, considerable focus has been placed on the potential challenges that Brexit might have posed to this trade up until the agreement of the Northern Ireland Protocol. This report looks forward over the medium-term up to 2030 to provide estimates on the extent to which trade between Ireland and Northern Ireland has the potential to grow.

The aim is to examine overall growth potential based on projections for both economies and also to provide more granular estimates on how the composition of this trade might evolve. As countries grow, trade internationally has tended to shift to higher value-added sectors and from manufacturing to services. Examining how the sectoral composition of future cross-border trade is likely to develop should provide a useful input to the development and targeting of trade and enterprise policy. This would help support the aims of these policies in extracting the maximum benefits from the potential growth paths for both economies.

The central aim of this research report is to identify the potential extent of growth in cross-border trade over the medium-term. It does this at a detailed sectoral level in order to identify areas with particularly strong growth potential. The objective of this is to aid the development of a focused enterprise policy to areas where returns to intervention can be maximised. The approach used draws together a range of sources of data on current trade patterns, both cross-border and internationally, and combines these with macroeconomic forecasts and scenarios to project forward the potential path of overall cross-border trade and how the broad composition of this trade is most likely to evolve.

The report is organised as follows: Chapter 2 describes the modelling approach used to determine the drivers of trade flows, the data and the macroeconomic forecasts used to underpin the projections. Chapter 3 presents the results for the determinants of goods trade and the projections at an aggregate level for cross-border goods trade up to 2030. Chapter 4 looks in more detail at the variation across sectors and potential changes in composition of goods trade flows at a more granular level. Chapter 5 examines the drivers and projections for services trade. Chapter 6 concludes.

CHAPTER 2: ESTIMATING THE DRIVERS OF TRADE FLOWS AND PROJECTION METHODOLOGY

This section outlines the method applied to estimating the determinants of trade between pairs of countries that we use as the basis for projecting cross-border flows into the future. It also outlines the sources of trade data used in the analysis and the key variables used to explain the determinants of trade in the baseline model. The final section of the chapter describes the macroeconomic forecasts used to extrapolate forward the growth of trade. Due to differences in data availability, goods and services are modelled and reported separately.

2.1 GRAVITY MODEL APPROACH

The empirical basis for the analysis is the gravity model, which relates trade flows between countries to the size of their markets and the cost of moving goods between them. The gravity model in international trade has been demonstrated to be an extremely robust empirical method. The method links trade between country pairs to the factors that work either to attract or to restrict trade using fundamental factors such as the size and income level of the economies (capturing supply and demand) and the distance between them (as a broad proxy for transport costs). Gravity models have been widely applied to analysis of goods trade but previous work focusing on services has found that it also applies well to services trade (Walsh, 2006).

The gravity approach to modelling trade has a long history, being first used in the 1960s by Tinbergen (1962). The technique acquired its name from the parallel with the physical force of gravity determined by the combined mass of two bodies and the (inverse square) of the distance between them. The method was also used to explain other types of international flows, most notably migration.

The baseline gravity equation to be estimated for aggregate export sales *S* from country i to country *j* is:

$$\ln(S_{ij}) = \beta_0 + \beta_1(\text{Supply factors}_{ij}) + \beta_2(\text{Demand factors}_{ji}) + \beta_3 \ln(\text{Distance}_{ij}) + \beta_4(\text{TradeCosts}_{ij}) + u_{ij}$$

The fundamental components of the gravity model are variables to capture supply (GDP and population of the source country), those to capture demand in the destination market (GDP and GDP per capita), and the distance between the two countries. In the traditional gravity model of goods trade, distance is treated as a broad proxy for transportation costs but evidence from work on services trade such as Walsh (2006) suggests that it captures a range of other costs and potentially

picks up some common preferences with the result that it also has strong predictive power for trade in services. The final term in the equation above, *Trade Costs*$_{ij}$, is a vector of coefficients for other variables that may increase or decrease the costs of trading between two countries such as international borders and membership of trade agreements Head and Mayer, 2014). The error term is u_{ij}, which picks up the variation in trade unexplained by the explicit variables included in the analysis. The empirical specification is in logs, which results in the coefficients for each of the continuous variables being interpreted as elasticities.

Quantifying the impact of a national border in the gravity framework has received a lot of attention since work by McCallum (1995) estimating that the national border between Canada and the US had an extremely large trade-depressing impact. The border on the island of Ireland has been examined a number of times in terms of its impact on trade in goods. The first work to estimate the border effect was Fitzsimons, Hogan, and Neary (1999) who examined how well the popular gravity model explained trade between Ireland and Northern Ireland. Using aggregate data, they found no evidence of trade in both directions between 1970 and 1992 being reduced by the border, although the significance level depended on the specification adopted.

Subsequent research taking a more granular approach and estimating a similar model at a sectoral level from 1988 to 2007, research by InterTradeIreland (2009) found evidence that trade was lower than predicted by a gravity equation for all Irish trade. In this research, a gravity model was applied using data for 42 countries plus the separate flows between Ireland and Northern Ireland and Great Britain for 11 broad manufacturing sectors. Across a range of econometric specifications, this found that both North to South and South to North flows were below the expected level by a considerable margin. The estimated shortfall of the actual trade over the expected level of trade on average showed that the North to South trade flow is 81.8 per cent below the expected level while that for South to North trade is 77.2 per cent below the expected level.

This report takes a similar initial approach to modelling the basic gravity model but takes advantage of greater availability of detailed trade data to apply the model to a wider range of goods sectors and also to expand the analysis to incorporate services trade as well. The determinants of trade are then extrapolated forwards in line with forecasts of GDP and population growth. Note that these extrapolations are based on nominal values in 2021.

2.2 TRADE DATA

Goods trade: The main source of trade data to provide the international patterns for the contribution of each country characteristic to trade flows comes from the

Eurostat Comext database, which compiles trade data to and from all EU member states with a full set of international partner countries supplemented by trade data between Ireland and Northern Ireland collected by the CSO. For this analysis, we use trade flows at a 3-digit product level for consistency between the two sources. The choice of a 3-digit product level is to match the data available from the CSO on trade between Ireland and Northern Ireland as the Eurostat data did not separately report trade flows for Great Britain and Northern Ireland until January 2021. These products are then classified into 75 sectors, each of which estimated separately. This allows the impact of each of the country characteristics to vary in their impact across sectors and the projections for total exports are aggregated up from the sector level results. The full list of sectors used in the analysis of goods trade are presented in Appendix 1 and the reporting and partner countries are listed in Appendix 2. The modelling of the drivers of trade for each sector is carried out over an estimation period of 2015 to 2019 in order to identify the determinants over a period that does not include any disruptions arising from the COVID-19 pandemic or Brexit. These are then used as the baseline to begin projections from 2022 as described in Chapter 3.

Services trade: In order to estimate the determinants of services trade internationally, we use bilateral services trade flows from the United Nations ComTrade database covering the same time period of 2015 to 2019 for the baseline determinants. This is available for 11 subcategories of services (BoP or Balance of Payments classifications) listed in Appendix 3. We use all available countries, which comprises trade between 27 reporting countries (all EU member states in this period apart from Romania) and 57 partner countries. The list of countries available is shown in Appendix 4. As for goods trade, we model the determinants of trade flows at the sector level and then aggregate these up to get a determination of aggregate trade flows. As Ireland-Northern Ireland services flows are not included in the ComTrade data, these estimates of trade determinants are then matched to the data available on cross-border trade in services from NISRA (described in Lawless, 2021). This is less detailed than the data available from the United Nations in terms of subcategories so the focus on the services projections will largely be on the path of aggregate flows.

2.3 DATA ON DRIVERS OF TRADE FLOWS

GDP of both countries is included as a key determinant of bilateral trade flows to capture market size and income level. This data comes for the World Bank World Development Indicators.

Population of both countries is another indicator of market size that is included as potentially affecting the supply and demand of different services. This data also comes for the World Bank World Development Indicators.

Distance is a central feature of the gravity model. It provides a broad proxy for transportation costs but also picks up other areas where proximity might result in similarity of supply and demand characteristics between countries. As such, it is included as a driver of trade both for services as well as goods. Distance is measured between the capital cities of each pair of countries from the CEPII gravity database.

FTA membership is an indicator variable which is set equal to 1 if both countries in a trading pair are members of a free trade agreement and 0 otherwise. The data on all registered FTAs comes from the Design of Trade Agreements (DESTA) database.

EU membership is an indicator variable which is set equal to 1 if both countries in a trading pair are members of the European Union and 0 otherwise.

Contiguity, defined as sharing a land border, is also included as a potential trade facilitating factor. This is a binary variable equal to 1 if there is a land border between each pair of countries and 0 otherwise. This comes from the CEPII gravity database.

Common language is another indicator variable which is set equal to 1 if both countries share a common official language and 0 otherwise. This comes from the CEPII gravity database.

North-South is an additional indicator included in the specifications for goods trade which captures trade between Ireland and Northern Ireland. As in the previous work by InterTradeIreland (2009), it picks up the extent to which cross-border trade differs from the level that would be predicted from the other country determinants included in the model. Data limitations mean that this cannot be included in the services estimations.

2.4 MACROECONOMIC FORECASTS UNDERLYING TRADE PROJECTIONS

Once we have estimated the determinants of trade across sectors, we use the main drivers to project forward potential trade growth in the coming decade. Of the key factors driving trade relationships between countries, we saw that several are relatively unchanging across time such as common language, shared border and membership of a common FTA. Our model of trade growth is therefore mainly based on projections for GDP and population as they evolve over time.

We take these forecasts from a number of sources. For Ireland, the Irish Fiscal Advisory Council published a long-term outlook in 2020 containing projections for

both population and GDP. The population projections are mainly based on CSO projections while the GDP projections are based on detailed modelling of the labour market and productivity trends. Population growth is determined by both natural increase (birth and death rates) and also by projections for migration.

For Northern Ireland, population projections by NISRA are used up to 2030. For GDP, projections specifically for Northern Ireland are available from the Ulster University Economic Policy Centre. These projections are available for two potential paths – a baseline and an upper scenario. Figure 2.1 shows the GDP projections up to 2030. The COVID-19 pandemic had a sharp negative impact on Northern Ireland in 2020 but less so for Ireland where a strong export performance offset the reductions in domestic consumption (O'Toole, 2021). For both economies, sharp recoveries were projected for 2021, although these may be revised downwards somewhat given the further public health restrictions in the last months of 2021. Further into the projection timeline, the projections of the Irish Fiscal Advisory Council are consistently higher than those of the Ulster University EPC for the period of 2022 to 2025, reflecting higher labour force growth (as seen in the population projections) and higher trend productivity growth. From 2026 onwards, the projections converge on a steady GDP growth rate around 2 per cent in line with international expectations of productivity growth across developed economies.

The population projections are shown in Figure 2.2 and also show consistently higher expected growth in Ireland relative to Northern Ireland driven primarily by assumptions relating to migration patterns.

FIGURE 2.1 GDP GROWTH PROJECTIONS

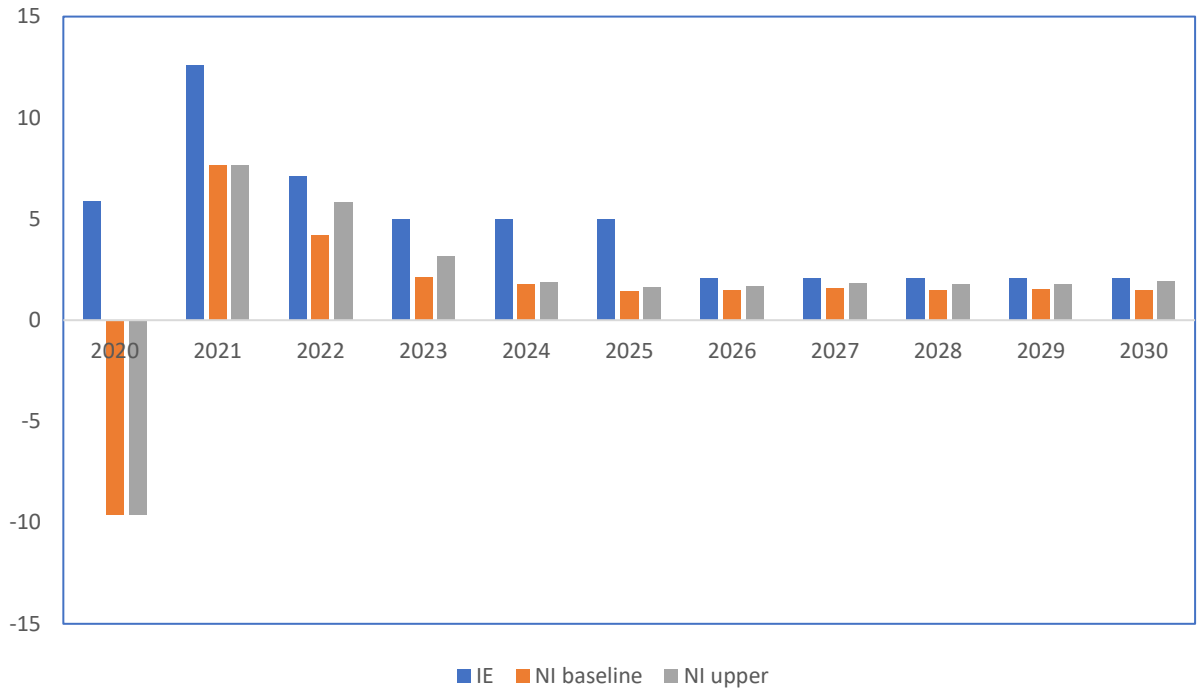
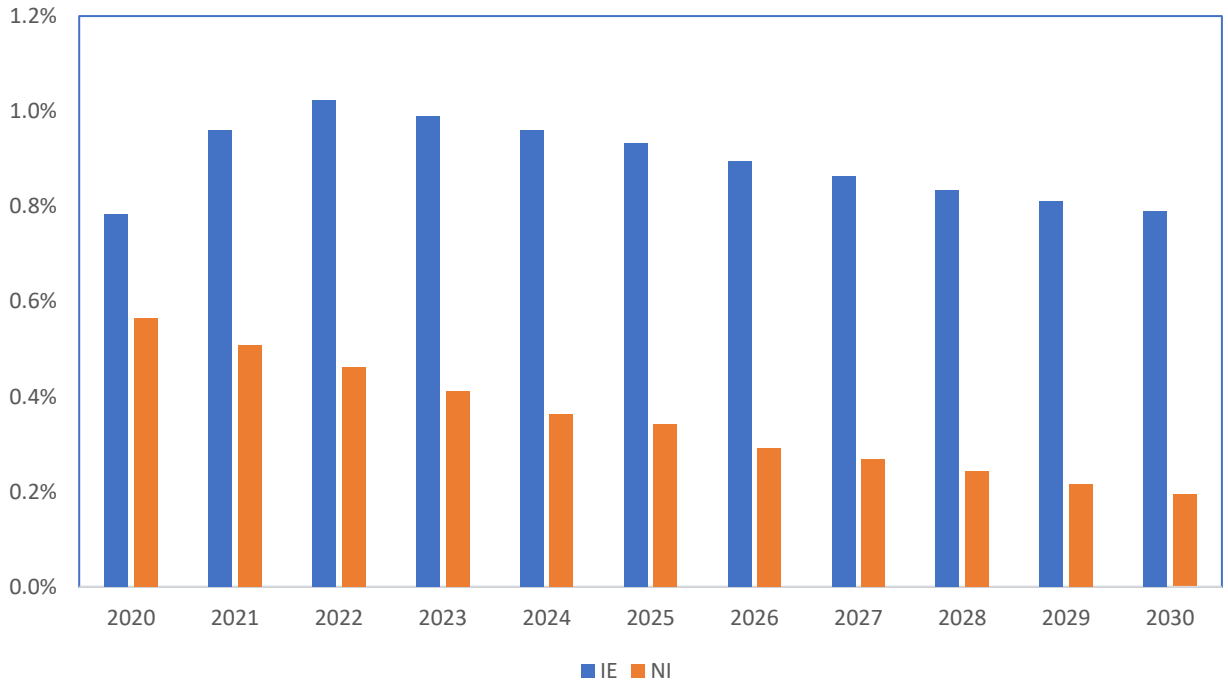


FIGURE 2.2 POPULATION GROWTH PROJECTIONS



CHAPTER 3: DETERMINANTS AND AGGREGATE PROJECTIONS OF GOODS TRADE

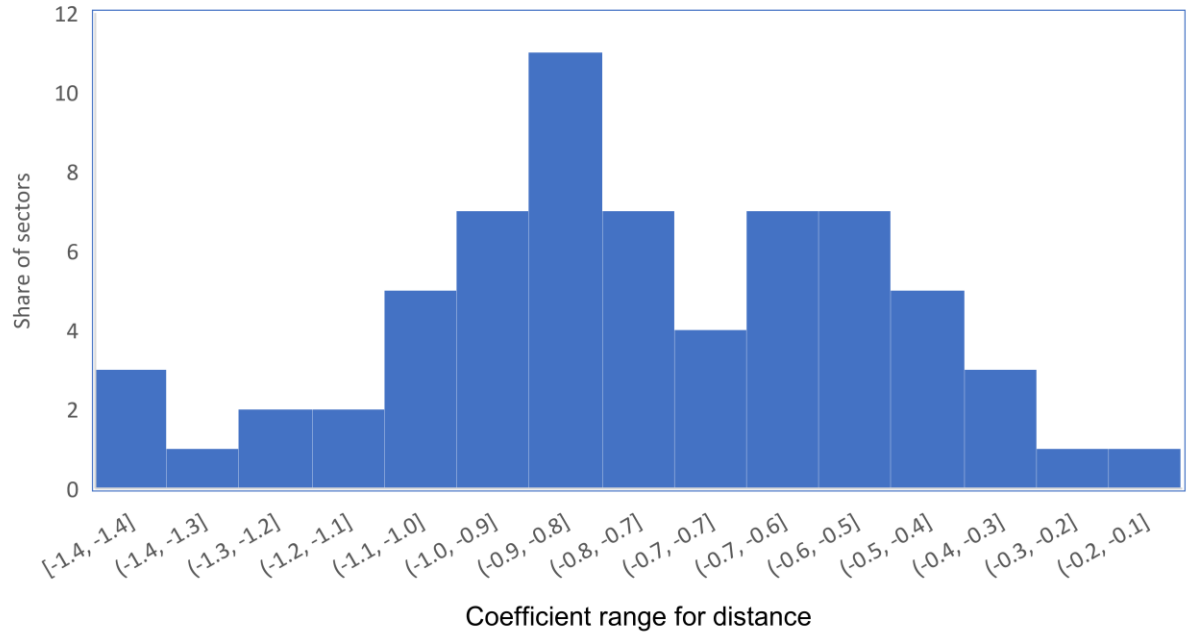
In this chapter, we first present the results for the gravity model estimation of goods trade, focusing on the variation across sectors in many of the key drivers of trade flows between countries. Section 3.2 examines the extent to which cross-border trade is above or below the levels expected by this modelling across sectors. Section 3.3 then links the gravity estimations to the forecasts for macroeconomic drivers to generate projections for cross-border goods trade. This chapter focuses on the projections at an aggregate level with variation across sectors explored further in Chapter 4.

