

Annex II: Evidence Review

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Introduction

This Evidence Review summarises the findings of an examination of 109 pieces of evidence on the potential impact of Free Trade Agreements (FTAs) concerning both the EU and non-EU countries on UK and Scottish agriculture. It is broadly split into three parts, the first summarises the findings from previous studies (and literature reviews) into the overall (macro) effect of Brexit on the UK, and especially Scottish, farming industry. This is done to inform the extent to which the UK's exit from the EU could affect its agri-food trade. This provides an indication of the scope for the reorientation of trade away from the EU and towards non-EU countries.

The second part examines the potential impact of FTAs that the UK has recently agreed or is in the process of negotiating/finalising with the selected non-EU countries i.e., Australia, NZ, Canada, and Mexico. This review looks at both UK and non-UK perspectives (e.g., Australian and NZ-based studies).

The third part considers studies looking at the impact of FTAs elsewhere (i.e., do not directly concern the UK) but could have an impact on the sectors within the scope of this study. For instance, the proposed EU-Mercosur FTA could have indirect impacts on Scottish beef.

Where appropriate, each part looks at the implications for agri-food output, trade and within this, the impacts of changes to tariffs, non-tariff measure and TRQs are also considered.

Finally, some concluding remarks are provided on the implications of the Evidence Review findings for the study more generally.

1.1 Brexit Impact Studies

In the wake of the UK vote to leave the European Union, much of the research conducted was broadly focused on looking at the impacts of a **UK-EU Free Trade Agreement (FTA)** versus a **No Deal** outcome. This is not surprising given the level of uncertainty over the direction of travel of the future trading relationship, at the time.

However, now there is clarity in the form of the UK-EU Trade and Cooperation Agreement (TCA), it is prudent to consider the following studies assessment of the scenarios most closely resembling the TCA. While results from No Deal outcomes may be included in the data tables, these will not be elaborated on as the UK eventually reached a deal with the EU via the TCA.

1.1.1 Impact on Agri-Food Output and Trade

UK-Wide Initial Studies

The first major study to appear in a peer-reviewed Journal article was that produced by Boulanger and Philippidis (2015)¹. This looked at the overall financial impact of the UK's exit from the EU and did not specifically focus on agriculture.

In the run-up to the referendum in June 2016, van Berkum et. al. (2016)² published their assessment of the implications for agriculture of a UK exit from the EU. The report produced by LEI-Wageningen in April 2016 was commissioned by the National Farmers Union and is often referred to as the 'LEI/NFU study'. It modelled the impact of Brexit by taking account of possible changes in domestic agricultural support policy and trade arrangements using the AGMEMOD model. It then used the outputs from this in farm-level modelling. In common with many of the studies completed since, it did not attempt to model the costs of supply of labour (particularly migrant labour) to the UK agricultural industry nor the impact of a changing regulatory burden on farmers.

Post-referendum, the Agri-Food and Biosciences Institute (AFBI) from Northern Ireland produced a study looking at the impact of three Brexit scenarios on different farm sectors. This analysis, published as Davis et. al. (2017)³, but commonly known as the 'AFBI Study' used the FAPRI-UK modelling system. This is a partial-equilibrium model initially developed by the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri. The model captures the dynamic interrelationships between the variables affecting supply and demand in the main agricultural sectors of England, Wales, Scotland and Northern Ireland. The study focused on the effects from changes in trading conditions and domestic support arrangements but did not include an analysis of regulatory effects or labour availability shifts.

The AHDB produced a report in September 2017 undertaken by AgraCEAS (previously part of Informa, now part of IHS Markit) led by Bradley and Hill (2017)⁴. This report, often called the 'AHDB study', assessed the impact of future domestic agricultural and trade policy on farm incomes. It built on previous Brexit work produced by the AHDB, including;

- A series of sector-based 'Horizon' reports published during 2016⁵ (subsequently updated in some areas – see Beef and Lamb report for 2019⁶) .
- Report on possible future trading relationships (AHDB, 2016⁷)

- Implications for Agriculture if the UK Trades under World Trade Organisation (WTO) rules (AHDB, 2017⁸)

The AHDB/Informa study, unlike the LEI/NFU and AFBI analyses attempted to model the impact of changing labour costs and regulatory burdens as well as trade and subsidy shifts. The report was subsequently used as the evidence base for AHDB's publication 'Brexit scenarios: an impact assessment'⁹ of October 2017.

The three studies outlined above (NFU, AFBI and AHDB) are the most cited of the early impact analyses undertaken for the UK as a whole.

1.1.2 Scottish Studies

The studies outlined above looked at the UK-wide situation. Three main reports have focused on Scotland.

Agriculture and Horticulture Development Board (AHDB)

Firstly, the AHDB produced a report in November 2017¹⁰ looking at the specific effects on Scotland. This built on the assumptions set out in its earlier UK-wide analysis (see above) and so looked at the effects of trade, domestic support, labour availability and regulation. It recognised the specific challenges posed by Brexit to Scottish agriculture including;

- The high proportion of Less Favoured Area (LFA) land in Scotland (85% of agricultural land compared to 17% in England).
- Distance to key markets and lack of local processing facilities in some cases.
- Differences in the relative sizes of sectors, with beef and potatoes being especially important in output terms in Scotland.

It was also noted that Scottish agriculture has advantages in terms of its 'brand' – notably Scotch Whisky, Scotch Beef and its seed potato industry.

Figure II-1 below summarises the key assumptions used in the modelling and the headline results. The study applied the variables to some Scottish-specific farm types and calculated the change in Farm Business Income (FBI) compared to the baseline (current) situation.

The 'Evolution' scenario might be considered to approximate to an FTA deal. In reality, none of the scenarios quite model the outcome of the TCA. The TCA outcome falls somewhere between evolution and unilateral liberalisation. The UK will tend towards more aspects of unilateral liberalisation as more FTAs are concluded.

One key point to note from the AHDB report is that it highlights some potential challenges for Scotland in reorienting trade flows. It flags some physical limitations in Scotland’s ability to trade with third countries including a lack of processing facilities for some products, and the lack of a deep-water port.

Figure II-1: AHDB: Assumptions and Results of Brexit Implication for Scotland

Key Assumptions	Scenario 1: Evolution	Scenario 2: Unilateral Liberalisation	Scenario 3: Fortress UK
Support	Direct Payments (DPs) and Agri-Environment Payments remain at current levels	DPs removed; Agri-environment payments increased to 50% of total current support levels.	DPs removed; Agri-environment payments set at 25% of total current support levels.
Labour	As at present.	50% increase in regular labour cost. No change in casual.	50% increase in both regular and casual labour cost.
Trade	Comprehensive UK/EU FTA giving tariff-free trade. 5% increase in cost of EU imports due to trade friction. 8% increase in RoW import costs due to friction.	No UK/EU deal. 8% increase in cost of EU and RoW imports due to trade friction but no import tariffs applied.	No UK/EU deal. 8% increase in cost of EU and RoW imports plus tariff costs. Exceptions for some TRQs.
Regulation	As at present.	Regulatory burden to fall over time. 5% cost reduction in some inputs.	All EU regulations adopted. No change in costs.
Results - % change in Farm Business Income From Baseline			
Specialist Sheep	-10%	-8%	-210%
Specialist Cattle	+14%	-89%	-86%
Dairy	+52%	-88%	+37%
Cereals	-9%	-81%	-103%
General Cropping	+2%	-66%	-60%
Pigs	+49%	+25%	+346%
Horticulture	+45%	-12%	-8%

Source: AHDB

Scotland’s Rural College (SRUC)

A further report from SRUC for the Scottish Government (Shrestha et. Al. Jan 2018¹¹) used the FAPRI-UK model to assess the impacts on Scottish agriculture.

This used three trade scenarios equivalent to those seen in the AHDB study. Support changes were limited to keeping present subsidy levels (denoted by a '+' in the results) or a complete removal of direct aid ('-'). No account was taken of labour or regulatory changes.

The price changes produced by the FARPI model are mapped onto typical Scottish farm businesses based on the Scottish Farm Business Survey (2014/15 reporting year). Results are presented for four major farm types which cover the majority of Scottish agriculture.

Figure II-2: SRUC: Assumptions and Results of ‘Assessing the Impacts of Alternative Post-Brexit Trade and Agricultural Support Policies on Scottish Farming Systems’

Key Assumptions	Scenario 1: Free Trade (FT)	Scenario 2: WTO Default (WTO)	Scenario 3: Unilateral Trade Liberalisation (LT)
Trade	UK and EU retain tariff and quota free access to each other’s markets. UK maintains tariffs equivalent to CET on RoW imports. 5% trade facilitation costs	Tariffs imposed on UK-EU trade (at CET levels). UK maintains tariffs equivalent to CET on RoW imports. 8% trade facilitation costs	Zero tariffs on UK imports from all sources. Standard CET on UK exports to EU. 8% trade facilitation costs.
Support	Two scenarios – current support maintained in full ('+') or all direct support removed ('-').		
Price Changes Compared to Baseline (2025) - FAPRI			
Beef	3%	17%	-45%
Sheep	-1%	-30%	-29%
Milk	1%	30%	-10%
Wheat	-1%	-4%	-5%
Barley	-1%	-5%	-7%

Results - % change in Farm Business Income From Baseline						
Support:	+	-	+	-	+	-
LFA Beef	0%	-68%	-14%	-56%	-66%	-126%
Dairy	3%	-18%	59%	42%	-25%	-44%
LFA Cattle & Sheep	2%	-148%	16%	-141%	-69%	-199%
Crops	1%	-56%	-3%	-58%	-4%	-59%

Source: SRUC

The Andersons Centre

In late 2020, a report was produced for Scottish Government by The Andersons Centre and Wageningen University (Haverty, 2020)¹² analysing the impact of Brexit scenarios on Scottish agricultural sectors.

The study used the AGMEMOD model to contrast the outcomes of two scenarios against a baseline of the UK remaining within the EU. The scenarios explored were a free trade agreement between the UK and the EU (FTA) and a “no deal”.

The outputs of the AGMEMOD model at the UK level were mapped onto Scottish agriculture, these results are outlined in Figures II-3 and II-4.

The results showed that there was little impact on the output of Scottish agriculture as a whole as a result of an FTA. The extent to which a sectors’ output increased was dependent on its net trade position. Where the UK is a net importer of a product, prices for that product tend to rise.

The report also draws conclusions about future UK FTAs, which are particularly relevant to this study. It highlights that future FTAs with nations that operate at a lower cost base or different standards has the potential to exert pressure on Scottish producers. This is raised as a particular issue for the beef sector where exposure to lower standards is likely to erode price.

Further, the report emphasises that non-EU markets are not going to sufficiently replace EU export markets. This is primarily due to the UK/ Scotland being seen as a high-quality, high-cost producer.

Figure II-3: AGMEMOD projections of Brexit Impacts on Selected Scottish Farm Sectors

Sector/ commodity	Base 2017- 19	FTA 2021		FTA 2025		No Deal 2021		No Deal 2025	
	£m	£m	% Ch	£m	% Ch	£m	% Ch	£m	% Ch
Wheat	121	121	0.0%	121	0.0%	123	2.0%	127	5.3%
Barley	269	269	0.0%	269	0.0%	241	-10.3%	222	-17.4%
Beef	575	581	1.1%	582	1.3%	672	16.9%	683	18.8%
Sheepmeat	213	215	1.0%	216	1.2%	152	-28.5%	137	-35.8%
Liquid Milk	384	386	0.6%	386	0.6%	440	14.6%	439	14.3%
Sub-Total	1,562	1,573	0.7%	1,574	0.8%	1,629	4.3%	1,608	2.9%

Source: Andersons, WUR and Scottish Government

Figure II-4: Estimated Short-Term Impact of Brexit on Selected Scottish Farm Sectors

Sector/ commodity	Base 2017-19	FTA 2021		No Deal 2021	
	£m	£m	% Ch	£m	% Ch
Potatoes- Seed	76	75	-1.9%	73	-4.6%
Potatoes – Ware	146	146	0.6%	155	5.9%
Cauliflower	6	6	1.6%	6	5.6%
Broccoli	10	10	1.6%	11	5.6%
Strawberries	95	95	0.2%	100	5.3%
Total	1,895	1,906	0.6%	1,973	4.1%

Source: Andersons, WUR and Scottish Government

In the AHDB, SRUC and Andersons work, a Free Trade deal between the UK and EU leads to the least change from the status quo. However, it can be seen that, particularly under the AHDB 'Evolution' scenario, there are still big changes in Farm Incomes (profit) compared to current levels. These points are picked up in more detail in Section 1.1.4 below.