3.1 GRAVITY MODEL RESULTS FOR GOODS TRADE

This section summarises the results relating to the drivers of goods trade across countries and, in particular, the sectors where trade between Ireland and Northern Ireland differs from the level predicted from the standard model. As described above, the empirical modelling is carried out in a bottom-up manner with separate specifications estimated for each of the 75 broad sectors. The full results for each sector along with information on the statistical significance of the estimates and the number of observations in each separate model are reported in Appendix 5. Here we focus on the diversity across the sectors of some of the key indicators.

Looking first at distance, Figure 3.1 shows what share of the 72 sector-level model results fall within different ranges according to the size of the distance coefficient. All of the ranges are negative as expected, with distance typically inhibiting trade either through direct transportation costs or through less tangible factors such as similarity of tastes and market familiarity. Even the sectors least impacted by distance show that a halving of distance would increase trade by around 7 per cent while at the left-hand side of the scale, a halving of distance is associated with trade increasing trade by around one-half for the sectors most sensitive to distance. Looking across the detailed results in the Appendix shows that heavier goods sectors such as iron and steel tend to be more negatively impacted by distance than sectors with lighter or higher-value products. These are in line with other international estimates which find an average impact of a ten percent increase in distance is to reduce trade by nine per cent, consistent with the highest share of sectors in this analysis resulting in estimated distance effects in the bracket around -0.9.

FIGURE 3.1 VARIATION IN THE IMPACT OF DISTANCE ON GOODS TRADE



In contrast to distance, country GDP levels are typically associated with greater trade flows. Figure 3.2 shows the variation in the size of the effect for the destination (i.e. purchasing) country GDP and Figure 3.3 show the variation in the effect of the origin (i.e. supplying) country GDP. The effect of GDP on trade is stronger for the purchaser side where higher incomes increase demand across essentially all sectors. The extent of the impact of destination GDP on trade patterns does vary substantially across sector groups however which will be an important factor in projecting forward cross-border trade growth. A typical pattern looking at the detailed results in the appendix is that GDP exerts a stronger pull on the demand for more sophisticated, higher value products. For example, a ten percent increase in GDP results in a ten percent increase in trade for medical and pharmaceutical products and a similar increase for office machinery and electrical machinery. Lower value-added sectors in raw materials (e.g., crude rubber or wood and cork) have a weaker relationship with destination GDP.

FIGURE 3.2 VARIATION IN THE IMPACT OF DESTINATION GDP ON GOODS TRADE

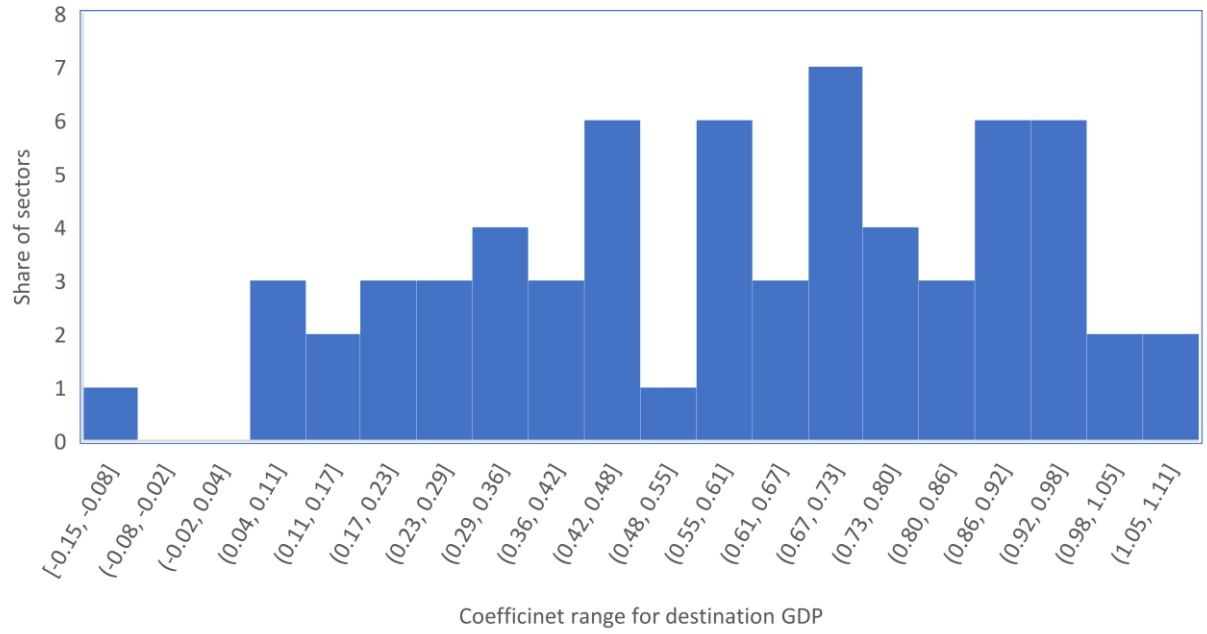
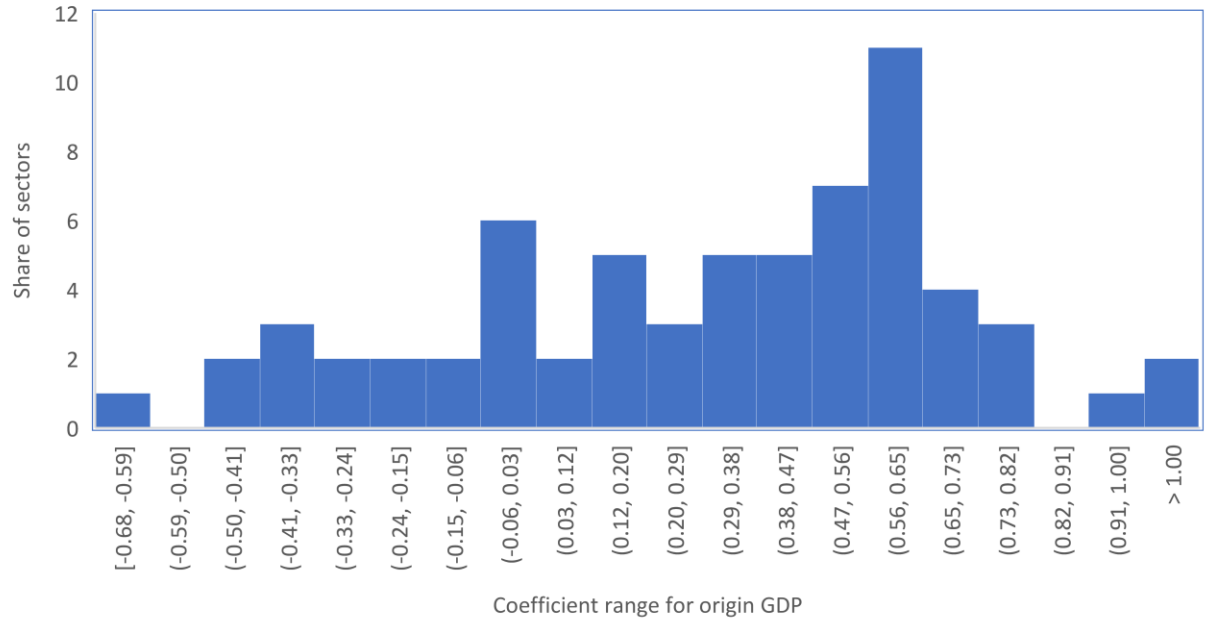


FIGURE 3.3 VARIATION IN THE IMPACT OF ORIGIN GDP ON GOODS TRADE

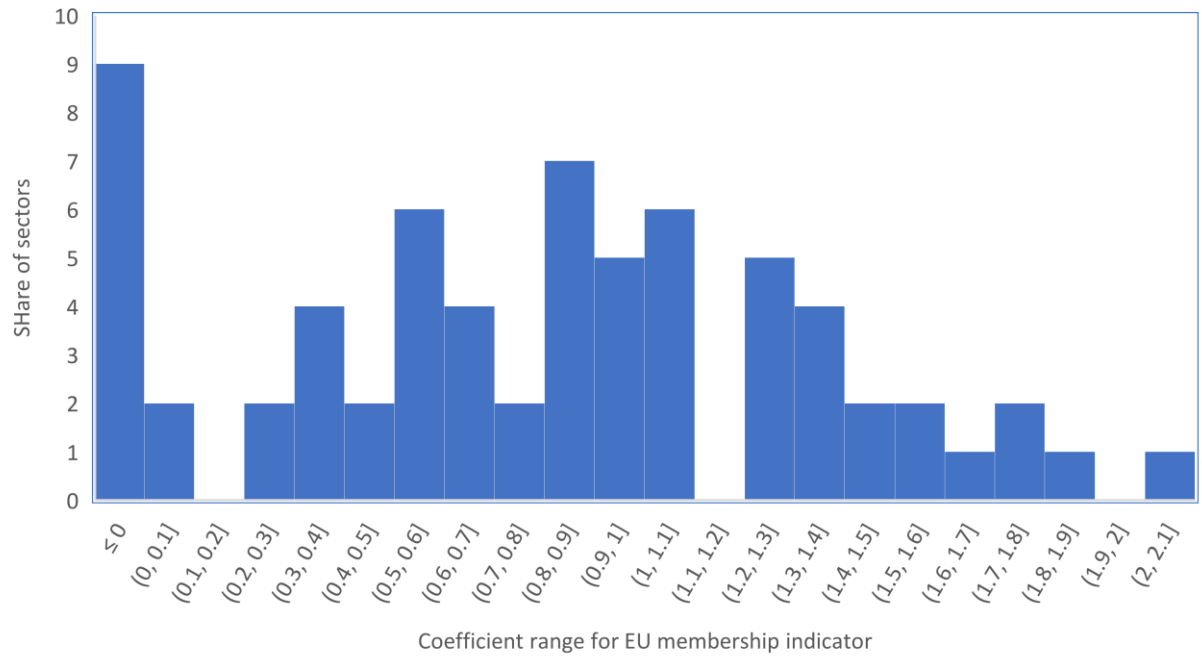


The GDP of the originating country in a trade flow (Figure 3.3) shows a greater range of potential impacts across sectors. In the case of the origin country, cost of production plays a role in addition to technical progress and scale of production resulting in some sectors where lower origin GDP results in higher trade in

particular sectors (for example cereals and tobacco). For the majority of sectors outside of raw materials, however, greater GDP in the originating country is also associated with greater trade levels.

Other control variables used in the gravity estimation show the expected positive relationships between common language, contiguity and free trade association membership with trade. Figure 3.4 illustrates one of these factors that reduce the cost of trading goods. It shows that membership of the EU is associated with greater trade for all but nine of the 75 sectors examined. Work by Mattoo, Mulabdic and Ruta (2017) examined a whole range of different trade agreements between countries and found that there was a significant positive association between preferential trade agreements and bilateral trade flows. In addition, the size of the effect was larger for deeper agreements. They ranked membership of the EU as the deepest trade agreement in their sample, increasing aggregate trade flows among members by 44 percent. This would be equivalent to slightly less than the mid-point of our sector-level estimates in Figure 3.4 (the bars in the range of a coefficient of 0.6). There are a number of instances where the impact of EU membership has been greater than this average effect, particularly in agriculture and food sectors.

FIGURE 3.4 VARIATION IN THE IMPACT OF EU MEMBERSHIP ON GOODS TRADE



3.2 CROSS-BORDER TRADE FLOWS RELATIVE TO MODEL PREDICTION

The final variable included in the estimated model of goods trade flows is the indicator specifically for cross-border trade between Ireland and Northern Ireland. The inclusion of this variable provides an indicator for how much the trade across the border systematically differs from the amounts captured by the other variables for the determinants of international trade in the model. We find considerable variation with a substantial number of sectors trading at a level to be expected from the other country-level characteristics included in the model. These include a number of the largest cross-border goods sectors, such as medicinal and pharmaceutical products as well as the meat and dairy sectors as shown in Table 3.1.

TABLE 3.1 SECTORS TRADING AT LEVEL PREDICTED BY GRAVITY MODEL

Live animals	Animal oils and fats
Meat and meat preparations	Fixed vegetable fats and oils
Dairy products and birds' eggs	Processed animal or vegetable oils, etc.
Fish and fish preparations	Organic chemicals
Sugars, sugar preparations and honey	Inorganic chemicals
Coffee, tea, cocoa, spices	Medicinal and pharmaceutical products
Miscellaneous edible products and preparations	Fertilizers, manufactured
Beverages	Leather, dressed fur, etc.
Hides, skins, furs	Rubber manufactures, n.e.s.
Cork and wood	Wood and cork manufactures
Textile fibres and their wastes	Paper, paperboard and articles thereof
Metalliferous ores and metal scrap	Non-metallic mineral manufactures, n.e.s.
Crude animal, vegetable materials n.e.s.	Prefabricated buildings & fixtures
Gas, natural and manufactured	Furniture and parts thereof

A small number of sectors are found to have trade higher than the model would predict. These are listed in Table 3.2. The most economically significant of the over-performing sectors is trade in animal foodstuffs which accounts for 4% of Ireland to Northern Ireland trade and 5% of exports from Northern Ireland to Ireland.

TABLE 3.2 SECTORS TRADING AT LEVEL HIGHER THAN PREDICTED BY GRAVITY MODEL

Vegetables and fruit
Crude fertilizers and crude minerals
Oil seeds, oleaginous fruits
Cereals and cereal preparations
Feeding stuff for animals
Coal, coke and briquettes

The remaining sectors, listed in Table 3.3, are those where average actual trade in the estimation period between 2015 and 2019 were below what the model would predict given the other country characteristics taken into account. This also shows the extent to which actual trade was below the level predicted. The magnitudes for the affected sectors are substantial but are in a similar range to those found in the earlier, more aggregate analysis, of InterTradeIreland (2009).

In some instances, the sectors trading below expectations may be as a result of absence of natural resources (tobacco or crude rubber for example) or requiring a production scale that is likely difficult to achieve in Ireland or Northern Ireland (e.g. road vehicles). Other areas currently showing lower than predicted levels of trade may be promising areas for growth with convergence to the level predicted by the other characteristics of the two markets providing a realistic benchmark. In the next chapter, we will include a scenario where a number of these sectors grow faster to achieve that convergence to the model predictions.

TABLE 3.3 SECTORS TRADING AT LEVEL LOWER THAN PREDICTED BY GRAVITY MODEL

Tobacco and tobacco manufactures	-100%	Iron and steel	-79%
Electric current	-99%	Textile yarn, fabrics	-76%
Other transport equipment	-97%	Chemical materials and products nes	-76%
Photographic equipment, optical goods	-97%	Metal working machinery	-76%
Telecommunications equipment	-92%	Plastics in primary forms	-75%
Pulp and waste paper	-90%	Petroleum and products	-74%
Instruments and apparatus n.e.s.	-90%	Road vehicles	-73%
Footwear	-90%	Miscellaneous manufactured articles	-69%
Travel goods, handbags etc	-88%	Plastics in non-primary forms	-68%
Non-ferrous metals	-88%	Power generating machinery and equipment	-68%
Office machines	-87%	Articles of apparel	-68%
General industrial machinery n.e.s.	-84%	Machinery for specialized industries	-62%
Crude rubber (incl. synthetic)	-84%	Perfume, cleaning etc. preparations	-59%
Dyeing, tanning and colouring material	-82%	Manufactures of metals, n.e.s.	-56%
Electric machinery, n.e.s. and parts	-80%		

3.3 PROJECTIONS FOR AGGREGATE GOODS TRADE

This section takes the determinants of goods trade at a sector level and extrapolates them forward based on the projections for GDP and population growth described in Chapter 2. These growth projections are then aggregated to give an overall path for goods trade.

One issue arises in terms of the starting point for the projections. The determinants of trade were estimated for the time period from 2015 to 2019 to give a pattern under normal trading circumstances. The actual data available for 2021 showed a substantial increase in cross-border trade following the exit of Great Britain from the EU while Northern Ireland retained access to the Single Market. Our baseline scenario treats this increase in trade as the starting point for the growth

projections. However, as some of this may be related to temporary changes with COVID-19 impacting supply chains, we also apply an adjustment to the starting point to control for increases in cross-border trade that cannot be explained by the market access element following Brexit. This is done by using the methods of Flynn, Kren and Lawless (2021) to cross-border trade, which estimated the extent to which the observed changes in trade could be explained by Brexit. For any sectors where there is a greater deviation in growth in 2021 than can be explained by this statistical exercise, we restrict the growth to the rate estimated by the model. This reduces the starting point of the trade projection exercise, effectively treating some of the 2021 level-shift as temporary for the purposes of the projection.

Along with our baseline and "COVID-adjusted" projection paths, we also calculate a third scenario where a number of sectors that were estimated as trading less than would be expected from the gravity model output converge to the level consistent with the gravity predictions. We do not apply convergence to all sectors that are below the gravity predictions – as discussed in the previous chapter, some of those sectors trading below the statistical predictions can be explained by factors such as resource access. We therefore take a subgroup of those sectors that were found to be trading below expectations but where convergence would be a reasonable target and may be amenable to policy interventions.

In choosing the sectors to apply the converge scenario to, we are influenced by the policy goals of the Northern Ireland government (outlined in the Department of Economy *10X Economy*) and the government of Ireland's National Development Plan, both of which highlight digital and high-technology sectors for growth. In implementing this scenario, we are limited in that the areas targeted as policy priorities do not precisely map onto the SITC coding of the trade data so this scenario should be interpreted as illustrative. The sectors where a higher "convergence" growth rate has been superimposed are listed in Table 3.4

It should be noted that these scenarios may be rather conservative as they do not project any sector growing above the parameters of the gravity model and current economic projections.

TABLE 3.4 SECTORS MODELLED AS CONVERGING TO MODEL PREDICTED LEVELS

Other transport equipment
Photographic equipment, optical goods etc.
Telecommunications and sound recording equipment
Instruments and apparatus n.e.s.
Office machines
General industrial machinery n.e.s.
Electric machinery, n.e.s. and parts
Chemical materials and products, n.e.s.
Metal working machinery
Miscellaneous manufactured articles, n.e.s.
Machinery for specialized industries

The aggregate projections for six paths of trade from Ireland to Northern Ireland could take are shown Figure 3.1 and those from Northern Ireland to Ireland are shown in Figure 3.2. Both are expressed in billions of Euro. The six paths relate to the three scenarios (baseline, Covid-adjusted and convergence) each calculated using two different paths of Northern Ireland income growth (designated as lower and upper) from the UUEPC projections for the Northern Ireland economy. While the patterns of growth are reasonably similar in both directions of trade, the level difference should be noted with trade from Northern Ireland to Ireland experiencing a substantial increase in 2021, which is then built on up to 2030 in all scenarios. The gap is particularly large for the baseline scenario whereas in the other two cases, where the 2021 increase for Northern Ireland's exports is moderated, the values of trade are more balanced in each direction. For each of the three scenarios, the difference in the level of trade accounted for by using the lower and upper economic growth projections is relatively modest. Going from Ireland to Northern Ireland, trade in 2020 is approximately 2.3 billion euros. By 2030, this trade is projected to reach a value of between €3.79 billion in the lowest scenario and €4.55 billion in the highest scenario. From Northern Ireland to Ireland, trade in 2020 starts at €2.42 billion and could increase to between €4.78 billion and €6.07 billion depending on the scenario.

FIGURE 3.1 PROJECTIONS OF AGGREGATE GOODS TRADE, IRELAND TO NORTHERN IRELAND

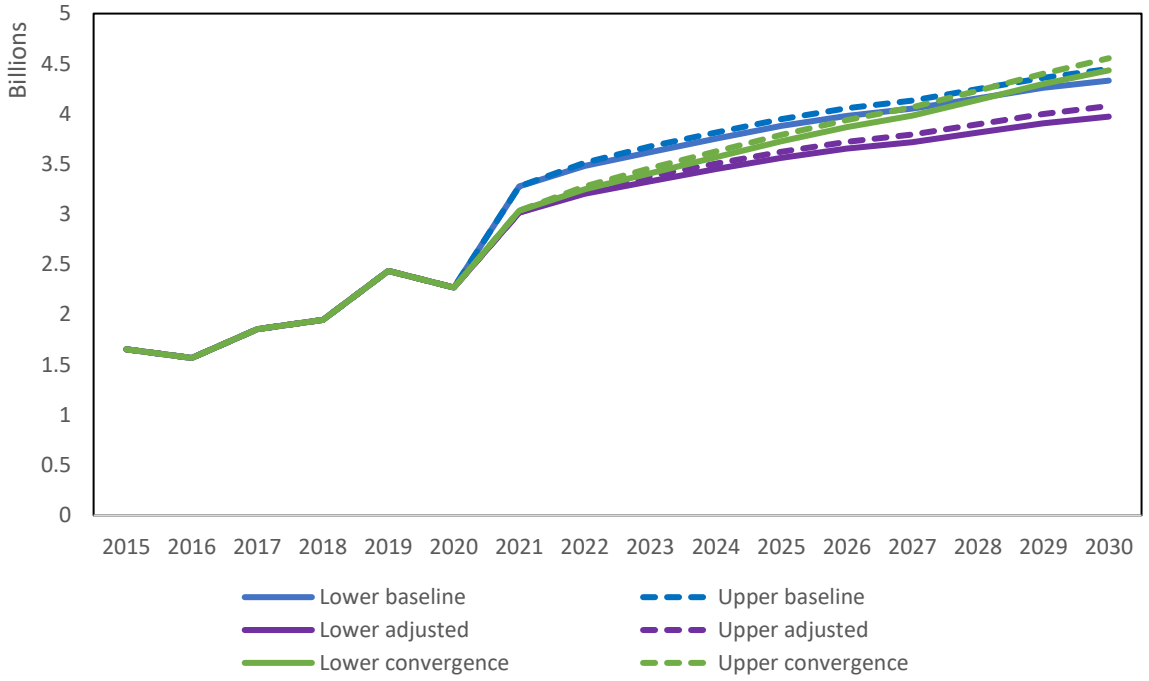


FIGURE 3.2 PROJECTIONS OF AGGREGATE GOODS TRADE, NORTHERN IRELAND TO IRELAND

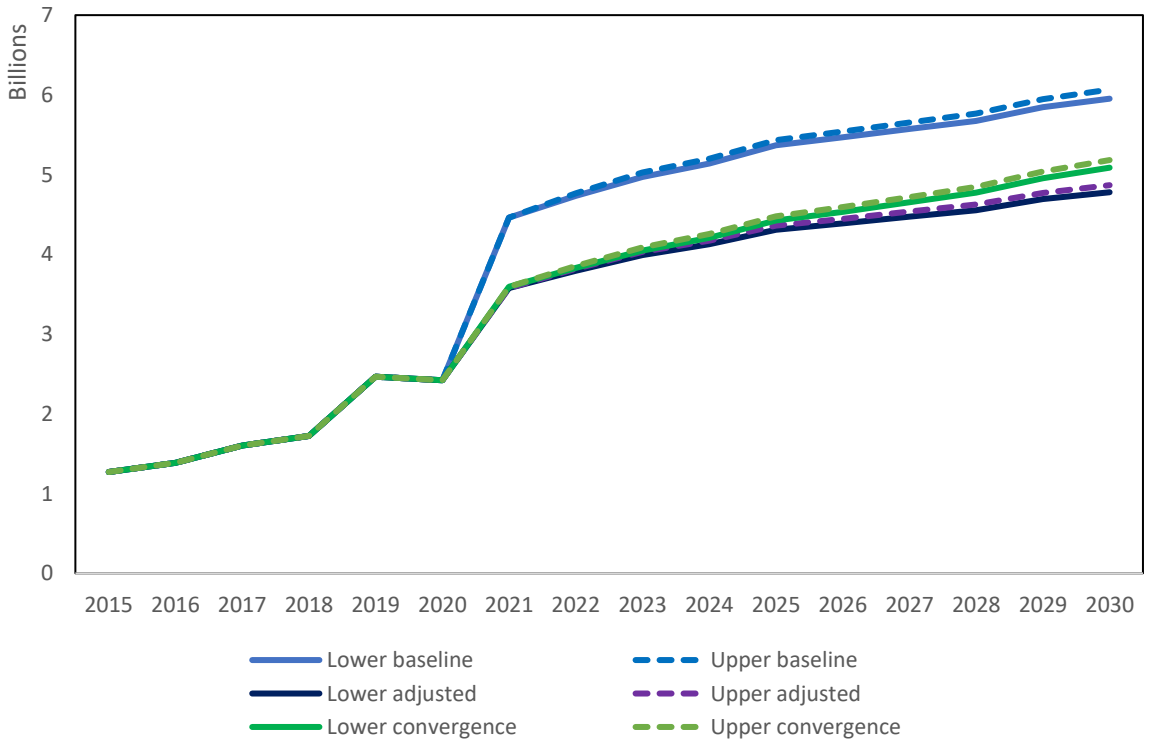


TABLE 3.5 ANNUAL PROJECTED GROWTH RATES FOR CROSS-BORDER GOODS TRADE

	Ireland to Northern Ireland					
	Lower baseline	**Upper baseline**	**Lower adjusted**	**Upper adjusted**	**Lower convergence**	**Upper convergence**
2021	44.5%	44.5%	33.0%	33.0%	33.7%	33.7%
2022	6.2%	7.2%	6.2%	7.1%	7.1%	8.0%
2023	4.0%	4.6%	3.9%	4.5%	4.9%	5.5%
2024	3.7%	3.8%	3.7%	3.7%	4.7%	4.8%
2025	3.3%	3.5%	3.3%	3.4%	4.4%	4.5%
2026	2.6%	2.7%	2.6%	2.7%	3.8%	3.9%
2027	1.8%	1.9%	1.8%	1.9%	3.0%	3.2%
2028	2.6%	2.8%	2.5%	2.7%	3.9%	4.1%
2029	2.5%	2.6%	2.4%	2.6%	3.9%	4.0%
2030	1.7%	2.0%	1.7%	2.0%	3.2%	3.5%
	Northern Ireland to Ireland					
	Lower baseline	**Upper baseline**	**Lower adjusted**	**Upper adjusted**	**Lower convergence**	**Upper convergence**
2021	84.2%	84.2%	47.7%	47.7%	48.4%	48.4%
2022	6.1%	6.8%	6.1%	6.8%	6.6%	7.3%
2023	5.0%	5.5%	5.1%	5.5%	5.6%	6.1%
2024	3.4%	3.5%	3.4%	3.5%	4.0%	4.1%
2025	4.4%	4.5%	4.5%	4.5%	5.1%	5.2%
2026	1.9%	2.0%	1.9%	2.0%	2.5%	2.6%
2027	1.9%	2.0%	1.9%	2.0%	2.6%	2.7%
2028	1.8%	2.0%	1.8%	2.0%	2.6%	2.7%
2029	3.0%	3.1%	3.0%	3.2%	3.8%	4.0%
2030	1.8%	2.0%	1.8%	2.0%	2.7%	2.9%

Table 3.5 reports these patterns as annual growth rates for each scenario and the upper and lower economic growth projections. The substantial upward shift in trade in 2021 stands out across the scenarios. The subsequent growth rates are relatively similar across the three scenarios – almost identical in the cases of the baseline and adjusted scenarios and somewhat higher in the convergence scenario when the selected sectors identified as having catch-up potential are assumed to grow more rapidly to match the predictions of the gravity model by the end of the projection horizon. The relative similarity of the growth projections from 2022 to 2030 highlights the extent to which the end point of the projections in level terms depends on how much of the increased trade flows in 2021 are permanent and therefore part of the subsequent growth base (the baseline scenario) or are transitory (so that the growth is accumulating from a lower starting point).

CHAPTER 4: DETAILED GOODS TRADE PROJECTIONS

This section looks in some further depth at the projections for goods trade, highlighting where growth projections vary across sectors and how over time this accumulates into some shifts in the overall sectoral composition of cross-border trade. We then go into further detail for the largest sectors in goods trade, looking separately at the projections for food, chemicals, basic manufacturing, machinery and general manufacturing. Due to the similarity in the paths, the sectoral projections discussed all use the UUEPC baseline growth projection (the lower path in the aggregate results of Chapter 3) for each scenario. For the individual sectors, we will mainly focus on the baseline scenario from the projections, thus giving somewhat of an upper bound to the overall evolution of trade flows.

4.1 BROAD SECTORAL GROWTH AND COMPOSITION CHANGES

In this section, we look at how the growth projections of goods in the previous chapter is allocated across sectors. Beginning with a set of ten broad sectors, Tables 4.1 and 4.2 show the average growth rates across two periods (2022-2030 and 2015-2030) for Ireland to Northern Ireland trade and Northern Ireland to Ireland respectively. The two time periods are chosen to show the extent of the impact of the 2021 trade jump over the longer period and the relatively steady growth path projected for most sectors from the model estimations across 2022-2030.

TABLE 4.1 AVERAGE TRADE GROWTH BY BROAD SECTOR, IRELAND TO NORTHERN IRELAND

	Baseline		Adjusted		Convergence	
	Average 2022-20	Average 2015-2030	Average 2022-20	Average 2015-2030	Average 2022-20	Average 2015-2030
Food and live animals	2.2%	6.7%	2.2%	6.2%	2.2%	6.2%
Beverages and tobacco	3.2%	2.6%	3.2%	1.5%	3.2%	1.5%
Crude materials, except fuels	0.6%	5.4%	0.6%	5.0%	0.6%	5.0%
Mineral fuels etc	0.6%	9.8%	0.6%	9.8%	0.6%	9.8%
Animal and vegetable oils and fats	1.5%	9.0%	1.5%	6.6%	1.5%	6.6%
Chemicals and related products, n.e.s.	4.2%	13.9%	4.2%	13.1%	5.2%	13.8%
Basic manufactures	3.1%	7.4%	3.1%	6.4%	3.1%	6.4%
Machinery, transport equipment	4.4%	9.4%	4.5%	8.1%	9.6%	11.4%
Miscellaneous manufactured articles	4.0%	4.7%	4.0%	4.0%	7.5%	6.3%
Goods not classified elsewhere	5.6%	3.0%	5.6%	0.0%	5.6%	0.0%
Total	3.2%	7.3%	3.1%	6.5%	4.3%	7.3%

TABLE 4.2 AVERAGE TRADE GROWTH BY BROAD SECTOR, NORTHERN IRELAND TO IRELAND

	Baseline		Adjusted		Convergence	
	Average 2022-20	Average 2015-2030	Average 2022-20	Average 2015-2030	Average 2022-20	Average 2015-2030
Food and live animals	1.9%	7.5%	1.9%	5.2%	1.9%	5.2%
Beverages and tobacco	3.2%	13.8%	3.2%	13.8%	3.2%	13.8%
Crude materials, except fuels	1.2%	6.8%	1.2%	4.5%	1.2%	4.5%
Mineral fuels etc	1.3%	24.6%	1.3%	21.2%	1.3%	21.2%
Animal and vegetable oils and fats	1.9%	4.3%	1.8%	3.2%	1.8%	3.2%
Chemicals and related products, n.e.s.	4.2%	36.3%	4.3%	35.8%	4.7%	36.1%
Basic manufactures	3.5%	13.3%	3.5%	11.7%	3.5%	11.7%
Machinery, transport equipment	4.2%	12.9%	4.2%	9.3%	8.1%	11.9%
Miscellaneous manufactured articles	4.2%	19.6%	4.2%	11.7%	7.0%	13.6%
Goods not classified elsewhere	5.0%	14.7%	5.0%	8.3%	5.0%	8.3%
Total	3.3%	12.5%	3.3%	10.1%	3.9%	10.5%

In each scenario and for both directions of trade, the level shift of 2021 has a large impact on the average across the entire fifteen-year horizon, particularly in the direction of Northern Ireland to Ireland trade with the level shift of 2021 less marked in the opposite direction. The average growth rates in the baseline and adjusted scenarios are the same for the 2022-2030 period as the difference between them is in the starting level. The convergence scenario is by construction more rapid growth although not in all sectors. The subsectors identified as convergence candidates are mainly located in the broader chemicals and machinery sectors.