1.1.3 Recent Studies

After an initial burst of research, there was a noticeable 'lull' in published reports through late 2018 and early 2019. Two pieces of research have subsequently been produced which are relevant to this study.

ERSC

The Economic and Social Research Council (ESRC) funded a project (the 'ESRC study'¹³) which is a collaborative work involving a number of researchers who have previously written in this area including the AFBI team and the SRUC. It was published in March 2019 and was led by Newcastle University. It is probably the most comprehensive study to date on the topic as it incorporates previous research plus new analysis.

The study used two economic equilibrium models to assess the impact of Brexit across several UK agri-food sectors;

- **CGE Model** – a general equilibrium model assessing impacts on wider economy and at a sector level.
- **UK-FAPRI modelling** – a partial equilibrium model demonstrating the sector level impacts. (This model is similar to that used by AFBI, 2017) and is considered to be an update of this work.

The outputs from the two models were linked and then applied to farm-level data (derived from the Farm Business Survey - FBS) to determine changes in farm profitability. The aim was to estimate the possible macro, sector and farm-level effects of selected trade and domestic policy scenarios for UK agriculture. As the FBS is undertaken on a devolved basis, there are separate analyses for Scotland, England, Wales and Northern Ireland.

Three trade policies were explored which included a UK-EU Free Trade Agreement, Unilateral Trade Liberalization and WTO rules. Figure II-5 below summarises the key results.

Figure II-5: ERSC: Summary of Assumptions and Resulting Price Changes

Key Assumptions	Free Trade Agreement (FTA) (Akin to Brexit Deal)	Unilateral Trade Liberalisation (UTL)	World Trade Organisation (WTO)
Trade	<ul style="list-style-type: none"> • Comprehensive UK/EU Free Trade Agreement with UK/EU tariffs at zero • UK adopts the EU common tariff schedule on Rest of World imports • UK maintains share of EU Tariff Rate Quotas applying to Rest of World imports. • Additional trade costs of 5% (livestock) and 2% (crops) for UK↔EU trade flows 	<ul style="list-style-type: none"> • An extreme free-trade scenario. • Elimination of all UK import tariffs for Rest of World including imports from the EU. • UK-EU exports subject to EU Common Custom Tariffs (CCT) • TRQs on UK-EU exports (limiting exports to Baseline flows) • Additional trade facilitation costs of 10% (livestock) and 5% (crops) for UK↔EU trade flow 	<ul style="list-style-type: none"> • No agreement upon Brexit, hence a fall back to WTO rules and current EU tariff schedules • UK trading with EU and Rest of World under Most Favoured Nation (MFN) tariffs • Requires a UK allocation of a share of the current EU tariff rate quotas with Rest of the World • Additional trade facilitation costs of 8 per cent (livestock) and 4 per cent (crops) for UK↔EU trade flows
	<p>Comment: this scenario is akin to Brexit Deal scenario used in this study.</p>	<p>Comment: given recent UK announcement on tariffs, tariffs on sheepmeat imports will be applicable. With a 230Kt beef TRQ with a zero tariff, imports under a No-Deal scenario would have some similar tendencies to UTL.</p>	<p>Comment: projections in this WTO scenario of relevance to Brexit No Deal. Allocations of TRQs also applicable. Imports of sheepmeat into UK likely to be similar to this scenario under No Deal. Beef imports will be more akin to UTL.</p>
Support	Two scenarios – current support maintained in full ('+') or all direct support removed ('-').		

Price Changes (2017 to 2026) - FAPRI	FTA		UTL		WTO	
	+	-	+	-	+	-
Support:						
Beef	1%	2%	-42%	-42%	17%	17%
Sheep	0%	4%	-19%	-19%	-23%	-23%
Pigs	1%	1%	-4%	-4%	25%	25%
Poultry	0%	0%	-3%	-3%	15%	15%
Milk & Dairy	1%	1%	-8%	-8%	28%	28%
Wheat	0%	1%	-2%	-2%	7%	8%
Barley	0%	1%	-8%	-8%	-5%	-5%

Source: ERSC (Hubbard et. al. (2019))

As well as the price changes shown in Figure II-5 above, the economic models produced detailed results by commodity on changes in production, usage, and trade. The CGE model also produces effects on land and labour markets. It is not intended to attempt to summarise all these outputs within this report.

As well as a split between the four devolved nations, the analysis is split down by size of farm – small, medium, large and very large. This means there are a large number of data points, even if the focus is limited to the Scottish results. For brevity, a summary of the farm level effects has not been provided within this report.

The conclusions of the report drawn across different commodities are broadly in line with those from earlier reports. The authors clearly show that Brexit will have significant implications for UK agriculture, which is a sector with strong trade links to the EU and a reliance on direct payment support. Under the trading scenarios modelled these impacts will be different for the commodity sectors and geographical regions of the UK. Whilst they recognise that tariffs and additional trade costs would vary under the trade scenarios explored, they also concluded that these trade effects could be overshadowed by foreign currency exchange rates, possible labour market changes and other NTBs. The impact of these other NTB's were not addressed in their study.

AHDB 2019 (Bradley & Hill)

The second 'recent' study is an update of the AHDB work undertaken by Bradley and Hill¹⁴. This was produced in April 2019 and updates the earlier, 2017, report. It had a

number of changes from the earlier analysis in that the assumptions were amended to incorporate amended changes in labour availability/cost, no changes in regulatory costs, and different assumptions on subsidy amounts (effectively the same overall level of payments but a shift in the type of payments).

Only two scenarios were modelled; 1. an agreed FTA and 2. trading on WTO terms. Thus, there was no unilateral trade liberalisation outcome. The WTO terms option incorporated the 'No Deal' tariffs that the UK Government announced in March 2019¹⁵. The No Deal tariffs have themselves, since been superseded by the UKGT regime.

The study uses the same basic trade scenarios as outlined in the 2017 AHDB report. It deploys a gravity model to assess the impact of price changes and the resultant impact on domestic production and also incorporates AFBI/FAPRI modelling analysis, a precursor to the FAPRI modelling work undertaken in the ERSC study. However, it should be noted that for the gravity modelling, one commodity at a time is examined, so there is no account of the cross-effects between different commodities. A series of farm-level modelling exercises are then undertaken to assess the impact of various scenarios on farm business income.

The projected price changes of selected products are presented in Figure II-6. These take account of some slight amendments to the original Bradley and Hill projections as set-out recently by the AHDB¹⁶.

Figure II-6: Projected Price Changes on the Domestic Market (2022) – Selected Products

Sector	UK-EU FTA	WTO: UK Tariff Schedule
Wheat	+2.3%	+3.6%
Barley	-2.0%	-12.1%
Oats	+0.1%	-3.0%
Milk	+2.6%	+3.8%
Beef	+4.3%	-4.6%
Sheep	-5.0%	-25.0%
Pigs	+3.4%	-4.8%
Poultry	+1.5%	+2.3%
Livestock feed	+0.7%	-0.8%
Poultry feed	+1.3%	+1.1%
Fertilisers	+0.9%	+4.9%

Sources: Bradley and Hill (2019) and AHDB (2019)

1.1.4 Commentary on Past Studies

Past studies on the impact of Brexit on Scottish agriculture provide useful background to the analysis of the impact of current and future Free Trade Agreements on Scottish farming. The results can be briefly summarised as follows;

- The direct impact of an UK-EU FTA (TCA) on prices and Scottish farm incomes is relatively small. There are effects from the additional costs of doing trade with the EU, but as the UK is generally a net importer from the EU, this increases prices for many commodities. Whilst there have been some effects on trade during 2021, the findings from these studies suggest that longer-term trade effects are relatively small. The effect of any subsidy changes is the key issue. Significant drops in farm income are seen if farm support is reduced or withdrawn.
- A unilateral liberalisation of trade causes UK prices to fall across all commodities as UK producers are forced to compete with cheaper prices from non-EU producers. Notably, whilst this did not occur as a result of Brexit, because the TCA was eventually agreed, similar effects could also arise if the UK agrees numerous trade deals elsewhere. This would have a significant adverse effect on farm incomes.
- In studies that have incorporated labour effects, this is generally seen to be detrimental to farm incomes as limits on free movement of labour increase UK

costs. This effect has been seen during 2021 and became more pronounced due to Covid restrictions on movement.

- The extent to which any sector, in particular beef, can realise gains in income as a result of Brexit is contingent on the protection afforded to sectors in future trade deals. An increase in non-EU competition is liable to impact the performance of Scottish agriculture¹⁷.
- The success of some sectors of Scottish Agriculture (e.g. beef, lamb, dairy products) will be contingent on their ability to reorientate trade from EU towards Non-EU markets and to find high-end niches in these markets. In some sectors there are physical barriers to this (e.g. liquid milk, where a lot of milk is processed in other parts of the UK).

1.1.5 Post-Brexit Analysis

Negotiations on the future trading relationship between the UK and EU concluded on 24th December 2020 with the signing of the UK-EU TCA. Its provisions became effective from January 2021 and the TCA was subsequently formally ratified by the UK and European Parliaments.

At the time of writing only limited analysis of the impact of the TCA on the UK agricultural sector, and by extension on Scottish agriculture, is available. This is primarily due to the lack of complete data following the UK leaving the EU.

That said, a report by the British Meat Processors Association (BMPA) (2021)¹⁸ sought to differentiate between “teething problems” and long-term systemic issues for UK meat trade as a result of Brexit. The report estimated that the systemic challenges could add an estimated £90-120 million per year to the cost of trade owing to increased certification costs. Further, the report highlights challenges in reorienting EU trade to non-EU destinations. This is primarily due to structure of the UK-EU meat trade being focussed on “fast-moving, high-value chilled fresh food”.

The report is limited, and it should be noted that BMPA is a trade association with its own political agenda.

A key aspect of the ability of agriculture in Scotland, and the UK as a whole, to continue to perform post-Brexit is the ability to reorientate trade. While there are currently no published studies which have looked at this, a quarterly trade snapshot from the Food and Drink Federation (Q3 2021)¹⁹ further highlights the challenge. Exports food and drink products in Q3 2021 were down 3.5% versus 2020. There

were some signs of a reorientation of trade with 7.5% increase in trade with non-EU nations, somewhat compensating for a 10.5% drop in trade with the EU.

Figure II-7, below, highlights the change in imports and exports of key food and drink products in 2021 versus 2020. It should be noted that trade will have been affected by Covid-19 and other external factors in both periods, as well as Brexit. However, for some key products, notably beef and cheese Brexit will have played a key role in shaping trade, particularly on UK exports as EU border controls became effective from January 2021 whilst there have been multiple delays to the implementation of the UK Border Operating Model.

Figure II-7: Change in value of top 10 imported and exported food and drink products to end-Q3 2021 vs end-Q3 2020.