Across each of the scenarios, growth higher than average is anticipated in the chemicals, machinery and miscellaneous manufacturing sectors. These sectors are the fastest growing in both trade directions. Trade in food and beverages, on the other hand, is projected to grow at more modest rates throughout the entire time horizon.

These variations in sector growth rates over the course of a decade would accumulate into shifts in the overall composition of goods trade. Tables 4.3 and 4.4 show how sector composition across the ten broad categories would look in 2030 compared to the 2015 and 2021 distributions for each of the scenarios. The former

table presents the results for Ireland to Northern Ireland trade and the latter for the opposite direction.

TABLE 4.3 PROJECTED CHANGE IN SECTOR COMPOSITION, IRELAND TO NI GOODS TRADE

Baseline	**2015**	**2021**	**2030**
Food and live animals	36.0%	35.6%	32.8%
Beverages and tobacco	5.4%	2.8%	2.8%
Crude materials, except fuels	4.5%	4.2%	3.4%
Mineral fuels etc	1.6%	2.1%	1.7%
Animal and vegetable oils and fats	0.4%	0.5%	0.5%
Chemicals and related products, n.e.s.	11.7%	20.4%	22.2%
Basic manufactures	14.1%	14.5%	14.5%
Machinery, transport equipment	9.1%	9.7%	10.8%
Miscellaneous manufactured articles	11.9%	8.1%	8.8%
Goods not classified elsewhere	5.3%	2.1%	2.6%
Total	100.0%	100.0%	100.0%
Adjusted	**2015**	**2021**	**2030**
Food and live animals	36.0%	36.7%	33.8%
Beverages and tobacco	5.4%	2.6%	2.6%
Crude materials, except fuels	4.5%	4.4%	3.5%
Mineral fuels etc	1.6%	2.3%	1.8%
Animal and vegetable oils and fats	0.4%	0.4%	0.4%
Chemicals and related products, n.e.s.	11.7%	20.6%	22.5%
Basic manufactures	14.1%	14.1%	14.2%
Machinery, transport equipment	9.1%	9.3%	10.5%
Miscellaneous manufactured articles	11.9%	8.0%	8.7%
Goods not classified elsewhere	5.3%	1.6%	1.9%
Total	100.0%	100.0%	100.0%
Convergence	**2015**	**2021**	**2030**
Food and live animals	36.0%	36.5%	30.3%
Beverages and tobacco	5.4%	2.6%	2.4%
Crude materials, except fuels	4.5%	4.4%	3.1%
Mineral fuels etc	1.6%	2.2%	1.6%
Animal and vegetable oils and fats	0.4%	0.4%	0.3%
Chemicals and related products, n.e.s.	11.7%	20.6%	22.2%
Basic manufactures	14.1%	14.1%	12.7%
Machinery, transport equipment	9.1%	9.5%	14.8%
Miscellaneous manufactured articles	11.9%	8.2%	10.8%
Goods not classified elsewhere	5.3%	1.6%	1.7%
Total	100.0%	100.0%	100.0%

TABLE 4.4 PROJECTED CHANGE IN SECTOR COMPOSITION, NI TO IRELAND GOODS TRADE

Baseline	**2015**	**2021**	**2030**
Food and live animals	43.1%	26.0%	23.1%
Beverages and tobacco	4.6%	5.1%	5.1%
Crude materials, except fuels	5.2%	3.0%	2.5%
Mineral fuels etc	3.1%	7.2%	6.1%
Animal and vegetable oils and fats	1.4%	0.6%	0.5%
Chemicals and related products, n.e.s.	5.9%	20.8%	22.6%
Basic manufactures	11.3%	13.0%	13.3%
Machinery, transport equipment	9.2%	8.0%	8.7%
Miscellaneous manufactured articles	7.3%	9.1%	9.8%
Goods not classified elsewhere	9.0%	7.1%	8.3%
Total	100.0%	100.0%	100.0%
Adjusted	**2015**	**2021**	**2030**
Food and live animals	43.1%	25.4%	22.6%
Beverages and tobacco	4.6%	6.4%	6.3%
Crude materials, except fuels	5.2%	3.0%	2.5%
Mineral fuels etc	3.1%	6.5%	5.4%
Animal and vegetable oils and fats	1.4%	0.7%	0.6%
Chemicals and related products, n.e.s.	5.9%	25.2%	27.4%
Basic manufactures	11.3%	14.0%	14.2%
Machinery, transport equipment	9.2%	6.4%	6.9%
Miscellaneous manufactured articles	7.3%	6.9%	7.4%
Goods not classified elsewhere	9.0%	5.7%	6.6%
Total	100.0%	100.0%	100.0%
Convergence	**2015**	**2021**	**2030**
Food and live animals	43.1%	25.3%	21.2%
Beverages and tobacco	4.6%	6.3%	5.9%
Crude materials, except fuels	5.2%	2.9%	2.3%
Mineral fuels etc	3.1%	6.4%	5.1%
Animal and vegetable oils and fats	1.4%	0.7%	0.5%
Chemicals and related products, n.e.s.	5.9%	25.1%	26.8%
Basic manufactures	11.3%	13.9%	13.4%
Machinery, transport equipment	9.2%	6.6%	9.4%
Miscellaneous manufactured articles	7.3%	7.0%	9.1%
Goods not classified elsewhere	9.0%	5.7%	6.2%
Total	100.0%	100.0%	100.0%

For trade from Ireland to Northern Ireland, all scenarios suggest a slight shift in the composition of goods trade away from food and crude materials towards chemicals and machinery. The magnitudes are not particularly large however in any of the scenarios. The most notable shift in composition comes from the substantial growth in chemicals trade between 2015 and 2021 prior to the start of the projection exercise. While this sector is still forecast to grow faster than average goods trade up to 2030, the pace is less dramatic and does not drive shifts in the overall composition of trade to the same extent. Trade from Northern Ireland to Ireland shows some large shifts in composition with lower growth in food and animals resulting in a reduction in the initially large share of trade accounted for by that sector. Chemicals and machinery as well as manufacturing begin to account for a more substantial share of overall goods trade by the end of the projection timeline.

4.2 GROWTH PROJECTIONS FOR FOOD AND LIVE ANIMALS SECTOR

The food and live animals sector is one of the largest in cross-border goods trade, accounting for 35.6% of sales from Ireland to Northern Ireland and 26% of sales from Northern Ireland to Ireland in 2021 as shown in Tables 4.3 and 4.4 above. The share of this sector in the total of Northern Ireland's exports to Ireland reduced sharply when compared to 2015 when it accounted for over 40% but this is due to the jump in trade in other sectors rather than a result of a decline in the sales of the sector itself. As noted above, this sector is one where projected growth up to 2030 is at the lower end of the set of estimates, with the overall sector projected to grow at close to 2% for trade in both directions. This section looks deeper at how this growth might be distributed across the different components of the sector.

There are ten subsectors within the food and live animals sector with meat and dairy produce dominating cross-border trade. These are both expected to grow marginally ahead of the sector average growth rate for trade in both directions (Table 4.5), resulting in them being likely to maintain their positions as the largest components of this sector when the composition is compared between 2021 and 2030 (Table 4.6). Cereals are projected to have the lowest growth performance over the decade, not much above a static path, which would have their contribution to overall trade in the sector fall by about two percentage points in both directions – going from 12.1% of Ireland to Northern Ireland food trade to 9.9% between 2021 and 2030 with the reduction in contribution going from 16.4% to 14.1% for Northern Ireland to Ireland trade. Both the live animals and animal feed subsectors are projected to also grow rather above the sector average.

FIGURE 4.1 PROJECTIONS WITHIN FOOD SECTOR, IRELAND TO NORTHERN IRELAND

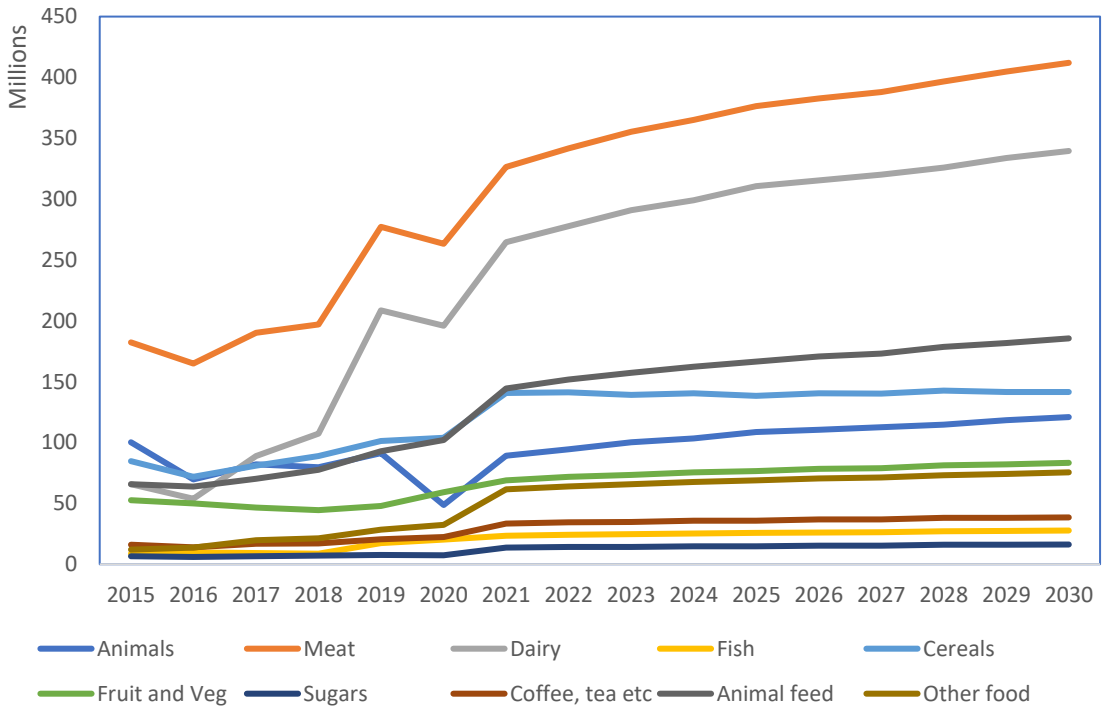


FIGURE 4.2 PROJECTIONS WITHIN FOOD SECTOR, NORTHERN IRELAND TO IRELAND

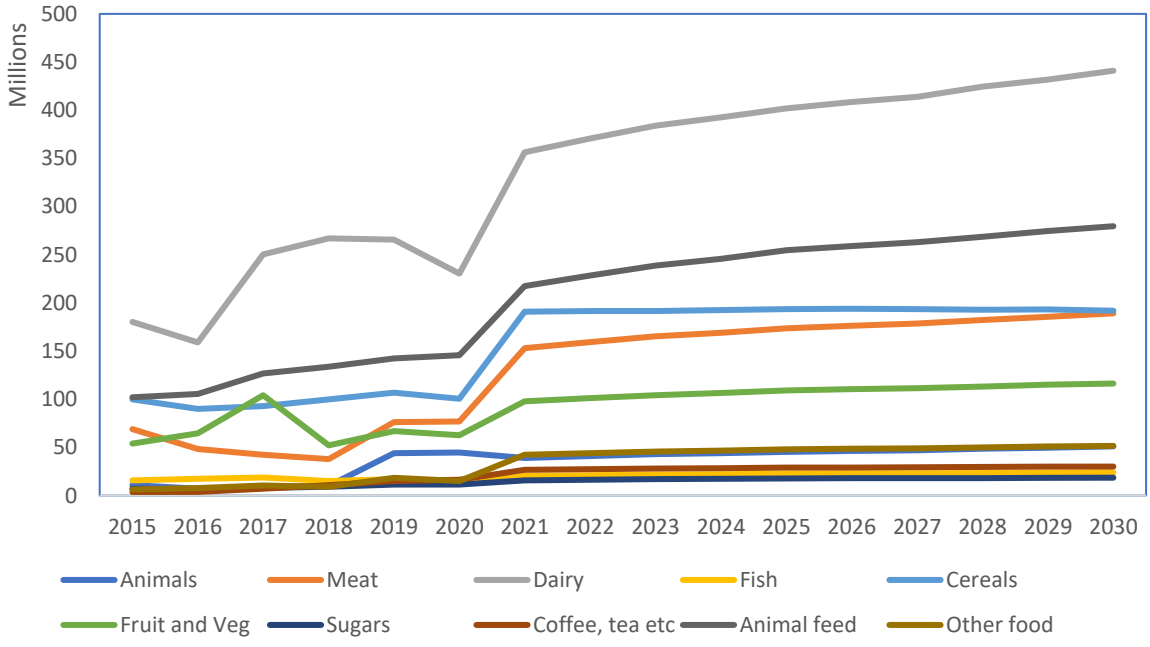


TABLE 4.5 PROJECTED GROWTH WITHIN FOOD SECTOR, 2021-2030

	IE to NI	NI to IE
Animals	3.4%	2.7%
Meat	2.4%	2.2%
Dairy	2.7%	2.1%
Fish	1.7%	1.8%
Cereals	0.0%	0.2%
Fruit and Veg	1.9%	1.8%
Sugars	1.6%	1.7%
Coffee, tea etc	1.4%	1.2%
Animal feed	2.6%	2.7%
Other food	2.1%	2.1%
Total	2.2%	1.9%

TABLE 4.6 COMPOSITIONAL CHANGE WITHIN FOOD SECTOR, 2021-2030

	IE to NI		NI to IE	
	2021	2030	2021	2030
Animals	7.6%	8.4%	3.4%	3.6%
Meat	28.0%	28.6%	13.2%	13.5%
Dairy	22.7%	23.6%	30.7%	31.4%
Fish	2.0%	1.9%	1.8%	1.7%
Cereals	12.1%	9.9%	16.4%	14.1%
Fruit & Veg	5.9%	5.8%	8.4%	8.4%
Sugars	1.2%	1.1%	1.4%	1.4%
Coffee, tea etc	2.9%	2.7%	2.3%	2.2%
Animal feed	12.4%	12.8%	18.8%	20.0%
Other food	5.3%	5.2%	3.6%	3.7%
Total	100.0%	100.0%	100.0%	100.0%

4.3 GROWTH PROJECTIONS FOR THE CHEMICALS SECTOR

In the chemicals sector, 2020-2021 saw a dramatic increase in trade in the medicinal and pharmaceutical subsector in both directions. From 2021 onwards, the projections suggest that most of the components of the chemicals sector grow at relatively similar levels close to the sector average of around 4.5% (with the exception of manufactured fertilizers where growth is considerably lower) as seen in Table 4.7.

This set of growth rates cements the dominant role of medicinal and pharmaceuticals products within the overall chemicals sector, accounting for two-thirds of chemicals trade from Ireland to Northern Ireland and three-quarters of chemicals from Northern Ireland to Ireland. This relies on the considerable increase in trade in 2021 proving permanent (rather than being driven by a temporary COVID-19 impact for example) and thereby setting the base for the future projections. This does not seem unrealistic however given the considerable size of this subsector in total international trade from Ireland and the supply chain potential for links with Northern Ireland production that may have become more attractive in the aftermath of Brexit.

FIGURE 4.3 PROJECTIONS WITHIN CHEMICALS SECTOR, IRELAND TO NORTHERN IRELAND

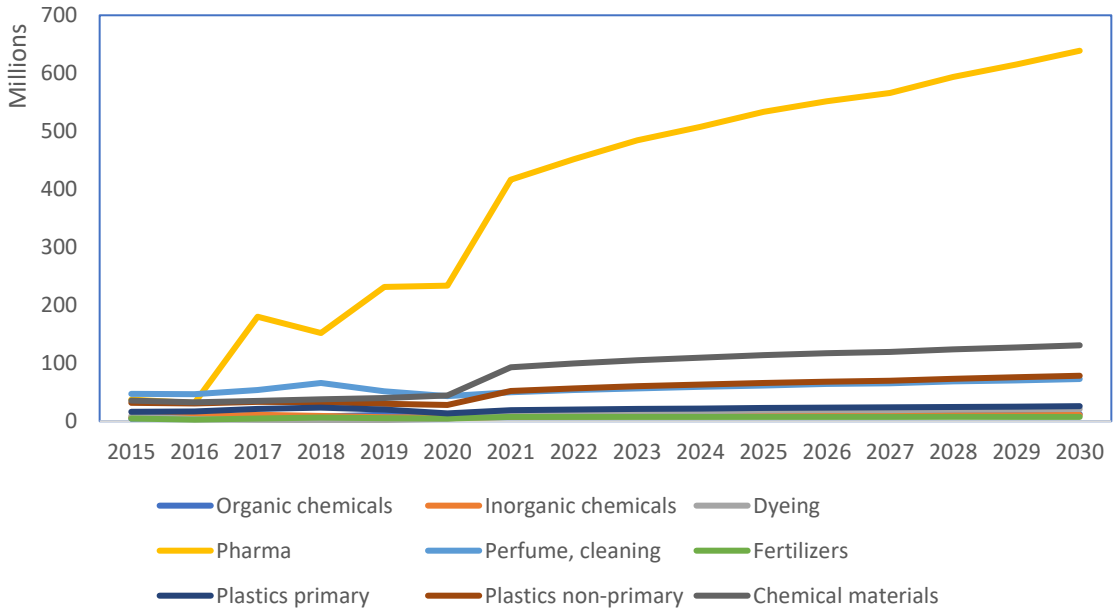


FIGURE 4.4 PROJECTIONS WITHIN CHEMICALS SECTOR, NORTHERN IRELAND TO IRELAND

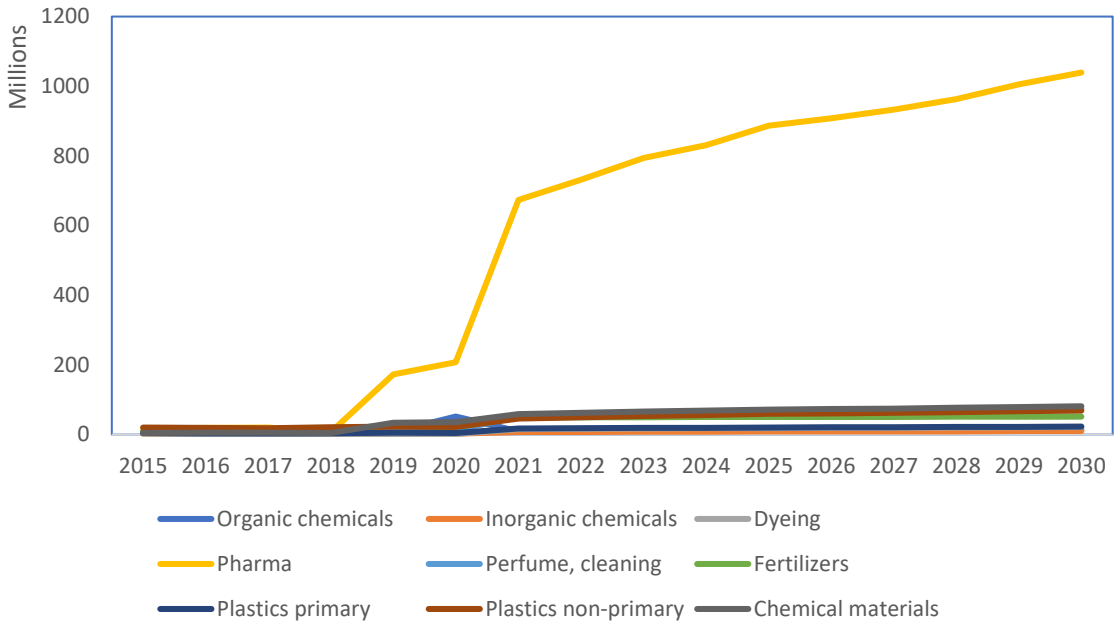


TABLE 4.7 PROJECTED GROWTH WITHIN THE CHEMICALS SECTOR, 2021-2030

	IE to NI	NI to IE
Organic chemicals	5.0%	5.0%
Inorganic chemicals	3.8%	3.8%
Dyeing	3.8%	3.5%
Pharma	4.7%	5.0%
Perfume, cleaning	4.1%	4.1%
Fertilizers	0.4%	0.6%
Plastics primary	3.4%	3.3%
Plastics non-primary	4.5%	4.6%
Chemical materials	3.7%	3.5%
Total	4.4%	4.5%

TABLE 4.8 COMPOSITIONAL CHANGE WITHIN THE CHEMICALS SECTOR, 2021-2030

	IE to NI		NI to IE	
	2021	2030	2021	2030
Organic chemicals	1.2%	1.2%	1.0%	1.0%
Inorganic chemicals	1.1%	1.1%	0.8%	0.7%
Dyeing	2.2%	2.1%	1.6%	1.5%
Pharma	62.3%	63.7%	72.7%	75.0%
Perfume, cleaning	7.5%	7.3%	5.5%	5.4%
Fertilizers	1.1%	0.8%	5.2%	3.8%
Plastics primary	2.8%	2.6%	1.8%	1.7%
Plastics non-primary	7.8%	7.9%	4.9%	5.0%
Chemical materials	13.9%	13.3%	6.4%	5.9%
Total	100.0%	100.0%	100.0%	100.0%

4.4 GROWTH PROJECTIONS FOR THE BASIC MANUFACTURING SECTOR

The subcomponents of the basic manufacturing sector are classified in the trade statistics by the primary material that they are produced from. Items made of metals other than those specifically classified showed a substantial increase in trade from Northern Ireland in 2019 and iron and steel products also grew sharply in 2021. This sets the base from which manufactures of metals continues to grow strongly, at almost one percentage point per year faster than the sector average. Products of other types of metal and non-metallic minerals all grow at similar rates to the sector average while textile and wood products are projected to lag in terms of growth rates.

FIGURE 4.5 PROJECTIONS WITHIN BASIC MANUFACTURING, IRELAND TO NORTHERN IRELAND

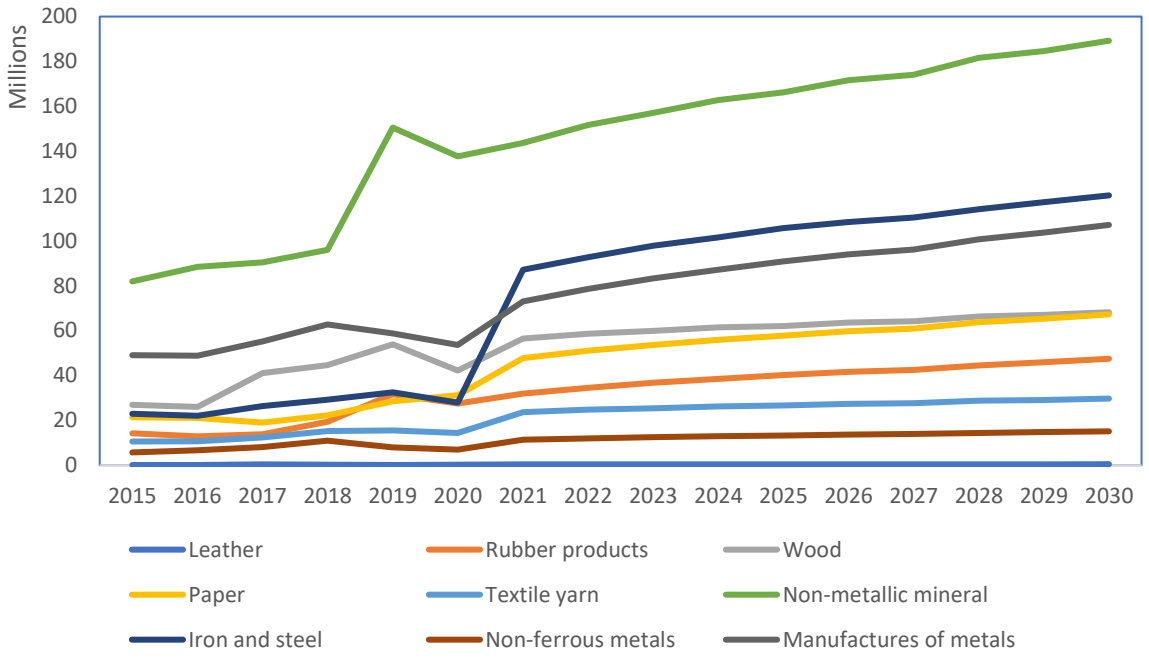


FIGURE 4.6 PROJECTIONS WITHIN BASIC MANUFACTURING, NORTHERN IRELAND TO IRELAND

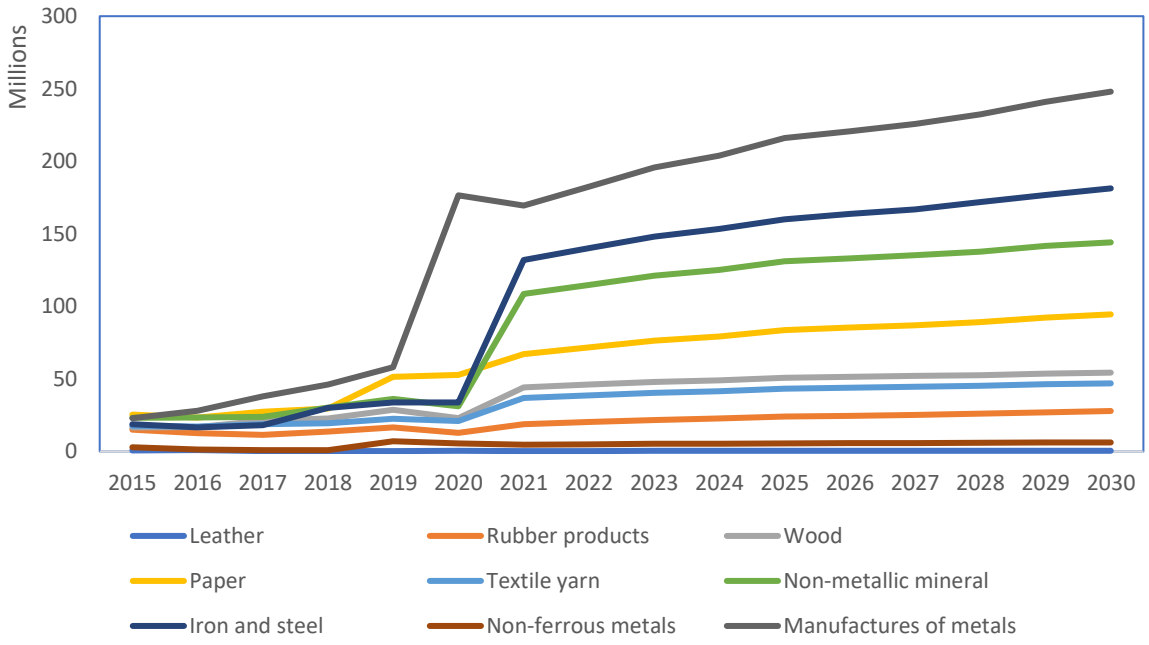


TABLE 4.9 GROWTH RATES WITHIN BASIC MANUFACTURING, 2021-2030

	IE to NI	NI to IE
Leather	1.6%	1.7%
Rubber products	4.4%	4.5%
Wood	1.8%	2.3%
Paper	3.6%	3.9%
Textile yarn	2.3%	2.7%
Non-metallic mineral	2.8%	3.1%
Iron and steel	3.5%	3.4%
Non-ferrous metals	3.0%	3.1%
Manufactures of metals	4.2%	4.3%
Total	3.2%	3.6%

TABLE 4.10 COMPOSITIONAL CHANGE WITHIN BASIC MANUFACTURING, 2021-2030

	IE to NI		NI to IE	
	2021	2030	2021	2030
Leather	0.1%	0.1%	0.1%	0.1%
Rubber products	6.7%	7.3%	3.2%	3.4%
Wood	11.9%	10.6%	7.6%	6.9%
Paper	10.1%	10.4%	11.5%	11.8%
Textile yarn	5.0%	4.6%	6.3%	5.9%
Non-metallic mineral	30.2%	29.4%	18.7%	18.1%
Iron and steel	18.3%	18.7%	22.7%	22.4%
Non-ferrous metals	2.4%	2.3%	0.8%	0.8%
Manufactures of metals	15.4%	16.5%	29.1%	30.7%
Total	100.0%	100.0%	100.0%	100.0%

4.5 GROWTH PROJECTIONS FOR THE MACHINERY SECTOR

The machinery sector is one projected to experience relatively strong growth over the next decade. As with the other sections looking at a more granular level within sectors, this section shows the rates projected using the baseline scenario. As noted in the discussion of Table 3.4, several of the components of the machinery sector could be considered as having convergence potential and hence to grow at a much faster rate than the baseline projections shown here. Industrial, office and electric machinery are all projected to grow particularly strongly in this baseline case, while the latter two could also have even higher rates in the hypothetical convergence scenario discussed previously.

TABLE 4.9 GROWTH RATES WITHIN MACHINERY, 2021-2030

	IE to NI	NI to IE
Power generation	4.6%	4.4%
Specialized machinery	4.4%	4.2%
Metal working	4.7%	4.9%
General industrial	6.1%	5.8%
Office machines	4.9%	5.0%
Telecomms equipment	2.9%	3.1%
Electric machinery	4.9%	5.3%
Road vehicles	4.0%	3.9%
Other transport	4.0%	4.1%
Total	4.8%	4.5%