Exports				Imports			
Product	Year to end-Q3 2021	Year to end-Q3 2020	Change	Imports-product	Year to end-Q3 2021	Year to end-Q3 2020	Change
Whisky	£3.3b	£2.7b	+21.0%	Fruit	£3.0b	£3.2b	-5.2%
Salmon	£568.3m	£470.9m	+20.7%	Wine	£2.3b	£2.3b	+2.2%
Chocolate	£527.9m	£537.4m	-1.8%	Vegetables	£1.9b	£2.0b	-4.8%
Pork	£426.6m	£453.3m	-5.7%	Chocolate	£1.2b	£1.2b	+3.9%
Cheese	£401.2m	£462.4m	-13.2%	Chicken	£1.2b	£1.4b	-13.3%
Gin	386.3m	£431.2m	-10.4%	Pork	£1.1b	£1.4b	-16.4%
Soft Drinks	£361.6m	£324.4m	+11.5%	Cheese	£1.0b	£1.2b	-14.5%
Breakfast Cereals	£355.6m	£378.4m	-6.0%	Savoury Snacks	£968.3m	£1.0b	-5.6%
Wine	£334.8m	£359.5m	-6.9%	Vegetable oils	£950.0m	£862.5m	+10.1%
Beef	£309.9m	£380.0m	-18.4%	Beef	£856.8m	£807.7m	+6.1%

Source: Food and Drink Federation

1.1.6 Effect on the Wider Scottish Economy and Food-Chain

Aside from studies focusing on agriculture it is also worth noting that there have been a number of studies looking at the effect on the wider Scottish economy and the food chain in Scotland. A very brief overview of the key ones is set out in this section. Although not directly related to the farming sector, the health of the overall

economy obviously has a bearing on the trading environment for Scottish farmers. The Scottish Government’s ‘Scotland’s Economic Strategy’²⁰ recognises the Food and Drink industry as one of six key Growth Sectors (alongside Financial and Business Services, Life Sciences, Energy, Tourism and Creative Industries) and Brexit’s effects on the wider food chain will have impacts on achieving the ambitions in the Strategy. A detailed sectoral analysis, including the food and drink sector, was published by the Scottish Government²¹ in February 2019. This looked at the effects of an ‘orderly’ Brexit – comparing a UK/EU FTA versus the status quo EU membership. The results of this study are set out in Figure II-8.

Figure II-8: Sectoral Change in GVA to 2030 Arising From an ‘Orderly’ Brexit

Sector	Scotland	Rest of UK	GVA Impact Index
Chemical Coke and Pharmaceutical	-10.1%	-8.4%	1.2
Mining and Quarrying	-8.3%	-9.4%	0.9
Basic Metals, Rubber & Plastic	-8.3%	-6.3%	1.3
Textiles, Leather, Wood & Paper	-6.9%	-6.4%	1.1
Food & Drink	-6.8%	-5.8%	1.2
Agriculture, Forestry and Fishing	-6.4%	-6.1%	1.1
Computer, Electronic & Optical	-5.7%	-4.4%	1.3
Machinery, Transport Equip & Furniture	-5.7%	-5.3%	1.1
Administrative & Support Services	-5.4%	-4.5%	1.2
Professional & Scientific Services	-5.0%	-3.5%	1.4

Source: Scottish Government

The report undertook a further analysis investigating which sectors faced the greatest ‘shock’ compared to the rest of the UK, given their relative size in the economy. On this measure, ‘Agriculture, Forestry & Fishing’ and ‘Food & Drink’ came first and second respectively.

In January 2020 a report on the Social and Equality impacts of Brexit²² was issued. This was a wide-ranging report not specifically looking at economic impacts.

However, it highlights that those living in remote and rural areas may be particularly affected by the loss of EU Rural Development funding and labour shortages (as it has often been migrant labour that has filled roles in the most remote parts of the country).

The latest overall analysis of the Scottish economy, the 'State of the Scottish Economy'²³ was produced by the Scottish Government in November 2021. The report highlights the challenges being posed for the Scottish economy and on Scottish businesses as a result of both Brexit and Covid-19. The report cites both the pandemic and Brexit as causes of input inflation. Further, the report also highlights a 14% drop in Scottish goods exports to June 2021, compared with annual exports to June 2020. The primary driver of the overall decline in exports has been the gas and oil and machinery and transport sectors. Despite the drop in export value overall, the value of total agri-food exports increased by 1% in the period Q3 2020 to Q2 2021, compared to the period Q3 2019 to Q2 2020²⁴.

Lastly, focusing in more detail on the food and drink sector, an evidence report by the Scottish Government²⁵ looked into food and drink export logistics in the light of Brexit, and in particular the resilience of those logistics to ensure the reliable, timely delivery of products to markets. It found that there was a heavy reliance on road transport via England to the South East ports and also on Heathrow for air transport. A more diverse set of logistics options with more direct movements from Scotland to key markets was seen as desirable.

1.1.7 Tariffs

For third country trade, outside of existing Free Trade Agreements the UK Global Tariff (UKGT) regime applies. The regime was set out on 19th May 2020.

From an agri-food perspective, as Figure II-9 below illustrates, most of the tariffs under the CET have been maintained at the same levels of the CET, but converted from Euro into Sterling. In most cases, the currency conversion rate is €1 = £0.83, but there are some variations due to rounding and simplifications. Effectively, the protection around the UK market will be kept at the same level as it was when the UK was protected by the EU CET. It should be noted that only a selection of agri-food tariffs are shown in Figure II-9. For some commodities, such as beef, there are varying tariffs depending on the product in question (i.e. the specific cut, frozen or chilled etc.). The accompanying Interim Report provides further detail (see Appendix I).

It is also worth noting that some tariffs have been fully liberalised, such as maize. This is primarily where the UK is not a large producer of the product, i.e., grain maize.

Figure II-9: UK Global Trade Tariffs

% or €/£ per tonne	EU Common External Tariff	UK Global Trade Tariff	Reason for Change
Feed Wheat	€95	£79	currency
Feed Barley	€93	£77	currency
Oilseeds	none	none	n/a
Maize	€10.4	£0	liberalisation
Sugar (raw cane)	€339	£280	currency
Butter	€1,896	£1,580	currency
Cheese (Cheddar)	€1,671	£1,390	currency
Beef Carcasses [○]	12.8%+€1,768	12%+£1,470	currency
Lamb Carcasses [○]	12.8%+€1,713	12%+£1,430	currency
Pig Carcasses [○]	€536	£440	currency
Chickens [○]	€262	£210	currency
Potatoes	14.4%	14%	simplification
Oranges	12%/16%	12%	simplification

Source: Department for International Trade ○ fresh/chilled

For many commodities, the UK both imports and exports during the year. This is due to factors such as seasonality in production and markets, together with consumer preferences. For example, Defra figures for 2019 were 80,000 tonnes of lamb imports to the UK and 107,000 tonnes of exports²⁶. Therefore, both tariffs on imports and exports need to be considered when looking at impacts on patterns of domestic production and consumption.

1.1.8 Tariff Rate Quotas (TRQs)

Tariff Rate Quotas (TRQs) allow a defined quantity of goods to be imported at lower, or zero, tariff rate. Following the UK's departure from the EU, a new series of TRQs were adopted for UK imports. TRQs have subsequently been a feature of trade negotiations, most notably with Australia.

According to The Customs (Tariff Quotas) (EU Exit) Regulations 2020²⁷, the UK operates 120 TRQs across more than 300 products, the majority of which fall under the agri-food harmonised system codes (01-24). The accompanying Summary Report provides further detail on the TRQs of relevance to this study (see Chapter 5, with more detail in Annex III)

TRQs are one of the main methods for protecting sensitive products, such as beef and dairy. However, when FTAs come into force, we tend to see the steady liberalisation of TRQs. The UK-Australia trade deal, signed in December, includes provision for the eventual removal of tariffs on sheep meat, dairy products, cereals, horticultural products and beef²⁸.

1.1.9 Non-Tariff Measures

Non-tariff measures (NTMs) are Government-imposed requirements, unrelated to tariffs, but which are faced by trading businesses. NTMs include customs procedures, sanitary and phytosanitary regulations, labelling, packaging, and testing requirements and certification, together with rules governing product origins and Government procurement²⁹. They are used to overcome or reduce the impacts of perceived product risks, including risks to human, animal or plant health or product descriptions and standards.

NTMs tend to increase production costs and can lead to delays, wastage, and added trading costs. They are, therefore, often a barrier to trade, particularly in the agri-food sector where risks to environmental quality and human, animal, and plant health need to be managed. NTMs tend to increase production and trade costs and, therefore, act as a barrier to trade. That being said, a 2016 study³⁰ noted that 'not all NTMs are bad' and that most are "necessary for consumer safety, and environmental, animal, and plant protection."

Non-tariff barriers (NTBs) are often conflated with NTMs. However, in most trade definitions³¹, NTBs are additional restrictions that are unrelated to Government-imposed regulations (e.g. private standards) which are discriminatory. This study focuses only on NTMs.

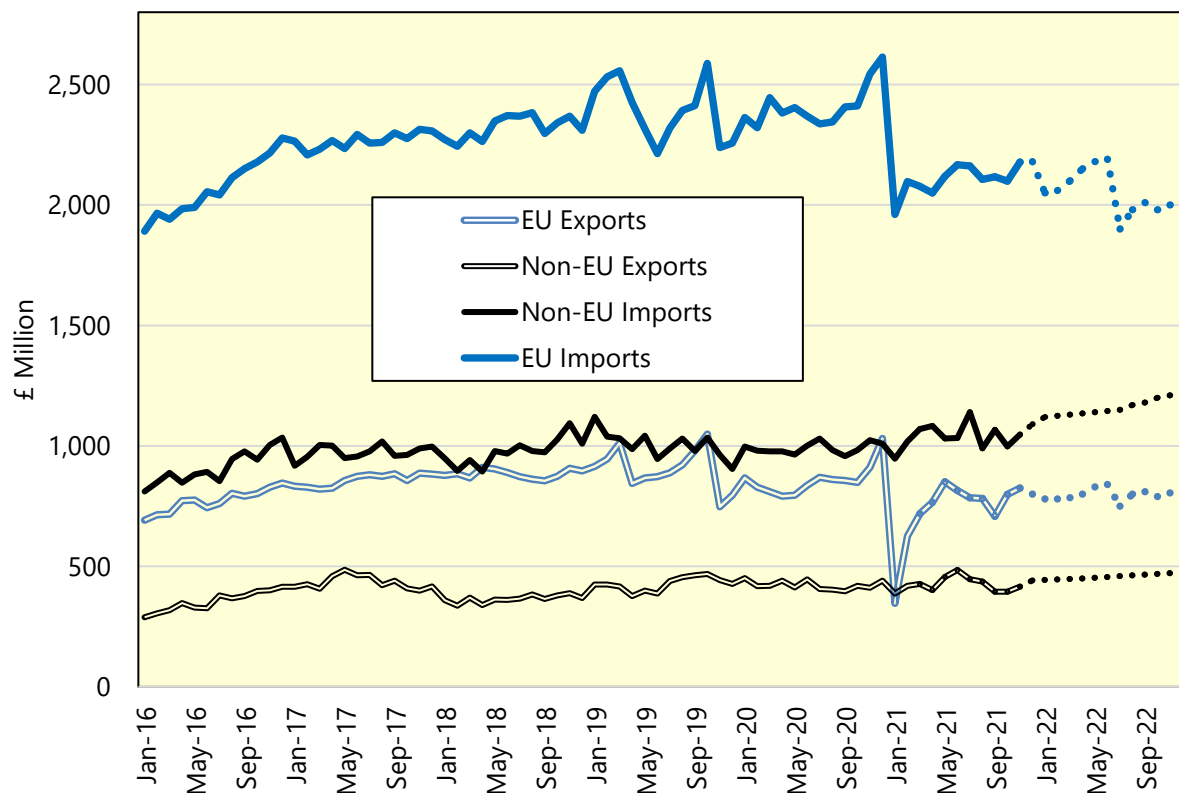
While trade tariffs have progressively reduced globally since 1948 to facilitate trade, evidence suggests that the same does not hold for NTMs, and in many instances they have become more burdensome. Academic reports have identified an increase in the number of locally implemented NTMs as a response to falling trade tariffs that have been agreed globally³², and while NTMs may be justified in terms of protecting health, welfare and the environment, they are sometimes used as a form of industry protection by governments³³.