FIGURE 4.7 PROJECTIONS WITHIN MACHINERY, IRELAND TO NORTHERN IRELAND

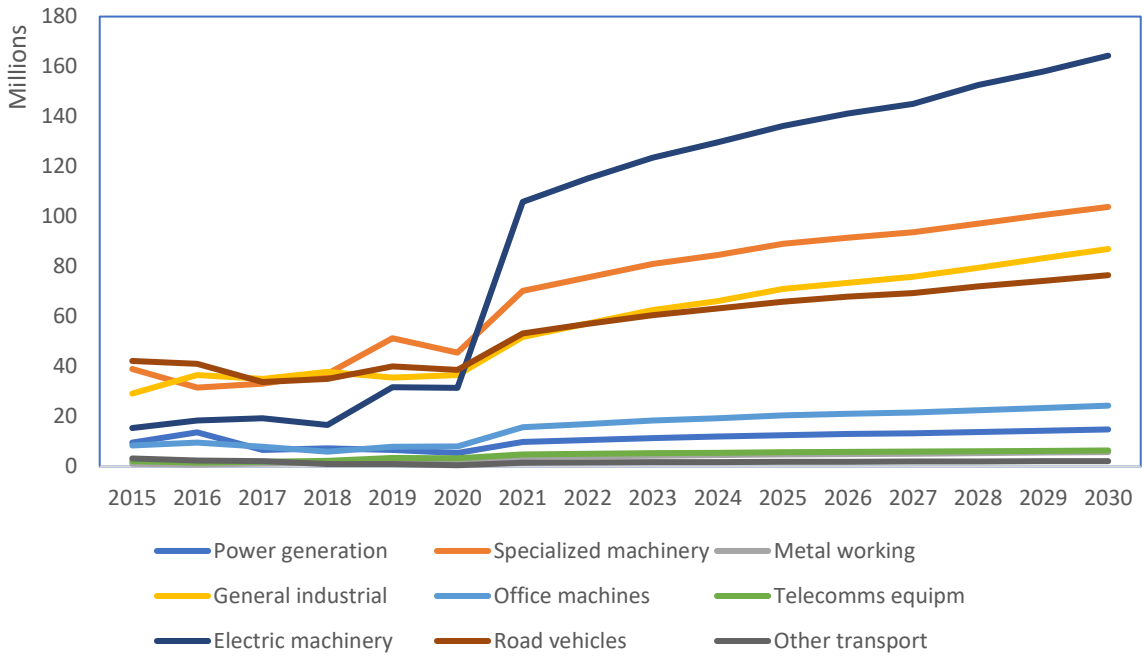


FIGURE 4.8 PROJECTIONS WITHIN MACHINERY, NORTHERN IRELAND TO IRELAND

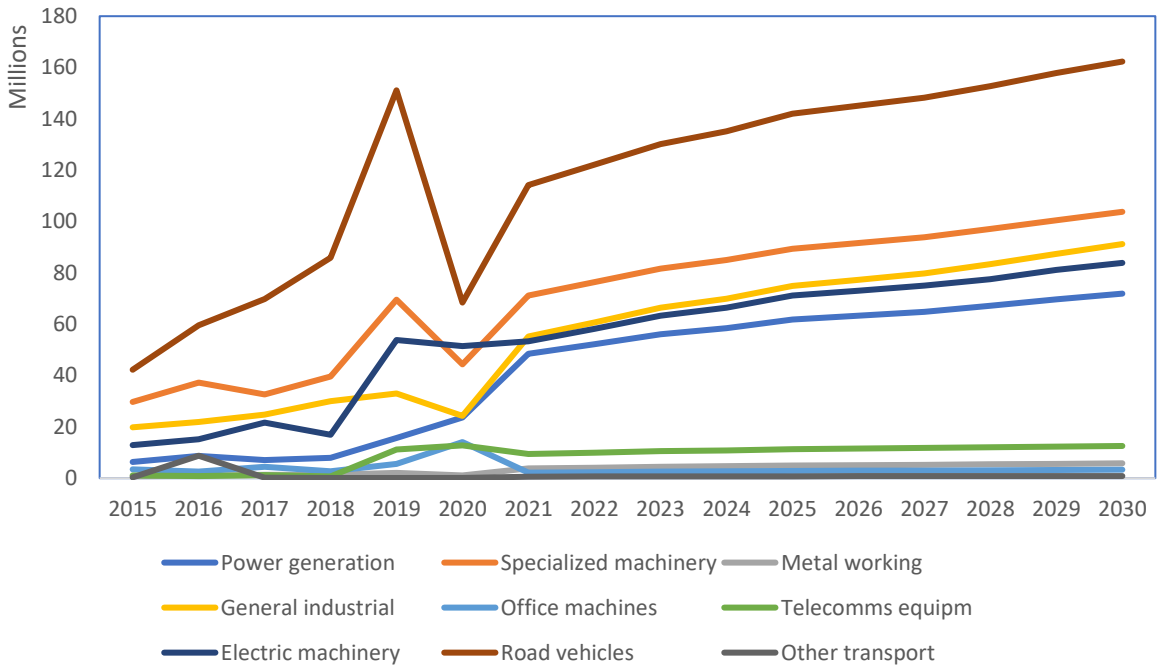


TABLE 4.10 COMPOSITIONAL CHANGE WITHIN MACHINERY, 2021-2030

	IE to NI		NI to IE	
	2021	2030	2021	2030
Power generation	3.1%	3.1%	13.5%	13.4%
Specialized machinery	22.2%	21.6%	19.8%	19.4%
Metal working	1.2%	1.2%	1.1%	1.1%
General industrial	16.3%	17.8%	15.4%	16.8%
Office machines	5.0%	5.0%	0.6%	0.6%
Telecomms equipment	1.5%	1.3%	2.6%	2.4%
Electric machinery	33.4%	33.7%	14.9%	15.7%
Road vehicles	16.8%	15.9%	31.9%	30.5%
Other transport	0.5%	0.5%	0.2%	0.2%
Total	100.0%	100.0%	100.0%	100.0%

4.6 GROWTH PROJECTIONS FOR THE GENERAL MANUFACTURING SECTOR

The largest components of the general manufacturing sector in terms of cross-border trade are in miscellaneous manufacturing and clothing followed by furniture production and the manufacture of instruments and apparatus. Growth is projected to be particularly strong in the latter category as well as in the miscellaneous manufacturing subsector that makes up the largest share of trade. Of the other substantial components, furniture is projected to grow rather more modestly than the other sectors leading to a slight reduction in its overall share of trade by the end of the decade (see Tables 4.11 and 4.12).

FIGURE 4.9 PROJECTIONS WITHIN GENERAL MANUFACTURING, IRELAND TO NI

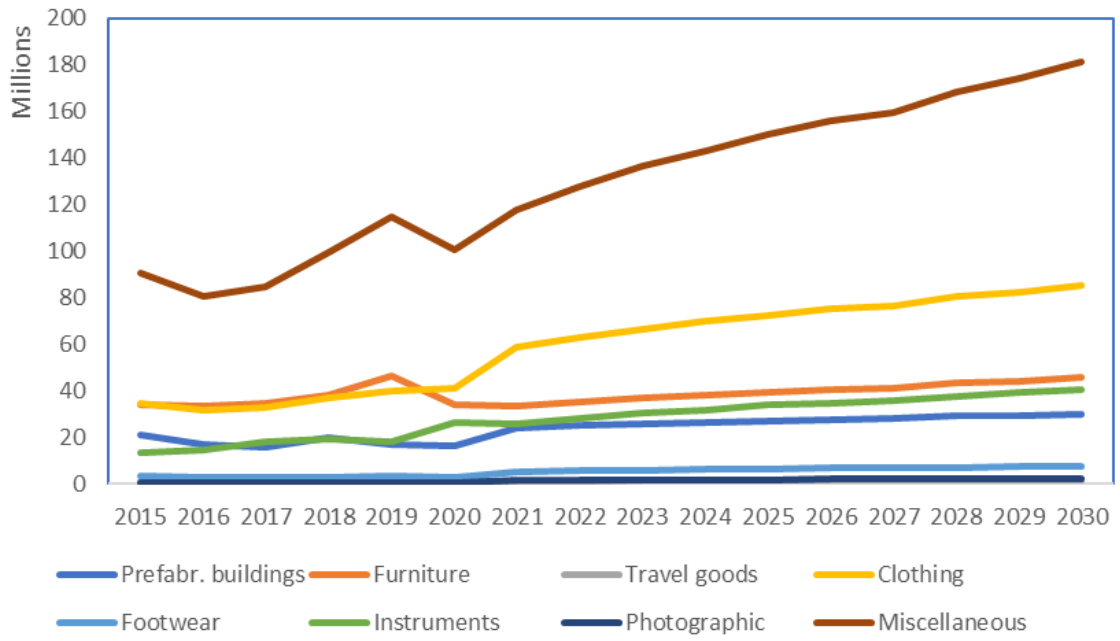


FIGURE 4.10 PROJECTIONS WITHIN GENERAL MANUFACTURING, NORTHERN IRELAND TO IE

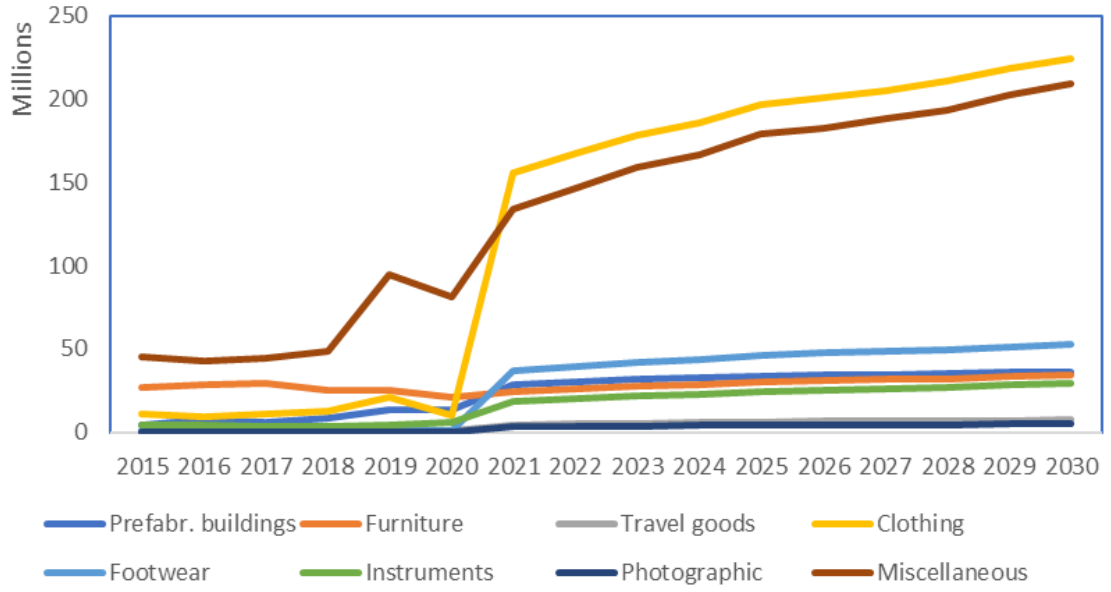


TABLE 4.11 GROWTH RATES WITHIN GENERAL MANUFACTURING, 2021-2030

	IE to NI	NI to IE
Prefabr. buildings	2.3%	2.6%
Furniture	3.3%	3.8%
Travel goods	5.4%	5.4%
Clothing	4.0%	4.1%
Footwear	3.9%	4.2%
Instruments	5.3%	5.4%
Photographic	4.5%	4.6%
Miscellaneous	4.8%	5.1%
Total	4.2%	4.4%

TABLE 4.12 COMPOSITIONAL CHANGE WITHIN GENERAL MANUFACTURING, 2021-2030

	IE to NI		NI to IE	
	2021	**2030**	**2021**	**2030**
Prefabr. buildings	8.9%	7.7%	7.1%	6.2%
Furniture	12.4%	11.6%	6.0%	5.8%
Travel goods	0.4%	0.4%	1.1%	1.2%
Clothing	22.0%	21.7%	38.4%	37.5%
Footwear	1.9%	1.9%	9.0%	8.9%
Instruments	9.6%	10.3%	4.5%	4.8%
Photographic	0.5%	0.5%	0.8%	0.8%
Miscellaneous	44.1%	45.8%	33.1%	34.8%
Total	100.0%	100.0%	100.0%	100.0%

CHAPTER 5: SERVICES TRADE PROJECTIONS

This chapter describes the results of the gravity estimation for services trade and then projects these forward using the macroeconomic drivers described previously. The services data available on cross-border flows is considerably less detailed than for goods but we can make use of the international patterns matched to cross-border characteristics to gauge the potential for differing growth rates across the subcomponents of services.

5.1 DETERMINANTS OF TRADE: SERVICES TRADE RESULTS

This section summarises the impact of country characteristics on services trade. It presents estimates from the available international data on services which is at a more detailed number of sectors than is available for cross-border trade. As a result, there is no North-South indicator included at this stage and the predictions of the model will be linked to aggregate cross-border trade in services in the following chapter. The disaggregated sector information will also be used to highlight where future growth may be most likely to be found in the chapter on projections. The disaggregated results can therefore play a role in policy formulation as an external guide to growth potentials even in areas where we are currently lacking the equivalent data on cross-border services.

The overall formulation of the estimation process is similar to that used for goods trade with the model estimated separately for each of the eleven available categories of services. Tables 5.1 and 5.2 present the variation in impact of country characteristics on trade in services with the former table presenting the results on the key economic characteristics of size and distance while the latter presents the results for language, contiguity and membership of both FTAs and the EU. The full detail of the results are included in Appendix 6.

Although services trade may initially appear likely to be less sensitive to distance than goods trade, we find that the effect of distance has a reasonably substantial inhibiting effect on trade in most types of services. The average magnitudes are however slightly lower than found for goods, averaging around a reduction of 5 percent for in trade for each 10 per cent increase in distance rather than the reduction of 9 percent on average for goods. Financial services are the least constrained by distance whereas transport, construction and other business services are much more likely to be found in geographically proximate countries. Both origin and destination GDP are strongly positively associated with trade in services. On the other hand, population shows a generally negative impact both for origin and destination, suggesting that smaller (but high-income) countries are more likely to be services traders than larger countries.

TABLE 5.1 SUMMARY OF GRAVITY MODEL DETERMINANTS OF SERVICES TRADE

	Distance	Origin GDP	Destination GDP	Origin population	Destination population
Transportation	-0.70	1.52	1.08	-0.55	-0.44
Travel	-0.59	1.09	0.97	0.00	-0.29
Communications services	-0.59	0.91	1.02	0.12	-0.48
Construction services	-0.65	1.62	0.61	-0.94	-0.13
Insurance services	-0.45	1.40	1.03	-0.27	-0.42
Financial services	-0.25	2.22	1.19	-1.78	-0.70
Computer and information	-0.50	1.40	1.21	-0.40	-0.56
Royalties and license fees	-0.37	1.71	1.39	-0.57	-0.67
Other business services	-0.68	1.95	1.29	-0.93	-0.56
Personal and recreational	-0.54	1.18	1.08	-0.25	-0.47
Government services	0.00	0.61	0.61	0.60	-0.13

TABLE 5.2 SUMMARY OF GRAVITY MODEL TRADE COST VARIABLES ON SERVICES TRADE

	FTA	EU member	Contiguity	Language
Transportation	69%	0%	54%	28%
Travel	28%	121%	141%	93%
Communications services	0%	98%	44%	75%
Construction services	0%	52%	93%	100%
Insurance services	19%	55%	41%	379%
Financial services	0%	98%	34%	563%
Computer and information	0%	96%	28%	75%
Royalties and license fees	0%	109%	0%	239%
Other business services	66%	46%	0%	196%
Personal and recreational	-17%	95%	43%	256%
Government services	41%	24%	0%	52%

Free trade associations do not always include provisions that open markets for services trade and Table 5.2 reflects this by showing no statistical significance (reported as zero) for higher trade in many services sectors amongst FTA partner countries. Some exceptions are there, however, with transport services

considerably higher amongst FTA country pairs as well as other business services. Unlike standard FTAs, membership of the EU with its much broader coverage of services trade facilitation and movement of labour, has a substantial link with higher trade across the different services categories. Common language is also a major factor in explaining patterns of services trade while being a neighbouring country has a substantial impact on most services flows as well.

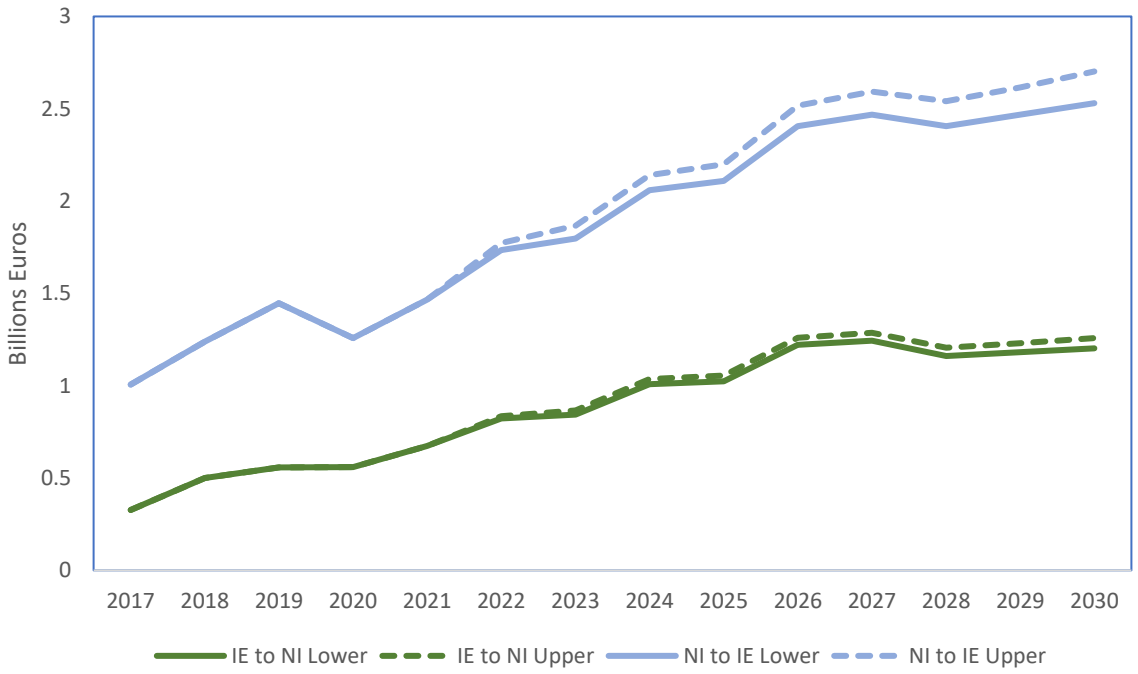
5.2 AGGREGATE PROJECTIONS FOR SERVICES TRADE

To generate projections for cross-border services trade, we match the projected growth rates from the gravity model to the relevant country characteristics for Ireland and Northern Ireland. We then calculate the projected growth rate and link it to the initial starting levels of cross-border services trade based on data from NISRA. As noted in the study of cross-border services trade by Lawless (2021), the CSO does not separate Northern Ireland as a services trade destination, so the measurement of services exported from Ireland to Northern Ireland is taken as being the reported imports from the Northern Ireland perspective.