As part of the Single Market, the UK faced few NTMs when exporting to the EU and was not subject to sanitary or phytosanitary measures (SPS), technical barriers to trade (TBT) or rules of origin (RoO) checks. Now the UK has left the Single Market all

such NTMs apply. These NTMs in conjunction with shortages of HGV drivers and the effects of the pandemic have had a significant impact on trade friction with the EU, particularly from January 2021, when EU border controls were implemented (see Figure II-10). Although there has been a partial recovery since, UK-EU trade has been significantly lower versus 2020 and before. This trend looks set to continue and NTMs are a key factor in this regard.

There is also the question of controls on imports into the UK, especially from the EU. This also has an effect on domestic prices, albeit not as great on export controls. The UK Government has published several iterations of its Border Operating Model (BOM) and in recent months further delays have been announced³⁴. For agri-food, most controls should be in place from July 2022 with some additional controls being implemented for dairy products from September. However, further delays cannot be ruled out. Figure II-10 projects some additional turbulence for UK imports from the EU (and exports to a lower extent) to coincide with the full introduction of the UK BOM. For the purposes of this study, modelling will assume that full checks are taking place on agri-food goods imported from the EU.

Figure II-10: UK Food and Live Animals Trade Since 2016



Source: ONS, analysed by Andersons

Estimating NTM Costs

NTMs are much more difficult to identify and quantify³⁵ than tariffs because they are not always published, are difficult to calculate, and vary across the region. However, they can be considerable, amounting to large costs and delays. Because time costs money the delivery of goods has become tailored to specific orders, leading to 'just-in-time' food supply. Frictions to trade that result in delays are, therefore, particularly critical to rapidly perishable food. Indeed, before the UK joined the EEC, the majority of meat traded was frozen for that reason. Their impact in certain food supply chains can be significant where perishable goods are easily damaged or lost as a result of delays³⁶. The OECD suggests that non-tariff frictions, particularly at the border, can, for many commodities and trade routes, be larger than the costs of the tariffs themselves. It states that customs compliance costs add 2% to 24% to the value of traded goods with smaller businesses being disproportionately affected³⁷.

An additional piece of research was conducted for AHDB, Quality Meat Scotland, and Hybu Cig Cymru by the Andersons Centre in 2019. The Red Meat Route to Market Report³⁸ investigated the impact of Non-Tariff Measures (NTMs) and Barriers (NTBs) on beef and sheepmeat trade with the EU under a Deal and No Deal Brexit scenario.

The impact of NTMs on trade was estimated using an import elasticities approach. This approach gives a percentage change in trade as a result of a 1% increase in the price of trade resulting from tariffs and NTMs.

The research found that changes to trade in beef and sheepmeat under a deal scenario were mainly due to the imposition of NTMs (which generally ranged from 0.4% to 6% but tended to average at 1% to 3% in AVE terms). Under a deal scenario sheepmeat exports to the EU were seen declining by 1.5%, while imports were seen declining by 2.9% once import elasticities were considered.

Under a No Deal scenario, sheepmeat exports were seen declining by 99.7%, beef exports were seen declining 87%. A key driver of trade declines was the higher incidence of NTMs. While a no deal scenario is not relevant to this study. The reduced NTMs under a deal scenario shows the impact that the reductions under an FTA can have on trade.

The likely impact of NTMs on UK and Scottish trade is more difficult to assess with high degrees of confidence than tariffs. The research literature identifies two broad approaches to quantifying NTMs in the agri-food sector namely, top-down and

bottom-up. Within these broad approaches, there are several methodologies which have been employed.

- The 'top down' approaches primarily use macroeconomic data on trade and seek to provide insightful estimates on the costs of the trade restrictions implied by NTMs. Within this, three main methodologies are identified:
 - Gravity model estimates encompassing quantity-based equations.
 - Price-based methodologies.
 - Time-cost methodologies.
- The 'bottom-up' methodologies use stakeholder surveys and related techniques (e.g., workshops, field-trips and case-studies) to gain a better understanding of the prevalence of NTMs for a variety of analytical purposes. These include information about the frequency of NTMs and relative importance of different measures such as their trade restrictiveness or trade impact³⁹.

The use of "bottom-up" business surveys or case studies has become more frequent in recent years to address the shortcomings of the top-down methods and to gain a more granular understanding of how NTMs affect business supply chains. Examples using business surveys include Grainger⁴⁰, ABAC⁴¹, Haverty⁴² and the International Trade Centre (ITC)⁴³. Examples employing a case-study methodology include Orden et al.⁴⁴ and Grainger⁴⁵. The bottom-up approaches have the potential to address many of the problems of top-down methodologies, but caution needs to be employed in solely relying on perceptions-based inputs from any one group of stakeholders (e.g., businesses, port health officials etc.) as it can lead to biases. What is required is a balanced approach which considers the perspectives of all stakeholders and based as factually robust data as possible.

Appendix I below contains an overview of the key NTM studies which have been conducted in recent years using both top-down and bottom-up approaches. It includes the 2020 study which Andersons undertook for the Scottish Government which builds upon the 2019 study which Andersons undertook for the AHDB (referred to above).

When looking at NTMs it is important to recognise the differences between different **products**. Simply using AVE percentages and applying across a whole category of trade (e.g., beef) is unlikely to capture all the nuances (e.g., chilled products more affected by value deterioration than frozen etc.).

For the purposes of this study, the NTM figures used will be based on work undertaken for the AHDB⁴⁶, supplemented by data generated from other NTM

projects that The Andersons Centre has been involved in as well as additional primary research which will be undertaken in the near future. In the final report, NTM estimates will be validated to ensure they are relevant for the Scottish industry.

Rules of Origin

Issues around Rules of Origin (RoO) requirements are also worthy of comment at this point. The RoOs determine in which country a product and its components have to be produced to benefit from preferential tariffs.

Through RoO, a certain level of processing is required to have taken place on a product before it can be considered "originating", and then not subject to tariff upon export to the EU. This is especially true in the case of agri-food where UK and EU agri-food supply chains are closely integrated, as compliance with European RoO requirements potentially could increase administrative costs for exports to the EU⁴⁷.

In summary, for agri-food products as long as 85% or more of raw materials (based on bill of materials) meet origin requirements as deriving from the UK or EU then they would be permitted tariff-free access under an FTA⁴⁸. If the 'non-indigenous' component is over 15% then restrictions apply.

Other Trade-Related Impacts

Influences such as multilateral trade resistance and the presence of internal trade barriers add layers of complexity to bilateral trade relationships. These factors are not considered in detail in this report but are outlined here for completeness.

Research⁴⁹ has demonstrated that trade is not only limited by the barriers set up between the importing and exporting nations (i.e., UK and EU), but also by the overall trade restrictions with other countries (i.e., trade restrictions the UK faces when exporting to China and South East Asian countries etc.). This is referred to as 'Multilateral Resistance'⁵⁰. The impact of multilateral trade resistance is likely to increase if the UK departs the EU and then changes its standards. Under these conditions, importers from Third Countries, which previously traded with the UK on the basis of EU standards, could become reluctant to import UK produce until they are satisfied that the new UK standards still conform to their requirements.

1.2 Impact of Other UK FTAs

1.2.1 UK-Australia

On 16th December 2021, the UK signed its first "from "scratch" trade deal since leaving the European Union. The UK-Australia FTA is currently awaiting ratification in

parliament. A document published by the House of Commons Library⁵¹ on 21st December 2021, highlights the overarching detail of the trade agreement which includes the complete removal of tariffs on all UK goods exported to Australia, as well as the removal of tariffs on the “vast majority” of imports from Australia.

Under the FTA, additional protection is afforded to UK agriculture in the short- to medium-term, through the phasing of tariff free access, using TRQs. The main products of concern for UK (and Scottish) agriculture are beef, sheepmeat, sugar and dairy. Further detail of how trade will be liberalised for these products is given in Figure II-11 below.

Figure II-11: Change in Australia Tariff-Free Quota as a result of UK-Australia FTA

Product	Years 1- 5	Years 6 – 10	Years 11 -15
Beef	Access to tariff free TRQ of 35,000t, rising in equal instalments to 68,333t	TRQ rises to 76,667t in year six, before rising in equal instalments to 110,000t	Trade “fully” liberalised, product specific safeguards will remain rising to 170,000t in year 15.
Sheep Meat	Access to tariff free TRQ of 25,000t, rising in equal instalments to 47,222t	TRQ rises to 52,778t in year six, before rising in equal instalments to 75,000t	Trade “fully” liberalised, product specific safeguards will remain rising to 125,000t in year 15.
Cheese	Access to tariff free TRQ of 24,000t rising in equal instalments to 48,000t	Trade fully liberalised from year six.	
Butter	Access to tariff free TRQ of 5,500t, rising to 11,500t in year five.	Trade fully liberalised from year six.	
Non-cheese dairy	Access to transitional tariff free TRQ of 20,000t	Trade fully liberalised from year six.	
Sugar	Access to tariff free TRQ of 80,000t rising to 160,000t in year five	TRQ rises to 220,000t by year eight.	

Source: House of Commons Library

Whilst not wanting to repeat the detail of the UK-Australia FTA in full, there are some additional aspects of the agreement which are of relevance to agriculture and barriers to trade which are worth highlighting. First, it is worth mentioning that the

UK-Australia FTA has been lauded as the first of its kind to include a specific animal welfare chapter. This represents an agreement of both parties to not regress on animal welfare conditions as a result of present or future trade deals⁵².

Second, the agreement includes specific measures to reduce the impact of barriers to trade by removing the need for customs brokers, a commitment to release goods from customs with 48 hours of arrival for all goods and six hours for perishable goods. Further, additional measures for simplifying customs processes are to form part of the trade agreement⁵³.

Finally, the deal makes concessions on some aspects of RoO, while not specifically relevant to this study, the Department for International Trade (DIT) highlight this as an additional measure of support for UK food and drink manufacturers⁵⁴.

There have been two main assessments of a UK-Australia free trade agreement (FTA). The biggest of these is the UK governments own impact assessment⁵⁵. The document published in December 2021 by the Department for International Trade used the UK government CGE model, GETRADE, which is based on the GTAP10 dataset from 2014. The impact assessment highlights the trade implications of the FTA on both UK agriculture (and its derived sectors) and on the Scottish economy as a whole.

The impact assessment is focussed on the long-run transformation of trade, assuming that all tariffs and tariff-rate quotas are eliminated in the long run. This does not account for the gradual staging of tariff reductions or tariff rate quotas.

The impact assessment also looked at non-tariff measures (NTMs). For the agri-food sectors reductions to NTMs were in line with agreements already observed.

The output of the model identified the agri-food sector as the sector seeing the biggest losses as a result of the FTA. The Gross Value Added (GVA) for agriculture, forestry and fishing was seen declining by £94 million, 0.70%, against the baseline. Further, the value of semi-processed foods was seen falling by £225 million against the baseline, a drop of 2.65%.

The primary decline in the GVA of agriculture, forestry and fishing emanates from declines to the competitiveness of the beef and sheep sectors. This would evidently have significant implications for Scottish agriculture, where the beef sector is dominant. The UK government impact assessment report also highlights the outcome of a partial equilibrium model, which suggests declines in the gross output of beef and sheepmeat of 3% and 5%, respectively.

For the Scottish Economy as a whole, the GETRADE model suggests a 0.08% increase to GVA, of £120 million.

A further report on the impact of the UK-Australia FTA was produced by AHDB and Harper Adams University. The impact assessment followed a trade network model approach, which looks at trade between four nodes (countries or groups of countries) within a network, for specific products.

The trade network model approach differs from the CGE and PE approaches, in that it allows for indirect impacts of other trade partners in the network, it also allows for imperfect market conditions.

The report projects minimal changes to both price and trade flows as a result of the FTA between the UK and Australia, in the medium term, all other things being equal. The results for UK lamb, beef, cheese, and oilseeds are summarised in Figure II-12 below.

Figure II-12: Headline changes in UK agriculture as a result of UK-Australia FTA

Sector	Domestic Production	Domestic Price	Imports from Australia	Exports to Australia
Lamb	-0.1% (200t)	-0.1%	+80.9% (+10,000t)	n/a
Beef	No change	No change	+260.7% (+12,000t)	n/a
Dairy (cheese)	-0.3% (-1,500t)	-0.5%	+254.0% (+1,100t)	+199.0% (+2,600t)
Oilseeds	-0.1% (-1,500t)	-2.0%	+1.0%(+28,000t)	n/a

Source: AHDB/ Harper Adams

Furthermore, impact assessments covering the trade deal between the UK and Australia are limited. However, other sources of information providing added detail on the trade agreement are available, which may offer some insight into the potential impact of the trade deal.

One article from “The Lighthouse” a Macquarie University publication highlights how the FTA is advantageous for Australian agriculture. Karunaratne (2021)⁵⁶ states that Australian farmers benefit from both economies of scale and comparative advantage in agriculture. The article highlights how Australian agriculture has had to innovate and reduce costs of production, due to a lack of protection relative to EU farmers.

1.2.2 UK-New Zealand

In February 2022, the UK and New Zealand signed the UK-New Zealand Free Trade Agreement (FTA), formalising the agreement-in-principle which was announced in October 2021. Under the UK-NZ FTA, upon entry into force, 100% of tariffs on UK

goods exports to NZ will be removed whilst tariffs on 99.5% of goods imports into the UK from NZ will also be removed.

For sensitive agri-food products, trade liberalisation with New Zealand is staged over 15 years. These products include beef, sheepmeat, butter, cheese, and apples. In early 2022, a research briefing was published which provides an overview of the FTA. The briefing provides further detail on how trade in the products mentioned above will be liberalised, this is given in Figure II-13.

Figure II-13: Change in New Zealand Tariff-Free Quota as a result of UK-NZ FTA

Product	Years 1- 5	Years 6 – 10	Years 11 -15
Beef	Access to tariff free TRQ, on a product weight basis, of 12,000t, rising in equal instalments to 23,920t	TRQ rises to 26,900t in year six, before rising in equal instalments to 38,820t	Trade “fully” liberalised, product specific safeguards will remain rising from 43,056t in year 11 to 60,000t in year 15.
Sheep Meat [^]	Access to at tariff free TRQ, on a carcase weight basis, of 35,000t in years 1-4, rising to 50,000t in year five	50,000t tariff free TRQ	50,000t tariff free TRQ
Cheese	Access to tariff free TRQ rising from 24,000t in year one to 48,000t in year five	Trade fully liberalised	
Butter	Access to tariff free TRQ rising from 7,000t in year one to 15,000t in year five	Trade fully liberalised	

Source: House of Commons Library [^]In any given year, trade can only take place under the UK-NZ FTA quota once utilisation of the WTO quota reaches 90%.

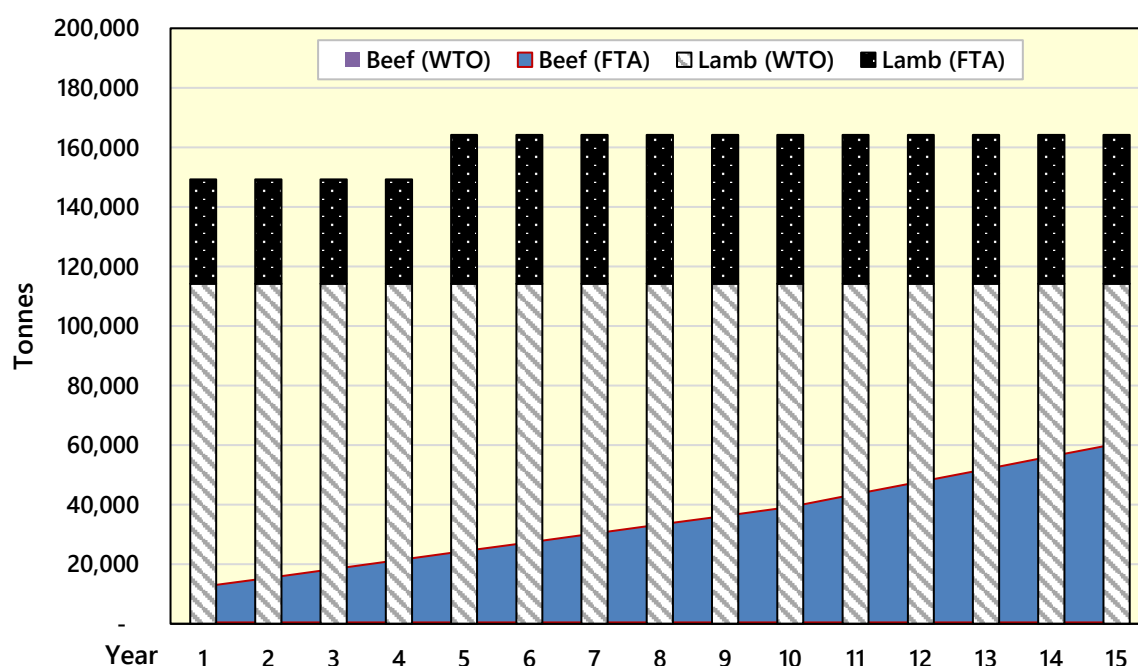
As with the UK-Australia FTA, the UK-New Zealand FTA will include provision for animal welfare regulations and the reduction of non-tariff barriers to trade.

In October 2021, the AHDB⁵⁷ published an article detailing some potential impacts of the UK-NZ FTA for British agriculture. The article highlights that New Zealand has limited access to the UK beef market outside of a new FTA, with a quota of just 454 tonnes available. However, the article also highlights that New Zealand already has

established markets for beef exports in the United States and China, which are geographically closer.

The AHDB article highlights the same point regarding trade orientation for lamb exports. Further, it flags that New Zealand sheep meat already benefits from a 114,000t TRQ into the UK, which has recently gone unfilled in recent years.

Figure II-14: Future NZ Beef & Lamb Market Access to the UK Following the UK-NZ FTA



Sources: UK Government and The Andersons Centre

There has been limited coverage of a UK-New Zealand trade deal in published studies. On 17th June 2020 an initial document titled “UK-New Zealand free trade agreement: the UK’s strategic approach”⁵⁸ was published. The document includes a scoping assessment highlighting some of the potential impacts on the UK economy and UK businesses as a result of an FTA.

The scoping assessment looked at two scenarios;

1. UK substantial tariff liberalisation, New Zealand full tariff liberalisation, and a 25% reduction in NTMs.
2. Full tariff liberalisation and a 50% reduction in NTMs.

As with the UK-Australia impact assessment (see Section 1.2.1), this report adopts a CGE modelling approach using GETRADE. The overall macroeconomic impact of an FTA with New Zealand is negligible in both scenarios. However, imports from New

Zealand are seen increasing 14.9% and 40.3% under scenarios one and two, respectively.

The impact of an FTA with New Zealand on Agriculture was also explored. No absolute changes to GVA are given, however, under scenario one, GVA from agriculture is seen declining by between 0.05% and 0.5% versus the baseline. Under scenario two, GVA is seen declining by more than 0.5% against the baseline.

This analysis is now somewhat dated, given that we know more about the potential future trading relationship between the UK and New Zealand. A more recent analysis was published in February 2022 by DIT⁵⁹. It shows that whilst the structure of the UK economy will remain largely unchanged by the FTA, there will be increased import competition in agriculture, notably beef and sheepmeat. It states that the long-run increase in imports is uncertain. That said, the study projects a reallocation of resources within the UK economy with a £48 million (0.35%) decline in gross value added (GVA) agriculture, forestry, and fishing as well as a £97 million (1.16%) decline in GVA in semi-processed foods. Whilst limited information was presented on Scotland, it was notable that the combined increase in GVA for Wales, Scotland and Northern Ireland was £52 million, whereas the GVA gain for London alone was around £131 million. Of this, £52 million GVA gain, Scotland is projected to achieve a £33 million GVA increase (+0.02% of its 2019 GVA). Given the importance of livestock farming in the Devolved regions, the projections imply that these regions will be significantly affected by the UK-NZ FTA and that these losses will cancel-out a significant proportion of the GVA gains that might be seen in other sectors. However, the DIT report also cautioned that any sub-national impacts are subject to a high degree of uncertainty.

In terms of agri-food, several caveats were listed in terms of the study's findings, including;

- **Strong future growth potential in other markets:** for instance in Asia, was not accounted for. This could mean that NZ produce gets diverted to these markets and does not compete with Scottish produce.
- **Product-specific safeguards for sensitive commodities:** were not factored into the long-term CGE modelling analysis. This means that their short-term impact on GVA during the transitional periods was not accessed.
- **Consumer preferences:** and the impact of campaigns such as 'Buy British' were not necessarily reflected in the modelling. Therefore, the projections may not accurately capture the actual consumption patterns shifts towards imports from NZ.

Despite these caveats, this study projects that;

- Gross output of beef would decline by 1% as a result of liberalisation (i.e., UK-NZ FTA).
- No reduction in the gross output of sheepmeat, as the existing WTO TRQ that NZ has access to is currently unfulfilled.
- A small long-term reduction in the gross output of butter as a result of the FTA. However, the DIT added several caveats to this (e.g., price convergence between UK and NZ butter and that NZ's main exported butter brand (Anchor) has been manufactured in the UK since 2012) and stated that it does not expect significant changes in butter imports from NZ due to the FTA.

1.2.3 UK-Canada

On 1 April 2021, the UK-Canada rollover agreement came into force. The rollover agreement included UK-Canada specific TRQs on some agrifood products as with the UK-New Zealand trade agreement, no up-to-date impact assessment covering the full details of the trade agreement exists.

However, in 2018 Ciuriak Consulting Inc⁶⁰. produced an impact assessment of the EU-Canada Comprehensive and Economic Trade Agreement (CETA) on the UK. The study used a CGE model to examine the possible implications of CETA coming into effect between the EU-28 and Canada in 2017, with the UK trading on CETA terms after EU exit. An alternative scenario was also explored where CETA came into force, but after exiting the EU, trade between the UK and Canada reverted to MFN terms.

Two sectors of agriculture were expected to see significant changes in their trading environment as a result of the UK and Canada continuing to trade on CETA terms. The UK dairy sector was expected to see a gain of £23 million in bilateral exports, with a total increase in sales domestically and through international trade of £32 million. The largest negative impact is seen on the UK cereals sector with imports of Canadian cereals seen growing by £85 million. This increase is seen displacing domestic sales, with a net loss to domestic and international trade of £39 million.

The change in cereals trade is likely to be driven by an increase in imports of wheat. Under the UK-Canada rollover agreement the TRQ on wheat is set to be eliminated from 2023 (but it is likely that the enhanced trade deal with Canada will be effective by then). Canadian milling wheat is a key input into the UK flour milling process and favoured for its high protein.

Trading on MFN terms with Canada, UK sales of dairy products are estimated to fall by £9 million.

1.2.4 UK-Gulf Cooperation Council (GCC)

An FTA between the UK and the Gulf Cooperation Council (GCC) is currently being pursued by UK Government. The negotiations on this trade deal are relatively early stage. The DIT commenced a consultation relating to future trade negotiations between the UK and GCC in October⁶¹. This consultation concluded on 14th January 2022.

Due to the early stage of negotiations very little work has been carried out looking towards the impact of a UK-GCC FTA. While there is little forecasting of the impact of any trade deal, some insight can be drawn from other documents.

Alongside the launching of its consultation, DIT published a brief highlighting the potential areas of interest in an FTA with the GCC⁶². Agriculture is mentioned briefly, highlighting that it makes up a small proportion of GVA in both the UK and GCC. As such, one might expect other sectors to be at the forefront of trade negotiations. The brief highlights that the UK's top exports to the GCC are mechanical power generators and travel and engineering services. From an importing standpoint refined oil is understandably the top good imported to the UK from the GCC, while travel and communications feature prominently in the service sector.