That overview of cross-border services trade showed that services trade in both directions is quite considerably lower than cross-border trade in goods. Particularly notable was the low relative share of services from Ireland to Northern Ireland, which is in contrast to the high overall services content of Ireland's total international exports. Comparing the level of trade predicted for services from the gravity model, services flows from Northern Ireland to Ireland are currently above the model's predicted level while those from Ireland to Northern Ireland are below what would be expected based on international patterns.

Annual average growth rate projected as 9% for services flows from Ireland to Northern Ireland and 8.2% for services from Northern Ireland to Ireland across the decade 2021 to 2030. As shown in Figure 5.1, despite being projected to grow at a slightly lower rate, services flows from Northern Ireland to Ireland remain consistently higher over the time horizon to 2030 as a result of the higher initial starting point. On a cumulative basis, services trade in both directions is projected to be approximately double its 2021 level by 2030. The more rapid projected growth relative to goods trade is in line with the expanding role of services in overall international trade observed at a global level. In the context of cross-border trade, this sees services likely to become a larger share of overall trade but for the levels to remain below those of goods trade. As with the aggregate projections for goods trade, there is a slight difference in levels between the baseline and upper scenarios for Northern Ireland's economic growth but this does not lead to any substantial divergence in the overall path of the trade projections.

FIGURE 5.1 PROJECTIONS OF AGGREGATE SERVICES TRADE



5.3 COMPONENTS OF SERVICES TRADE

As with goods trade, we would not expect the growth to be evenly allocated across services components. The results of the gravity model applied to services trade showed reasonably considerable variation across the components to the key drivers of trade, the GDP and population of both partner countries. Unfortunately, the starting level of trade in each of the components is not available at a comparable level of detail for cross-border trade so restrict the discussion here to growth projections generated by combining the country characteristics and macroeconomic projections for Ireland and Northern Ireland with the parameters of the gravity model based on international patterns.

Table 5.3 shows that, given the countries' characteristics and macroeconomic forecasts, growth higher than the average for total services would be anticipated for financial services and business services in particular. The slowest growth rate is projected for government services but this is typically a small proportion of overall services trade. Travel, transportation and construction services are projected to grow relatively strongly but still at a slightly lower pace than that of the overall services sector. This would see a reduction in the share of these components in overall services trade by 2030 although the sectors themselves would be trading at a higher level.

TABLE 5.3 PROJECTED AVERAGE GROWTH FOR SERVICES COMPONENTS, 2021-2030

	Ireland to Northern Ireland		Northern Ireland to Ireland	
	Lower	**Upper**	**Lower**	**Upper**
Communications services	5.8%	6.2%	5.9%	6.3%
Computer and information services	7.6%	8.1%	7.3%	7.9%
Construction services	6.9%	7.2%	5.3%	6.0%
Financial services	9.3%	9.8%	7.7%	8.6%
Government services	4.4%	4.7%	4.4%	4.7%
Insurance services	7.4%	7.9%	6.8%	7.4%
Other business services	9.4%	10.0%	8.4%	9.2%
Personal, cultural and recreational	6.6%	7.1%	6.5%	7.0%
Royalties and license fees	9.0%	9.6%	8.5%	9.2%
Transportation	7.7%	8.2%	7.0%	7.7%
Travel	6.4%	6.8%	6.2%	6.7%
Total Services	8.4%	8.9%	7.5%	8.2%

Overall, the projections for cross-border services trade show considerable potential for relatively rapid growth over the decade to 2030. This would see services begin to converge in terms of relative shares of trade with that of goods although it is unlikely on the basis of these projections to overtake goods trade in this period. The expansion of services is broad-based across all of the different components but particularly liable to be driven by growth in financial and other business services.

This is based on an assumption of no changes to market access for services over this period. Examining the risks of divergence in services regulations that could potentially arise in the post-Brexit era for the UK as a whole, Lowe (2021) identified financial services, insurance and transport services as sectors where UK firms might consider relocation to the EU may become increasingly attractive if EU market access becomes more costly. Focusing on the services sector in Northern Ireland, Shepard et al. (2019) estimated that courier services and professional services such as accountancy and legal services were amongst the most exposed to changes in market access regulations. The estimates by Shepard et al. (2019) of potential percentage cost increases that could arise from restrictions on services trade are re-produced in Table 5.4. The estimates show considerable variation in the degree to which different parts of the services sector might be affected by restrictions in the event of regulatory barriers being put in place for services trade between the EU and UK. They also take into account that some restrictions might be offset to a

certain degree for trade between Ireland and the UK due to provisions of the Common Travel Area. The estimates for the impact of any new restrictions on services trade were therefore found to be lower for trade between Northern Ireland and Ireland, relative to potential impacts on Northern Ireland's trade with the rest of the EU. These therefore give a broad sense of the areas where the estimates of growth in services trade projected in the earlier part of the chapter might be at risk of underperforming if reciprocal market access is reduced.

TABLE 5.4 POTENTIAL COST IMPLICATIONS FOR CROSS-BORDER SERVICES TRADE OF REGULATORY DIVERGENCE (%)

	NI exporters to EU	NI importers from EU	NI exporters to Ireland	NI importers from Ireland
Accounting services	7	4	4	4
Air transport	13	13	12	13
Architecture services	4	3	2	3
Broadcasting	5	7	4	7
Commercial banking	7	4	5	4
Computer services	6	2	0	2
Construction	5	2	2	2
Courier services	18	28	11	28
Distribution services	6	9	6	9
Engineering services	3	1	0	1
Insurance	3	0	0	0
Legal services	7	8	8	8
Logistics customs brokerage	3	4	0	4
Logistics storage and warehouse	5	7	3	7
Maritime transport	3	4	2	4
Road freight transport	3	7	1	7
Telecommunication	7	7	5	7

Source: Shepard et al. (2019, technical update document)*:* https://www.economy-ni.gov.uk/publications/eu-exit-and-impacts-northern-irelands-services-trade.

Notes: These estimates relate to the scenario of Northern Ireland staying in Single Market when Great Britain does not.

CHAPTER 6: SUMMARY AND POLICY IMPLICATIONS

This report looks forward over the medium term to provide estimates on the extent to which trade between Ireland and Northern Ireland has the potential to grow. Determinants of trade are modelled using international data on bilateral trade flows in both goods and services at a disaggregated level. Having generated the strength of a variety of country characteristics in driving trade flows, we use these estimated parameters to generate granular projections of cross-border trade linked to external forecasts for population and macroeconomic growth in Ireland and Northern Ireland.

In the introduction, we noted that the international patterns show that as countries grow, their trade is frequently observed to shift towards higher value-added sectors and from manufacturing to services. The estimates on drivers of trade across sectors shows that key variables such as GDP, distance, language and EU membership vary in terms of the degree to which they influence trade flows. For example, distance plays a greater inhibiting role in heavy goods sectors than in higher value goods and is lower again for most services components. Although lower than for most goods sectors, distance remains an important factor in services trade.

In examining the drivers of international trade between 2015 and 2019, we find that average actual cross-border trade in a number of goods sectors were below the level that the model would predict given the other country characteristics taken into account. Some of these sectors currently showing lower than predicted levels of trade may be promising areas for growth if they could target convergence to the level predicted by the other characteristics of the two market.

To take into account the substantial increase in trade that occurred in some goods sectors in 2021, we use a number of scenarios for our projections. The baseline projections take the 2021 level as the starting point for the projections. An alternative scenario lowers this starting base in several sectors to adjust for potential temporary changes such as COVID-19 impacting supply chains. A final scenario includes a converge factor to several of the sectors identified as trading below expected level generated by the gravity model predictions. It should be noted that these scenarios may be rather conservative as they do not project any sector growing above the parameters of the gravity model and current economic projections.

The central projections for growth rates of goods trade are reasonably similar in both directions of trade. This maintains the initial level difference with trade from

Northern Ireland to Ireland experiencing a substantial increase in 2021, which is then built on up to 2030 in all scenarios. From the 2021 level, subsequent growth rates are estimated to average around 2.5% a year in both directions. In the convergence scenario, where sectors that currently trade at levels below model predictions catch up, the average growth rates increase to between 3.2% and 4.2%. These growth rates are not even across all sectors within goods. Higher than average growth is projected in the chemicals, machinery and miscellaneous manufacturing sectors in each of the scenarios and in both trade directions. Trade in food and beverages, on the other hand, is projected to grow at more modest rates throughout the entire time horizon, leading to a slight decline in the overall share of trade accounted for by these sectors.

We also examine how growth projections vary at a more detailed level within each sector – for example with medicinal and pharmaceutical products growing at a faster rate that the overall chemicals sector. The overall patterns from 2021 to 2030 show a shift in the composition of goods trade away from food and crude materials towards chemicals and machinery, with some subsectors driving these trends within sectors. The key areas for growth appear similar in both trade directions suggesting substantial potential for development of supply linkages across the island.

Services trade is projected separately from goods and at a less granular level given the more limited data available. However, the projections of the report show that trade in services is likely to grow at a substantially more rapid pace than trade in goods, albeit from a much lower base. Even with the lower starting point, however, trade in services could converge reasonably rapidly in level terms on goods trade over the course of the decade to 2030. This occurs without the level shift observed in goods trade in 2021 as the Northern Ireland Protocol does not apply to services and therefore Brexit should not have resulted in any initial shifts in services provision.[1]

At the starting point of the projections, services trade in both directions is quite considerably lower than cross-border trade in goods. Given the estimates from the gravity model of international trade in services and the macroeconomic projections for Ireland and Northern Ireland, this report finds that trade in services could grow sharply over the next decade. The annual average growth rate for services trade comes in at around 10% for trade from Ireland to Northern Ireland and 9.1% for services from Northern Ireland to Ireland. Cumulatively, this would result in services trade in both directions being approximately double its 2021 level

[1] A caveat on this statement is that goods trade data is available for most of 2021 at the time of writing allowing the post-Brexit level shift to be incorporated into the projections but no cross-border services trade data will be available until late 2022.

by 2030. Although detailed data on the components of cross-border services trade is limited, the parameters estimated from the gravity model of international trade in services combined with the relevant country characteristics suggests that the growth in services trade is likely to be particularly strong in financial services and business services.

The projections show a potential path for growth in cross-border trade based on international patterns of trade determinants and external projections of the key drivers. Apart from in the convergence scenario for goods trade, no additional growth is modelled. However, that is not to suggest that growth in cross-border trade on aggregate and specific sectors could not outperform these baseline projections. Policy initiatives supporting innovation and skills development could both directly impact the trade patterns of targeted sectors and also indirectly support trade growth on aggregate through a positive reinforcement cycle with GDP, one of the key drivers of the projections in this report. Current policy objectives in Ireland's National Development Plan and Northern Ireland's Economy 10X already align well with the sectors identified in this report as having the stronger growth potential in trade. Skills development is likely to be a key factor in ensuring that this potential is achieved, and perhaps exceeded. This is particularly the case where the projections show shifts in growth across sectors such as towards services.

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Appendix 1: Goods trade sectoral breakdown

SITC classification Rev. 4 ; level 2

Code	Description	Code	Description
00	Live animals	52	Inorganic chemicals
01	Meat and meat preparations	53	Dyeing, tanning and colouring material
02	Dairy products and birds' eggs	54	Medicinal and pharmaceutical products
03	Fish and fish preparations	55	Perfume, cleaning etc. preparations
04	Cereals and cereal preparations	56	Fertilizers, manufactured
05	Vegetables and fruit	57	Plastics in primary forms
06	Sugars, sugar preparations and honey	58	Plastics in non-primary forms
07	Coffee, tea, cocoa, spices	59	Chemical materials and products, n.e.s.
08	Feeding stuff for animals	61	Leather, dressed fur, etc.
09	Miscellaneous edible products and preparations	62	Rubber manufactures, n.e.s.
11	Beverages	63	Wood and cork manufactures
12	Tobacco and tobacco manufactures	64	Paper, paperboard and articles thereof
21	Hides, skins, furs	65	Textile yarn, fabrics, made up articles, etc.
22	Oil seeds, oleaginous fruits	66	Non-metallic mineral manufactures, n.e.s.
23	Crude rubber (incl. synthetic)	67	Iron and steel
24	Cork and wood	68	Non-ferrous metals
25	Pulp and waste paper	69	Manufactures of metals, n.e.s.
26	Textile fibres and their wastes	71	Power generating machinery and equipment
27	Crude fertilizers and crude minerals	72	Machinery for specialized industries
28	Metalliferous ores and metal scrap	73	Metal working machinery
29	Crude animal, vegetable materials.	74	General industrial machinery n.e.s.
32	Coal, coke and briquettes	75	Office machines
33	Petroleum and products	76	Telecommunications and sound recording
34	Gas, natural and manufactured	77	Electric machinery, n.e.s. and parts
35	Electric current	78	Road vehicles
41	Animal oils and fats	79	Other transport equipment
42	Fixed vegetable fats and oils	81	Prefabricated buildings & fixtures
43	Processed animal or vegetable oils	82	Furniture and parts thereof
51	Organic chemicals	83	Travel goods, handbags etc
52	Inorganic chemicals	84	Articles of apparel and clothing accessories
53	Dyeing, tanning and colouring material	85	Footwear
54	Medicinal and pharmaceutical products	87	Instruments and apparatus n.e.s.
55	Perfume, cleaning etc preparations	88	Photographic equipment, optical goods etc.
56	Fertilizers, manufactured	89	Miscellaneous manufactured articles, n.e.s.
57	Plastics in primary forms	91	Postal packages not classified
58	Plastics in non-primary forms	93	Special transactions and commodities
59	Chemical materials and products, n.e.s.	97	Gold, non-monetary
61	Leather, dressed fur etc.		

Appendix 2: Country coverage for goods trade modelling

Reporting countries

Austria	Estonia	Italy	Portugal
Belgium	Finland	Latvia	Slovakia
Bulgaria	France	Lithuania	Slovenia
Croatia	Germany	Luxembourg	Spain
Cyprus	Greece	Malta	Sweden
Czechia	Hungary	Netherlands	United Kingdom
Denmark	Ireland	Poland	

Partner countries

Afghanistan	Burkina Faso	Estonia	Iraq	Mauritius	Poland	Tajikistan
Albania	Burundi	Ethiopia	Ireland	Mexico	Portugal	Tanzania
Algeria	Cambodia	Faroe Isl.	Israel	Micronesia	Qatar	Thailand
Andorra	Cameroon	Fiji	Italy	Moldova	Russia	Togo
Angola	Canada	Finland	Jamaica	Mongolia	Rwanda	Tonga
Antigua and Barbuda	Cape Verde	France	Japan	Morocco	Samoa	Trinidad and Tobago
Argentina	Cayman Isl.	French Polynesia	Jordan	Mozambique	San Marino	Tunisia
Armenia	CAR	Gabon	Kazakhstan	Myanmar	Sao Tome and Principe	Turkey
Aruba	Chad	Gambia	Kenya	Namibia	Saudi Arabia	Turkmenistan
Australia	Chile	Georgia	Kiribati	Nauru	Senegal	Turks and Caicos Islands
Austria	China	Germany	Kuwait	Nepal	Seychelles	Tuvalu
Azerbaijan	Colombia	Ghana	Kyrgyzstan	Netherlands	Sierra Leone	Uganda
Bahamas	Comoros	Gibraltar	Lao	New Caledonia	Singapore	Ukraine
Bahrain	Congo	Great Britain	Latvia	New Zealand	Slovakia	United Arab Emirates
Bangladesh	Costa Rica	Greece	Lebanon	Nicaragua	Slovenia	United States
Barbados	Cote d'Ivoire	Greenland	Lesotho	Niger	Solomon Islands	Uruguay
Belarus	Croatia	Grenada	Liberia	Nigeria	Somalia	Uzbekistan
Belgium	Cuba	Guatemala	Libya	North Korea	South Africa	Vanuatu
Belize	Cyprus	Guinea	Lithuania	North Macedonia	South Korea	Venezuela
Benin	Czechia	Guinea-Bissau	Luxembourg	Northern Ireland	Spain	Vietnam
Bermuda	Denmark	Guyana	Macao	Norway	Sri Lanka	Vincent and the Grenadines
Bhutan	Djibouti	Haiti	Madagascar	Oman	St Kitts and Nevis	Yemen
Bolivia	Dominica	Honduras	Malawi	Pakistan	St Lucia	Zambia
Bosnia and Herzegovina	Dominican Republic	Hong Kong	Malaysia	Palau	Sudan	Zimbabwe
Botswana	Ecuador	Hungary	Maldives	Panama	Suriname	
Brazil	Egypt	Iceland	Mali	Papua New Guinea	Swaziland	
British Virgin Islands	El Salvador	India	Malta	Paraguay	Sweden	
Brunei	Equatorial Guinea	Indonesia	Marshall islands	Peru	Switzerland	
Bulgaria	Eritrea	Iran	Mauritania	Philippines	Syria	