On 12th January 2022, a meeting of the International Trade Committee looked at UK trade negotiations and an agreement with the GCC⁶³. In terms of the likely progress of any trade deal the committee highlighted that the UK-GCC agreement would be a multilateral agreement rather than bilateral. It is highlighted in the transcript of the committee that negotiating bilateral agreements can be a "very painful process," trying to find terms that seven nations (UK, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) find acceptable is more challenging than agreeing terms on a bilateral basis.

One factor which could affect the impact of a trade deal, but not necessarily be reflected in the results of the modelling work is the long-term economic prosperity of the GCC. A 2021 report by the International Monetary Fund⁶⁴ highlights the potential medium and long-term challenges of an economy built on hydrocarbons.

1.2.5 UK Accession to CPTPP

While research looking into specific trade agreements and their impact on agriculture in the UK (and/or Scotland) has so far been limited, further research has been carried out looking at the potential impacts of the UK joining the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

The CPTPP is trading block of eleven countries. This is of particular relevance here as CPTPP includes Australia, Canada, New Zealand and Mexico. In targeting FTAs with

Australia and New Zealand as a priority the UK is deemed to be positioning itself to join CPTPP.

As with the countries the UK is currently pursuing an FTA with the Department for International Trade has published a scoping assessment⁶⁵ outlining the potential impact of the UK joining CPTPP. The scoping assessment used CGE modelling to assess the impact of a 100% liberalisation of imports of most products, with a 75% liberalisation of “sensitive” products. As with other analysis, the sensitive products included wheat and other cereals, beef, sheepmeat and dairy products.

UK exports were deemed to be either 100% liberalised for the majority of products and 85% liberalised for agricultural sectors. Non-tariff costs (NTMs) were also deemed to have reduced, in line with reductions estimated for other trade agreement impact assessments.

As well as looking at the current make up of CPTPP (CPTPP 11), the study also considered CPTPP 11 plus Thailand and South Korea (CPTPP 13) and CPTPP 13 plus the USA (CPTPP 14).

Were the UK to join CPTPP 11 GDP is estimated to grow by £1.8 billion, rising to £5.5 billion with CPTPP 13 and CPTPP 14. This assumes that the UK has a bilateral agreement with the USA.

The GVA of agriculture, forestry and fishing is estimated to be unchanged in the long run were the UK to join CPTPP 11.

Additionally, an article by the School of Public Policy at the University of Calgary, focuses on the implications for Canada were the UK to join CPTPP. In the article, Stephens (2021)⁶⁶ highlights some potential challenges of increased market access for UK agriculture into Canada (over and above the rollover agreement). Challenges for Canadian agriculture owing to increased access for UK dairy, poultry and eggs are mooted. However, the article does point to wider economic benefits for the CPTPP 11 from widening the reach of the groups trade.

1.2.6 Other UK FTAs

On 23rd October 2020 the UK signed an FTA with Japan. The UK-Japan Comprehensive Economic Partnership (CEPA) is seen by the Department for International Trade as a bridging agreement until the UK joins CPTPP⁶⁷. For agriculture, the agreement includes staged reductions/ eliminations of tariffs on UK exports of beef, pork and cheddar.

In February 2021, a final impact assessment⁶⁸ for CEPA was published. The assessment highlighted positive impacts for UK agriculture and agri-food products. This is driven by an increase in scope for exports, owing to the lack of an advanced

agriculture sector in Japan. The GVA of agriculture as a result of the agreement was seen increasing by between 0.05% and 0.5%.

A similar impact assessment was also carried out for the UK-Norway, Iceland, and Liechtenstein agreement⁶⁹. The report identifies potential advantages for some agri-food products specifically from improved trade with Norway. Four premium hard cheeses including Orkney Scottish Island Cheddar are set to face a reduced tariff, from 277% ad valorem to £2.30/kg. Additionally, UK specific TRQs with Norway is introduced for all cheese (299 tonnes), eggs (48 tonnes), poultry (158 tonnes) and selected pork products (470 tonnes). The size of the TRQs is relatively small highlighting the limited overall impact of the trade agreement.

It is also worth highlighting the commencement of negotiations between the UK and India. On 13th January 2022, the UK officially launched negotiations with India on a new FTA. An accompanying policy paper⁷⁰ was published, which included a scoping assessment. The scoping assessment used a CGE model, to interpret the impact on the UK economy and sectors under two scenarios, detailed in Figure II-15 below.

Figure II-15: Scenarios for UK-India FTA Scoping Assessment

Parameter	Scenario 1 (moderate liberalisation)	Scenario 1 (greater liberalisation)
UK tariffs on imports from India	Reduced by 2pp on average (Down 3pp)	Reduced by 3pp on average (Down 5pp)
Indian tariffs on UK exports	Reduced by 9pp on average (Down 11pp)	Reduced by 12pp on average (Down 17pp)
NTMs on UK imports from India	Reduced by 7pp on average (Down 12pp)	Reduced by 12pp on average (Down 22pp)
NTMs on UK exports to India	Reduced by 6pp on average (Down 11pp)	Reduced by 11pp on average (Down 19pp)

Source: House of Commons Library pp – percentage points (figures in brackets represent change for agri-food sector)

The results of the modelling suggest a 0.12% boost GDP under scenario 1 (£3.3 billion) and a 0.22% boost under scenario 2 (£6.2 billion), through to 2035. Under both scenarios trade with India is seen growing significantly, whilst overall trade is also seen to increase. Despite boosts to GDP under both scenarios the GVA of

agriculture, forestry, and fisheries is seen declining (down between 0.05% and 0.5%) owing to increased competition in vegetables, fruit and nuts.

1.3 Other FTA Studies

It is also prudent to think about the impact of FTAs not involving the UK that may have an impact on the future trading relationship of the UK. This includes deals being undertaken by the EU, Australia, Canada, GCC, and New Zealand. Such deals may limit the scope for UK trade.

1.3.1 The EU

One key study into FTAs carried out recently is the 2021 update of a piece of work by the EU Joint Research Centre (JRC)⁷¹. The report looks at the cumulative economic impact of trade agreements on EU agriculture. The JRC report is of particular interest to this project as it employs the MAGNET model to look at the impacts of trade with a number of key partners including, Australia, Canada, Mexico, and New Zealand.

The MAGNET model was used to analyse the impacts of 12 FTAs on agri-food trade flows, this was then transformed into the impact on EU agriculture at a product specific level using a partial equilibrium model.

The research used various scenarios to model trade impact. For countries where trade talks had concluded (Canada, Japan, Mercosur, Mexico, and Vietnam) details of those trade agreements were used in the model. For the other seven nations (Australia, Chile, Indonesia, Malaysia, New Zealand, the Philippines, and Thailand) two scenarios were modelled. These two scenarios involved either a 97% (conservative) or 98.5% (ambitious) liberalisation of tariffs, combined with either a 25% (conservative) or 50% (ambitious) cut to tariffs for "sensitive" products.

Figure II-16, below, outlines the relative change in production value for a number of key products as a result of the conservative and ambitious scenarios.

Figure II-16: Relative change vs. baseline in production value, 2030

Product	Conservative (97% liberalisation of tariffs, 25% cut to tariffs on sensitive products)	Ambitious (98.5% liberalisation of tariffs, 50% cut to tariffs on sensitive products)
Barley	+0.21%	+0.48%
Beef meat	-2.72%	-2.77%
Butter	+2.87%	+2.64%
Cheese	+3.50%	+3.45%
Sheep meat	-2.17%	-3.50%
Skim Milk Powder (SMP)	+2.84%	+3.09%

Source: EU Commission

The largest impacts on agricultural production value are clearly seen for dairy (positive) and beef and sheep meat (negative). Much of the increase in production value for dairy stems from an increase in exports, particularly of cheese, to Japan and Mexico.

The trade impact on beef is largely seen from a big increase in the volumes of beef imported from the Mercosur countries, with smaller impacts from a rise in imports from Australia. The impact on sheep meat is from a very low base, but much of the impact is driven by a rise in imports from Australia.

Given the study being carried out for Scottish Government is not concerned with direct trade between the UK and Japan and the UK and Mercosur, while we may expect to see the same directional change in production value, the actual impacts may be more muted.

Further studies have been carried out looking at specific trade agreements with the EU. As alluded to above, the EU-Mercosur trade deal is likely to have a large impact on the EU beef market. An Irish Government impact assessment⁷² highlights the potential impact of the trade deal on the agri-food sector.

The report highlights that as a result of the trade deal, a significant uplift is projected in the volume of beef, sheep, and other red meats (+41.3% from €3 million) and dairy (+8% from €0.8 million) being imported from the Mercosur nations. This, combined with the uplift in total EU imports of beef from Mercosur, could reorientate some Irish beef trade to the UK, as the nearest market, with the fewest logistical barriers.

The study concludes by stating that the upper estimate for the reduction to Irish beef production is 0.08%, with a decline in Irish beef output of €44-55 million. Additionally, producer returns were forecast to reduce by approximately 2%. The main driver of this reduction in beef output is an increase in high value beef cuts being imported from Mercosur, under new TRQs at reduced tariff rates.

A further study, by Wageningen Economic Research⁷³, conducted in 2020 found that both the beef and cattle sector and horticulture sectors in the Netherlands would experience declining production and farm incomes owing to their greater exposure to imports. The average income per beef farm was estimated to decline by 5.4% as a result of the Mercosur Agreement. The impact on dairy and arable incomes was forecast to be nominal, at -0.2% and -0.3% respectively, and positive income effects were seen for pig (+2.3%) and poultry farms (broiler +0.5%, layer +1.0%).

1.3.2 The Regional Comprehensive Economic Partnership (RCEP)

On 1st January 2022, the RCEP entered into force. The RCEP is an FTA across 15 Asia-Pacific countries, including Australia, New Zealand, China, Japan, Brunei, Cambodia, Indonesia, Laos, Myanmar, Malaysia, the Philippines, South Korea, Singapore, Thailand and Vietnam.

An assessment report by the United Nations Conference on Trade and Development (UNCTAD)⁷⁴ was published in December 2021. The report used an adapted partial equilibrium model, to calculate trade creation and diversion as a result of tariff concessions under RCEP.

The report estimated the trade diversion for member states at \$25.2 billion dollars. A high volume of this trade was diverted away from the EU (-\$8.3 billion), the US (-\$5.1 billion) and to a lesser extent the UK, which is estimated to see \$0.5 billion decline in trade with RCEP nations.

Agriculture forms a key part of the trade diversions, with a combined \$3.4 billion diversions in animal products and food products, and a further \$2.0 billion diversion in vegetable products. Including trade creation, the overall effect of RCEP on trade in agriculture (including tobacco and beverages and oils and fats) was estimated at \$9.6 billion.

This is a significant reorientation of trade which could limit the impact of trade deals between the UK and Australia and New Zealand. Based on the geographical closeness of RCEP relative to the UK.

1.3.3 United States-Mexico-Canada Agreement (USMCA or CUSMA)

The USMCA (CUSMA in Canada) superseded the North America Free Trade Agreement (NAFTA) on 1st July 2020. One key piece of analysis on the impact of USMCA on agriculture was conducted by Global Affairs Canada⁷⁵. The report also used a CGE model of global trade.

The report looked at the impact on the Canadian economy and its sectors as a result of USMCA coming into force, against the impact of no-NAFTA. The results of the modelling highlight that USMCA results in a large volume of meat and dairy imports into Canada from the US, where USMCA is in place. At the same time, Canada's exports to Mexico are seen declining. This is due to Mexican imports from the US increasing. This further highlights that FTAs with more geographically proximate countries can lead to significant reorientation of trade.

1.4 Other Issues

1.4.1 Farm Support

Scottish legislation around farm support differs significantly from the Agriculture Bill in England. On 1st October 2020, The Agriculture (Retained EU Law and Data) (Scotland) Bill⁷⁶ became an Act of Scottish Parliament. Under the Act there are no changes to the EU support schemes, at least until 2024.

The Act contains a provision for a new Scottish agricultural policy. This policy which must be laid before Scottish Parliament before 31st December 2024, must include the Scottish Ministers' policies and proposals on the simplification and modification of future agricultural payment schemes. There are further requirements for the Act which must also provide detail on the sustainability and resilience of Scottish Agriculture to climate change, profitability in the agrifood supply chain, support for new entrants, support for innovation, and improvements in productivity.

These above clauses, which are present in the current Scottish Agriculture Act, help frame what one might expect from future subsidies. Also contained within the Bill are powers for the Scottish Government to set rules on standards for agricultural products.

Agricultural policy in Scotland is currently the subject of a public consultation⁷⁷. A key part of this consultation is the future direction of farm support payments. As such, the direction of support in the medium to long-term remain uncertain.

After 2024, there may well be a sharp squeeze on budgets as farming competes with other Government priorities such as the NHS, schools, social care etc. Even in the

short-term, there is an argument that the unforeseen expense of the Covid-19 outbreak renders past promises in funding irrelevant and agriculture should 'do its bit' by accepting less support.

Given all these uncertainties, for the purposes of this report, it will be assumed that support to Scottish farmers, both in its overall value, and the schemes via which it is paid, will remain unchanged.

1.4.2 Labour

The effect of changes in labour availability on Scottish agriculture and the wider food chain has not been researched in any great detail. However, some studies are relevant.

One analysis by QMS⁷⁸ looked at the situation for the Scottish red meat sector. The survey, published in February 2017, shows 52% of the unskilled workforce, 44% of the skilled workforce and 16% of supervisory and management staff to be non-UK nationals. In total among those businesses responding to the survey just over 1,500 employees are non-UK nationals or some 43% of the total workforce. In addition, Food Standards Scotland (FSS) reported that around 98% of their official veterinarians were non-UK nationals.

A further report was produced by Thompson (2018)⁷⁹, which looked at the requirement for seasonal labour in the Scottish horticultural and potatoes sector. The report identified that some 85 tonnes or £625,000 of fruit went unharvested or downgraded due to a lack of seasonal labour in 2017. The report highlighted structural changes would be required for a large proportion of businesses would either have to restructure or downscale if there was no seasonal labour.

Labour shortages have continued to be a prevalent issue, particularly for horticulture, in the wake of Brexit and Covid. Throughout 2021, the challenges of seasonal labour shortages on the horticulture sector was highlighted by a number of news organisations. An article in The Financial Times⁸⁰ highlighted how growers were cutting back on crop plantings due to a lack of available labour. The challenges for labour are further highlighted by an article in The Independent⁸¹ which highlighted the volume of vegetables being thrown away by a producer in Scotland due to a lack of farm workers and lorry drivers.

The lack of research into farm labour, and particularly farmer numbers prompted research by The Andersons Centre⁸² into UK farmer numbers. This report focuses on

ascertaining the number of decision-making units (actual farmers) as opposed to holdings, as many farmers operate multiple holding. The report demonstrates the number of decision-making units at a geographical and sectoral level, as well as by scale of the business. The headline figures for Scottish agriculture, by sector are given in Figure II-17 below.

Figure II-17: Number of decision-making units in Scottish agriculture sectors, 2020

	Cropping (approximate size, Ha)	Dairy (approximate size, head of cattle)	Grazing livestock (approximate size, Ha)
All full-time	2,120	630	5,670
Small	670 (165)	40 (50)	1,630 (95)
Medium	500 (260)	70 (85)	1,120 (140)
Large	530 (340)	190 (130)	1,370 (200)
Very Large	420 (820)	330 (270)	1,550 (520)

Source: The Andersons Centre

At the UK level, the Migration Observatory reported in 2017⁸³ that 40% of the workforce of 'Process Operatives' (primarily food processing workers) are foreign born.

A report on the UK economy as a whole by the Migration Advisory Committee (MAC)⁸⁴ found that migration from the EU was not a major determinant of wages for UK workers. However, it did find that some evidence suggesting that lower-skilled workers face a negative impact while higher-skilled workers benefit. As the agri-food sector is relatively low-wage then it is likely to be one of the areas of the economy where wages have been restricted by migration. The report goes on to state that the labour market opportunities of indigenous residents will be improved by migrants who are complementary to them.

The above study was conducted on permanent, full-time employment. Of course, much employment in agriculture, and especially horticulture is seasonal and casual.

One study that provides some pointers was carried out by Anderson Midlands⁸⁵ for the NFU in early 2020. This focused on the additional costs in the fruit and vegetable sector due to Covid-19 restrictions. Covid has limited the supply of labour from the EU in the same way that ending free movement of labour did. The study found that farm employment costs increased by between 6% and 15% in the UK fruit and vegetable sector. It identified five key areas which have contributed to the increase;

worker availability & recruitment, training, accommodation, transport & logistics and operations.

Further evidence into the disruption of farm labour due to Covid was given at an Environment, Food and Rural Affairs (EFRA) Committee meeting on 26th October 2021. The witnesses to the Committee represented a broad spectrum of the agriculture and horticulture supply chain. Witnesses referenced how Covid acted as an accelerant to the challenges of labour availability, with many non-UK workers returning to their home nations as a result of the pandemic and subsequently not returning⁸⁶.

1.4.3 Regulation

The cost of regulation is partly captured in the analysis of NTMs – divergence in standards between the UK and its trading partners will increase the amount of border checks and thus the cost of doing trade.

However, the issue of regulation also impacts at farm level. This is both directly, in terms of the costs of complying with farm standards (e.g., NVZs or animal welfare requirements) and indirectly through access to technology and inputs.

DefraLex⁸⁷, an online portal detailing legislation managed by Defra, suggests the department was responsible for 2,269, active laws, as of 1st January 2022. Not all of them will relate to farming, as some will cover environmental issues, but this illustrates the level of regulation the agricultural industry is exposed to.

There is widespread acceptance of the regulatory burden placed on agriculture and the need for reform to enable farmers to get on with the business of farming whilst the sector still retains an appropriate level of oversight. The 'Pack Report'⁸⁸ – 'Doing Better: Initiative to Reduce Red Tape for Farmers & Rural Land Managers, published in 2014, made over 60 recommendations on how the system in Scotland could be improved. A similar exercise was undertaken in England in 2018 with the Stacey Review⁸⁹. In fact, there have been a number of 'regulation' reviews over the years with the subject returned to at regular intervals. This demonstrates the inherent problem in tackling bureaucratic 'red tape'.

The National Audit Office⁹⁰ estimated in 2012 that compliance with regulation cost the average English farm £5,500 per year. With the same basic set of (EU) regulation, it is unlikely that the figure for Scotland would be much different, and it is also likely the costs are far more likely to have gone up rather than down in the interim period.

For the purposes of this study, it is assumed that there will be no significant change in the regulatory burden (and cost) on Scottish agriculture.

The second impact of regulation is less direct but affects the way agricultural technology is regulated. This influences the inputs UK farmers have access to and their relative competitiveness against international competition. Two often-cited examples are the regulation of genetic modification technologies and plant protection products (pesticides). As with on-farm regulation, this study assumes that no substantive changes, large enough to have an economic impact, will occur in this area in the timescale being used. For example, the Scottish Government has a long-standing policy⁹¹ of opposing the cultivation of GM crops in the open environment.

1.5 Concluding Remarks

This evidence review has considered 109 pieces of evidence covering a range of issues related to impact of Free Trade Agreements upon the performance on Scottish agriculture. Due to the fast-paced nature and infancy of UK trade negotiations, this evidence review finds the availability of information, particularly relating to Scottish agriculture, limited.

Evidence is more widely available on the impact of free trade agreements upon the UK economy and agriculture as a whole. Generally, the available research finds that the scale of the impact of trade agreements on sectors of agriculture varies by the trade position of one country, relative to another (comparative advantage).

In the two most progressed trade deals with the UK; Australia and New Zealand, the evidence available to date suggests that the hardest hit sectors will be grazing livestock. This is primarily due to Australia and New Zealand having a comparative advantage in the production and export of beef and sheepmeat.

If Scottish agriculture is at a competitive disadvantage in a sector to the nation with which a free-trade deal is signed, then it is likely that the sector will be negatively impacted. However, where a sector can demonstrate a comparative advantage, such as dairy trade with Canada, then a sector is more likely to see a positive impact.

Another key finding of the evidence review is that the degree of impact resulting from a free-trade agreement will depend upon more than just tariffs, TRQs and NTMs. Geographical location is also important to the scale of any impact.

Appendix I: Previous NTM Studies

Previous NTM Studies – Top-Down (A)

Study	<u>Cadot et al. (2018)</u> ³⁵	<u>Bellora et al (2017)</u> ⁹²	<u>InterTrade Ireland (2017)</u> ⁹³	<u>Kee et al. (2009)</u> ⁹⁴ <u>Kee and Nicita (2017)</u> ⁹⁵
Summary Title	Estimating AVEs of NTMs (OECD study)	EU-UK Agri Trade: state of play and possible EU exit impacts	Potential Impact of WTO tariffs on cross-border trade	Estimating Trade Restrictiveness Indices
NTM Methodology	Top-down – price-based approach	Top-down gravity approach building on Kee et al. (2009)	Top-down gravity approach, derived from Kee et al; Dhingra et al	NTBs - Top-down – gravity approach but based on partial equilibrium model
Regions Covered	80 countries (OECD and non-OECD)	UK-EU	UK and Ireland	78 countries, incl. EU (15)

Key NTM Estimates	AVE (%)	AVE (%) – UK export NTMs only	AVE – central estimate	AVE (%) All traded tariff lines
	Live Animals: 28.3% - SPS (4.6%); TBT (16.5%); BCM (2.8%) and QRs (4.4%)	Pre-EU exit*	(applicable to third countries generally):	EU: 13.4%
	Vegetable products: 32.5% - SPS (5.5%); TBT (17.1%); BCM (6.9%) and QRs (3.0%)	Total agri: 22.78% Dairy (47.78%); Bovine meat (26.41%); other meat (32.94%)	12%, notes that NTBs for some products much higher.	All – simple average: 10% All – import weighted average: 12%
	Fats and Oil: 36.0% - SPS (17.7%); TBT (9.1%); BCM (4.6%) and QRs (4.6%)	Post-EU exit (2030 simulation)	AVE – developed economies: 3%* (central estimate)	Click here for more AVEs (requires STATA)
	Processed food: 33.5% - SPS (13.5%); TBT (12.1%); BCM (1.3%) and QRs (6.6%)	Total agri: 39.89%		Tariff lines affected by NTB
	Raw hide skins: 25.8% - SPS (0.4%); TBT (6.0%); BCM (5.0%) and QRs (14.4%)			EU: 45% All – simple average: 45% All – import weighted: 32%
	Wood: 66% - SPS (25.0%); TBT (30.2%); BCM (0.5%) and QRs (10.3%)			UK-EU Import weighted AVE NTM: 3.4% (however, notes that as UK is part of Single Market this is effectively 0)

Key Underlying Assumptions and Notes

1. AVEs are unweighted & capture restrictiveness of NTMs on products.
 2. NTM costs (adaptation, information, & conformity assessment), assumed to pass through entirely to importers.
 3. Small-country assumption (horizontal supply curve) used but caution urged for US & EU.
 4. AVEs estimated from trade unit values (prices) for SPS and TBT assumed to reflect compliance costs accurately.

1. Based on mean value trade flows 2013-2015.
 *2. Pre-EU exit are derived estimates based on a trade agreement similar to TTIP where all potential trade restrictiveness that could have been removed (actionable measures) have been taken away. As such, Pre-EU exit appears to be a misleading term.
 3. Estimates are simulation-based

1. Simply assumes that NTMs between developed economies are 25% of Kee et al average based on simulations by other studies.
 2. Authors (via personal communication) state that variations outlined in Kee et al were applied to estimate NTBs in individual agri-commodities (e.g. cheese). But detail unavailable.

1. Estimates AVEs for NTBs by country at tariff line level using quantity-based import demand elasticities.
 2. Only studies direct impact of NTBs on import demand, ignores redistributions of tariff income or cross-price substitution effects.
 3. Perfectly competitive world markets; each country cannot affect world prices.
 4. All protection instruments (NTBs) are potentially binding.