Appendix 3: Services trade sectoral breakdown

BoP level	Commodity name
1	Transportation
2	Travel
3	Communications services
4	Construction services
5	Insurance services
6	Financial services
7	Computer and information services
8	Royalties and license fees
9	Other business services
10	Personal, cultural, and recreational services
11	Government services

Appendix 4: Country coverage for services trade modelling

Reporting countries

Austria	Estonia	Italy	Portugal
Belgium	Finland	Latvia	Slovakia
Bulgaria	France	Lithuania	Slovenia
Croatia	Germany	Luxembourg	Spain
Cyprus	Greece	Malta	Sweden
Czechia	Hungary	Netherlands	United Kingdom
Denmark	Ireland	Poland	

Partner countries

Argentina	Greece	Poland
Australia	Hungary	Portugal
Austria	Iceland	Rep. of Korea
Belgium	India	Russian Federation
Brazil	Indonesia	Singapore
Bulgaria	Ireland	Slovakia
Canada	Italy	Slovenia
Chile	Japan	South Africa
China	Latvia	Spain
China, Hong Kong SAR	Lithuania	Sweden
Croatia	Luxembourg	Switzerland
Cyprus	Malaysia	Thailand
Czech Rep.	Malta	Turkey
Denmark	Mexico	USA
Egypt	Morocco	United Kingdom
El Salvador	Netherlands	Uruguay
Estonia	New Zealand	Venezuela
Finland	Nigeria	
France	Norway	
Germany	Philippines	

Appendix 5: Gravity results by SITC sector

	Live animals	Meat	Dairy	Fish	Cereals	Fruit/Veg	Sugars	Coffee, tea	Animal feed	Misc. edible products
NI-IRE	0.834	0.513	0.324	0.361	1.299***	1.050**	0.128	-0.451	1.860**	-1.017
Distance	-1.362***	-0.348***	-0.481***	-0.337***	-0.596***	-0.631***	-0.905***	-0.702***	-0.810***	-0.798***
Origin GDP	0.771***	0.447***	0.611***	0.199***	-0.334***	0.158***	-0.161***	-0.028	0.300***	0.238***
Dest. GDP	0.303***	0.367***	0.247***	0.389***	0.184***	0.384***	0.565***	0.314***	0.548***	0.439***
Origin Pop.	-0.082	0.169***	0.008	0.337***	0.960***	0.754***	1.330***	1.086***	0.543***	0.515***
Dest. Pop.	0.210***	0.031*	0.130***	0.066***	0.155***	0.215***	0.013	0.243***	0.153***	0.095***
FTA	0.155**	-0.076	0.161***	0.182***	0.147***	0.732***	0.274***	0.175***	0.149**	0.295***
EU	0.945***	1.719***	1.271***	0.699***	1.023***	1.043***	1.388***	1.286***	1.039***	1.063***
Contiguity	1.270***	2.087***	1.674***	1.181***	2.035***	1.845***	1.533***	1.743***	1.986***	1.028***
Language	0.588***	0.641***	0.744***	0.628***	0.568***	0.753***	1.100***	0.827***	0.251***	0.895***
Constant	-9.107***	-10.719***	-9.769***	-7.892***	0.496	-13.938***	-14.865***	-13.550***	-14.74***	-9.653***
Observations	12,645	39,240	42,969	45,168	73,427	86,334	32,808	73,139	16,961	37,620
R-squared	0.378	0.246	0.214	0.158	0.182	0.304	0.369	0.272	0.338	0.289

	Beverages	Tobacco	Hides, skins, furs	Oil seeds	Crude rubber	Cork and wood	Pulp and waste paper	Textile fibres	Crude minerals	Metal ores and scrap
NI-IRE	0.918	-5.675***	0.867	1.292*	-1.854**	0.702	-2.296**	0.311	1.290**	-0.378
Distance	-0.538***	-0.470***	-0.282***	-0.810***	-0.498***	-0.525***	-0.655***	-0.432***	-0.856***	-0.506***
Origin GDP	0.350***	-0.485***	-0.009	-0.378***	-0.126**	-0.043	0.420***	-0.679***	0.024	-0.218***
Dest. GDP	0.766***	0.049**	0.161***	0.218***	0.226***	0.046***	0.450***	-0.145***	0.448***	0.067***
Origin Pop.	0.600***	1.161***	0.379***	1.137***	1.072***	0.218***	0.232***	1.450***	0.780***	0.812***
Dest. Pop.	-0.309***	0.272***	0.105***	0.464***	0.498***	0.218***	0.395***	0.634***	0.206***	0.295***
FTA	0.330***	0.107	0.235**	0.209***	0.115	-0.066	0.053	-0.067	0.457***	0.211***
EU	1.402***	2.046***	0.873***	1.018***	0.601***	0.353***	1.269***	0.505***	-0.172***	0.273***
Contiguity	2.062***	0.737***	0.983***	2.101***	1.490***	2.395***	2.820***	0.637***	1.323***	1.149***
Language	0.855***	0.309***	-0.671***	0.014	0.244***	-0.125*	-0.752***	0.725***	0.460***	0.207***
Constant	-18.22***	2.370***	0.563	-5.753***	-14.440***	7.558***	-17.307***	0.426	-11.96***	1.046*
Observations	42,895	17,784	9,446	20,423	17,716	42,097	9,987	51,272	50,110	39,844
R-squared	0.348	0.178	0.085	0.260	0.194	0.115	0.241	0.129	0.236	0.084

	Crude animal, vegetable materials n.e.s.	Coal, coke and briquettes	Petroleum and products	Gas, natural and manufactured	Electric current	Animal oils and fats	Fixed vegetable fats and oils	Processed animal or vegetable oils, etc.	Organic chemicals	Inorganic chemicals
NI-IRE	-0.271	3.975***	-1.360*	0.699	-4.388***	0.959	1.173	-1.025	-0.566	-0.044
Distance	-0.783***	-0.139***	-1.410***	-1.444***	-1.040***	-0.656***	-0.491***	-0.548***	-0.772***	-0.858***
Origin GDP	0.514***	-0.447***	-0.241***	-0.347***	0.451***	0.259***	-0.085**	0.723***	0.716***	0.488***
Dest. GDP	0.560***	0.353***	0.501***	0.279***	0.155*	0.420***	0.339***	0.473***	0.871***	0.728***
Origin Pop.	0.525***	0.671***	1.245***	1.064***	0.023	0.607***	1.123***	0.156**	0.437***	0.577***
Dest. Pop.	0.198***	0.044	0.093***	0.271***	0.015	0.099***	0.192***	0.174***	0.174***	0.076***
FTA	0.420***	0.404***	0.254***	0.552***	0.503	0.307***	0.269***	0.249***	0.428***	0.616***
EU	0.926***	-0.384***	-0.407***	-2.262***	-0.236	0.482***	1.382***	1.221***	0.656***	-0.013
Contiguity	1.272***	1.965***	1.264***	1.354***	1.065***	1.559***	2.272***	2.195***	1.371***	1.415***
Language	0.441***	-0.441***	0.246***	-0.148	-0.043	0.256**	0.731***	0.028	0.595***	0.398***
Constant	-22.85***	2.840***	-5.117***	1.954**	5.944***	-14.22***	-14.35***	-23.25***	-34.67***	-25.21***
Observations	36,370	13,117	35,213	12,111	1,441	8,821	25,924	9,985	85,333	53,040
R-squared	0.385	0.089	0.222	0.165	0.256	0.241	0.267	0.280	0.413	0.348

	Dyeing, tanning and colouring material	Medicinal and pharma products	Perfume, cleaning etc. preparations	Fertilizers, manufactured	Plastics in primary forms	Plastics in non-primary forms	Chemical materials	Leather, dressed fur, etc.	Rubber manufactures, n.e.s.	Wood and cork manufactures
NI-IRE	-1.698***	-0.563	-0.903*	1.217	-1.372***	-1.150**	-1.424***	0.410	-0.734	-0.244
Distance	-0.775***	-0.842***	-1.067***	-0.893***	-0.932***	-1.192***	-0.813***	-0.693***	-0.907***	-1.008***
Origin GDP	0.621***	0.605***	0.414***	-0.259***	0.509***	0.565***	0.556***	-0.040	0.580***	0.005
Dest. GDP	0.600***	0.997***	0.881***	0.233***	0.565***	0.912***	0.614***	0.439***	0.842***	0.636***
Origin Pop.	0.326***	0.397***	0.800***	1.051***	0.437***	0.506***	0.481***	1.079***	0.477***	0.747***
Dest. Pop.	0.102***	-0.162***	-0.110***	0.290***	0.220***	-0.064***	0.117***	0.297***	0.082***	-0.023*
FTA	0.424***	0.328***	0.317***	1.009***	0.513***	0.573***	0.289***	0.092**	0.283***	0.356***
EU	0.686***	1.551***	0.882***	0.064	0.862***	0.464***	0.992***	0.801***	1.050***	0.586***
Contiguity	0.956***	0.921***	1.010***	1.967***	1.359***	1.214***	1.055***	1.235***	1.524***	1.405***
Language	0.551***	0.797***	1.300***	0.441***	0.189***	0.699***	0.473***	-0.105	0.485***	0.544***
Constant	-22.164***	-26.239***	-25.202***	-2.544***	-20.469***	-25.217***	-22.953***	-17.837***	-27.866***	-9.867***
Observations	46,051	46,679	65,531	13,532	78,158	60,141	91,715	33,758	65,128	50,780
R-squared	0.319	0.394	0.437	0.269	0.340	0.462	0.347	0.281	0.479	0.298

	Paper, paperboard	Textile yarn, fabrics.	Non-metallic minerals	Iron and steel	Non-ferrous metals	Manufactures of metals	Power generating machinery	Specialized Machinery	Metal working machinery	General industrial machinery
NI-IRE	-1.006	-1.430***	0.132	-1.567***	-2.092***	-0.814***	-1.148***	-0.955***	-1.424***	-1.857***
Distance	-1.332***	-1.027***	-0.977***	-1.155***	-0.901***	-1.062***	-0.643***	-0.737***	-0.938***	-0.879***
Origin GDP	0.340***	0.076***	0.157***	0.561***	0.293***	0.483***	0.689***	0.730***	0.601***	0.985***
Dest. GDP	0.835***	0.658***	0.777***	0.584***	0.687***	0.889***	0.785***	0.692***	0.960***	0.950***
Origin Pop.	0.808***	0.930***	0.869***	0.292***	0.695***	0.613***	0.339***	0.187***	0.433***	0.096***
Dest. Pop.	0.039***	0.164***	-0.030***	0.198***	0.056***	-0.079***	0.010	0.077***	-0.058***	-0.062***
FTA	0.423***	0.480***	0.277***	0.559***	0.383***	0.381***	0.184***	0.181***	0.252***	0.280***
EU	1.366***	0.871***	0.564***	0.352***	0.339***	0.822***	0.372***	0.534***	0.300***	0.713***
Contiguity	1.338***	0.982***	1.546***	1.503***	0.983***	1.386***	0.995***	1.271***	1.115***	1.288***
Language	0.518***	0.510***	0.588***	0.332***	0.483***	0.778***	0.319***	0.317***	0.355***	0.433***
Constant	-22.134***	-18.37***	-19.450***	-17.90***	-20.29***	-24.933***	-27.70***	-23.956***	-28.698***	-32.308***
Observations	48,293	162,771	128,237	112,167	80,624	180,649	97,481	144,366	63,600	218,104
R-squared	0.488	0.408	0.386	0.346	0.280	0.475	0.359	0.372	0.468	0.492

	Office machines	Telecommunications equip.	Electric machinery, n.e.s.	Road vehicles	Other transport equipment	Prefabr. buildings	Furniture and parts thereof	Travel goods, handbags	Articles of apparel	Footwear
NI-IRE	-2.020***	-2.587***	-1.623***	-1.291***	-3.596***	-0.540	0.304	-2.139***	-1.144***	-2.258**
Distance	-0.668***	-0.510***	-0.903***	-0.952***	-0.457***	-1.003***	-1.266***	-0.892***	-1.027***	-1.139***
Origin GDP	0.760***	0.341***	0.574***	0.569***	0.517***	0.076***	0.132***	0.616***	0.426***	0.305***
Dest. GDP	0.895***	0.692***	1.063***	0.721***	0.884***	0.710***	0.979***	1.101***	0.851***	0.950***
Origin Pop.	0.154***	0.407***	0.499***	0.412***	0.309***	0.808***	1.022***	0.690***	0.792***	0.937***
Dest. Pop.	-0.090***	-0.062***	-0.120***	0.029***	-0.328***	-0.074***	-0.141***	-0.195***	0.010	-0.059***
FTA	0.255***	0.139***	0.454***	0.218***	0.238***	0.178***	0.549***	0.263***	0.236***	0.299***
EU	1.517***	1.621***	0.929***	1.393***	0.558***	0.783***	0.858***	1.405***	1.708***	1.808***
Contiguity	1.373***	1.551***	1.146***	1.201***	1.305***	1.250***	0.909***	1.476***	1.381***	1.593***
Language	0.718***	0.359***	0.604***	0.587***	0.505***	0.683***	0.780***	0.802***	0.746***	0.572***
Constant	-27.685***	-17.675***	-29.765***	-21.266***	-20.829***	-13.312***	-20.600***	-35.354***	-27.726***	-26.748***
Obs.	75,505	81,496	183,267	110,539	48,071	51,938	27,094	26,576	170,582	25,274
R-squared	0.450	0.310	0.512	0.438	0.291	0.418	0.553	0.576	0.505	0.530

	Instruments and apparatus n.e.s.	Photographic equipment, optical goods etc.	Miscellaneous manufactured articles, n.e.s.	Postal packages	Special transactions and commodities	Gold, non-monetary
NI-IRE	-2.292***	-3.479***	-1.163***	2.669***	-6.387***	5.258***
Distance	-0.634***	-0.646***	-0.876***	-0.428***	-0.968***	-0.194***
Origin GDP	0.818***	0.601***	0.507***	1.060***	0.171**	1.198***
Dest. GDP	0.969***	0.941***	1.110***	0.738***	0.679***	0.788***
Origin Pop.	0.121***	0.317***	0.578***	-0.080**	0.706***	-0.260***
Dest. Pop.	-0.153***	-0.247***	-0.260***	-0.191***	-0.244***	-0.073**
FTA	0.241***	0.021	0.386***	0.280***	-0.008	0.741***
EU	0.588***	1.269***	0.956***	-0.363***	-0.129	0.011
Contiguity	1.184***	1.207***	1.098***	1.050***	1.310***	1.201***
Language	0.527***	0.734***	1.000***	1.098***	1.125***	0.537***
Constant	-29.506***	-26.554***	-29.450***	-28.169***	-11.574***	-34.052***
Observations	94,015	71,396	214,883	21,634	10,178	7,521
R-squared	0.414	0.375	0.471	0.337	0.218	0.339

Appendix 6: Gravity results by services subsectors

	Transportation	Travel	Communications services	Construction services	Insurance services	Financial services	Computer services	Royalties and licenses	Other business services	Personal & recreational services	Government services
Distance	-0.704***	-0.594***	-0.588***	-0.647***	-0.450***	-0.253***	-0.501***	-0.366***	-0.675***	-0.535***	-0.060
Origin GDP	1.520***	1.093***	0.910***	1.624***	1.400***	2.219***	1.402***	1.708***	1.948***	1.178***	0.611***
Dest. GDP	1.076***	0.970***	1.020***	0.606***	1.032***	1.191***	1.214***	1.391***	1.286***	1.078***	0.614***
Origin Pop.	-0.552***	0.009	0.121**	-0.935***	-0.265***	-1.783***	-0.400***	-0.566***	-0.931***	-0.252***	0.602***
Dest. Pop.	-0.437***	-0.294***	-0.475***	-0.130***	-0.424***	-0.696***	-0.564***	-0.666***	-0.559***	-0.469***	-0.129***
FTA	0.522***	0.250***	0.003	0.050	0.170**	-0.113	0.118	-0.091	0.504***	-0.188**	0.341***
EU	0.133	0.794***	0.684***	0.417***	0.440***	0.683***	0.673***	0.737***	0.377***	0.670***	0.219*
Contiguity	0.433***	0.878***	0.367***	0.660***	0.342***	0.289**	0.245**	0.022	0.108	0.355***	-0.126
Language	0.243***	0.658***	0.560***	0.692***	1.566***	1.892***	0.561***	1.221***	1.086***	1.271***	0.419***
Constant	-30.473***	-29.122***	-26.565***	-22.792***	-35.980***	-33.714***	-34.390***	-44.703***	-39.566***	-30.422***	-26.630***
Observations	8,595	8,387	5,902	4,556	5,589	5,754	6,676	5,478	8,899	5,551	3,030
R-squared	0.550	0.566	0.494	0.356	0.522	0.430	0.495	0.493	0.644	0.496	0.467