Previous NTM Studies – Top-Down (B)

Study	Berden et al (2009) summarised in Berden and Francois (2015)⁹⁶	Dean et al. (2009)⁹⁷ summarised in Berden and Francois (2015)	Fontagné, et al (2013)⁹⁸ summarised in Berden and Francois (2015)	Egger et al. (2015)⁹⁹ summarised in Berden and Francois (2015)
Summary Title	Estimating AVEs of NTMs (OECD study)	Estimating Price Effects of NTBs	Transatlantic Trade (TTIP): Whither Partnership	Non-tariff barriers
NTM	Top-down –	Top-down – Price-based for 47 products	Top-down gravity approach building on Kee et al. (2009)	Top down – gravity model to assess impact of TTIP
Methodology	Quantity/gravity, some bottom-up elements			
Regions Covered	Mainly US-EU and other countries combined to rest of world	EU, US as part of 65 country study (115 cities)	US and EU	EU and US
Key NTM Estimates	<p>TCE (%) US to EU Food & beverages: 56.8%; wood and paper products (11.3%).</p> <p>TCE (%) US to EU – bus. survey Food & beverages: 33.6%; wood and paper products (47.1%).</p>	<p>TCEs (EU) Bovine meat (68.2%) Fruits and vegetables (48.2%) Processed food (35.6%)</p> <p>UK – 2001 estimates Bovine meat (75.4%); Fruits and vegetables (52.5%); processed food (36.3%).</p>	<p>TCEs (EU) Agriculture (48.2%)</p> <p>Also cites Berden et al. (2009) EU Agriculture NTM: 56.8%</p>	<p>TCEs versus EU Agriculture (primary food): 25.2%; beverages and tobacco (19.5%); processed food (48.4%)</p> <p>TCEs versus FTA Agriculture (15.8%); beverages & tobacco (42%); processed food (33.8%)</p>
Key Underlying	1. Assesses potential impact of FTA between	1. Based on NTM incidence, (calculated via	1. Based on assessing the potential impact of TTIP	1. Estimate TCEs of NTMs taking account

<p>Assumptions and Notes</p>	<p>US and EU and associated impact on NTMs. Assumes legislation for FTA introduced in 2012, shows impact for 2018. 2. Based on Trade Cost Equivalents (TCE), which are akin to AVEs using 5-step process. 3. First step is based on business survey perceptions of restrictiveness of export markets vs home markets. 4. Agriculture not in scope. 5. 25% alignment of NTMs in US-EU FTA. 6. Sectors assumed not to impact each other with respect to NTMs. 7. 100% container scanning would be abolished in 2018.</p>	<p>TRAINS and USITC databases), retail price data to calculate gaps. 2. NTB = AVE of aggregate trade protection – tariff applied. 3. Sample of imported varieties assumed equal across all cities. 4. A country which exports a large share of the world’s exports of a product is likely to produce a relatively large share of the world’s varieties of this product. 5. NTBs assumed endogenous. 6. If a country’s exports of a product are large, assumes that country is less likely to impose an NTB on that product.</p>	<p>using 4 scenarios. Focus on aggregate manufacturing and not product-specific. 2. Similar to CETA, goods tariff removal is front-loaded for most products, with 3-7-year transition for most sensitive products (incl. agri). 3. Across-the-board 25% cut in trade restrictiveness of NTMs. But one scenario has 30% cut in NTM AVEs for products > median protection level and 15% cut for products < median. 4. Finds trade generally would increase by 50% but 150% upsurge in agri-products trade. 5. One scenario reduces Third country exporter NTMs by 5%. 6. Constant elasticity of substitution.</p>	<p>of potential TTIP effects, using 3-step method (review FTA data, estimate NTMs, calculate TCE). 2. Uses dummy variables to compare impact of NTMs (TCEs) versus EU (deepest form of integration) and against other FTAs. NTMs versus EU therefore higher as this is the freest trade possible globally. 3. Unable to provide granularity on individual policy areas (SPS, TBT etc.) within NTMs.</p>
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Previous NTM Studies – Top-Down (C)

Study	Dhingra et al (2017a) Dhingra et al (2017b) ¹⁰⁰	Ferrantino (2006) ¹⁰¹ based on Bradford (2005) ¹⁰²	Sanjuán López et al. (2013) ¹⁰³	Hummels et al. (2007) ¹⁰⁴
Summary Title	Local economic effects of EU exit EU exit consequences for UK trade	Quantifying the trade and economic effects of non-tariff measures	Gravity estimation of NTMs on US-EU Agri-Food Trade	Calculating Tariff Equivalents for Time in Trade
NTM Methodology	Top-down – gravity approach, based on Berden et al and Kee et al	Top-down – price-based	Top-down – Gravity approach	Top-down – time cost approach
Regions Covered	Mainly UK-EU but drawing insights from Norway and US.	9 OECD countries including UK and Netherlands (estimates below)	US-EU; Intra-EU and Rest of World (RoW) to US or EU.	OECD, APAC, Europe & Central Asia, LATAM, MENA, Africa
Key NTM Estimates	Dhingra et al (2017a) UK-EU NTBs to increase by 2.77% under Norway-style (soft-EU exit). Hard EU exit NTB increase 8.31% Dhingra et al (2017b) TCE (%) US to EU Food, beverages & tobacco: 56.8%	NTBs (%) 3rd Country to; UK: Fruit, veg etc (31.7%), crops & garden products (126%); Beef, sheep meat, horsemeat etc (102.6%); poultry & pork (25.6%); dairy (8.1%); sugar (0%); beverages etc (23.4%). Netherlands:	AVE (%) US to EU Beef (42%); processed rice (29%); dairy (29%); beverages (20%). Intra-EU Beef (3%); processed rice (0%); dairy (3%); beverages (7%). RoW to EU	Tariff equivalent (AVE %) High-Income OECD Imports Inland transport (1.3%); customs (1.2%); port (2.1%); Total: 4.6% Per day delay (PD) (0.8%)

<p>Wood & wood products: 11.3%</p>	<p>Fruit, veg etc (0%), crops & garden products (19.7%); Beef, sheep meat, horsemeat etc (77.3%); poultry & pork (15.7%); dairy (5.6%); sugar (19.9%); beverages etc. (4.7%).</p>	<p>Beef (7%); processed rice (14%); dairy (11%); beverages (8%).</p>	<p>UK: Inland transport (1.8%); customs (1.8%); port (0.9%); Total: 4.6% PD (0.9%); France total (4.6%) PD (0.7%); Netherlands: Inland transport (0.6%); customs (0.6%); port (0.6%); Total: 1.9% PD (0.6%).</p>	
<p>Key Underlying Assumptions and Notes</p>	<p>1. For 2017a, UK-EU NTBs in soft EU exit is one quarter of US-EU NTB, as EU integration progresses 25% faster than rest of world (incl. UK). 2. Hard EU exit (WTO) NTB increase is three-quarters of US-EU NTB (11.08%). EU integration to run at 40% faster than UK.</p>	<p>1. Bradford (2005) uses minimum implied delivered price for given location as basis for world price. 2. For simplicity, it is assumed that low-price country imposes no NTMs. 3. Each market is supplied from minimum-cost import price (c.i.f.) 4. Difference between domestic producer price and minimum-cost</p>	<p>1. NTMs include divergences in regulations and standards. 2. Model assumes that observed volume of trade between territories follows Poisson distribution model. 3. Discrepancies between actual trade and predicted trade under model is taken to be indicative of trade barriers. NTMs therefore proxied by residuals. 4. NTMs for US-EU higher because of retaliatory</p>	<p>1. Data based on World Bank's Doing Business data. 2. Assumes that one knows relationship between time-cost and trade (strong assumption). 3. Delays associated with inland transport, port waiting time, and customs clearance is same as burden imposed by slow ocean shipping.</p>

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|---|---|--|--|
| <p>3. UK to save 17% from its fiscal contribution to EU in Soft EU exit.</p> <p>4. Hard EU exit, saves 58.6% in fiscal contributions to EU.</p> <p>5. For 2017b estimates see assumptions for Berden et al (2009)</p> | <p>import price for each country is basis for estimating protection effect. Tariffs are subtracted to give NTB.</p> | <p>nature of trade between both (e.g. hormone beef ban).</p> <p>5. Lower RoW NTMs may reflect that most countries not close to EU standards will simply not trade, therefore lowering NTM.</p> | <p>4. No sector specific estimates provided.</p> |
|---|---|--|--|

Previous NTM Studies – Top-Down (D)

Study	<u>Minor (2013)¹⁰⁵</u>	<u>Grainger (2013)¹⁰⁶</u>
Summary Title	Time as barrier to trade: a GTAP database of ad valorem costs	Trade & customs procedures, compliance costs for meat imports.
NTM Methodology	Top-down, Time Cost, see Hummels et al. (2007)	Bottom-up – survey based (meat)
Regions Covered	134 countries on GTAP database	Mercosur to UK
Key NTM Estimates	<p>AVE (%)</p> <p>Imports range: Per Day (PD) missing (=0) to PD Excl. missing</p> <p>UK: 0.75% - 1.13%; FR: 0.78% - 1.17%; NL: 0.67% - 1.14%</p> <p>Exports:</p>	<p>Port clearance costs, £/container Initial agent doc. check, £0-£15; port health charges, £87-£97 (£24 for NZ meat); BIP fee: £70-£110; Direct trader fee: £6-£15; Agent’s customs entry fee: £11-£20; Shipping line LoLo: £50-£85; Port handling, £220; Vehicle booking & other port handling, £21. Total, £382-£673.</p>

Key Underlying Assumptions and Notes

UK: 0.82% - 1.14%; **FR:** 0.8% - 1.10%; **NL:** 0.78% - 1.27%.

1. Provides AVE on a Per Day basis for both import and export.
2. Missing values could denote commodities with low time costs or where there are insufficient data, therefore, including missing (=0) could lead to biases.
3. Point estimates assumed to be normally distributed.
4. Caution urged when applying per day AVE time costs to long delays (e.g. 30 days for fresh fruit), if time improves by 1 day, impact will be low as fruit will still be of very low quality and will not affect demand.

1. Above charges are basic only. Exclude overheads incl. one-off capital costs (£656) and annual fees (£13,736). Also exclude additional costs associated with further inspection (sampling etc.) which could add a further £53-£1,540.
2. Assumes 20ft container used weight 12 tonnes.
3. Any organic meat imported recognised by EU.
4. Based on average price of £2.87/kg for Mercosur imported meat (2011 trade data), AVE for port clearance costs is **1.1% - 2.0%**. With additional inspections, increases to **1.2%-6.4%**.

Previous NTM Studies – Bottom-Up (A)

Study	Haverty (2020)¹²	KPMG (2018)	Haverty (2017)¹⁰⁷																								
Summary Title	Brexit – Agricultural Sectors. Analysis of Impact on Scottish Agriculture	Impact of NTBs as result of EU exit	Impact of WTO trading on NI beef and sheep meat																								
NTM Methodology	Bottom-up	Bottom-up – case study method building on prev. macro studies.	Bottom Up – survey based																								
Regions Covered	UK (Scotland) and EU	UK and Netherlands	UK (NI) – EU																								
Key NTM Estimates	<p>AVE (%)</p> <table border="1"> <thead> <tr> <th></th> <th>FTA</th> <th>MFN</th> </tr> </thead> <tbody> <tr> <td>Wheat & Barley</td> <td>0.1</td> <td>0.1</td> </tr> <tr> <td>Beef Carcases</td> <td>1.2-2.9</td> <td>2.2-5.0</td> </tr> <tr> <td>Sheep Carcases</td> <td>0.9-2.0</td> <td>1.8-3.4</td> </tr> <tr> <td>Cheese</td> <td>1.1-1.7</td> <td>1.9-2.7</td> </tr> <tr> <td>Potatoes (Ware)</td> <td>1.3-5.3</td> <td>1.7-7.2</td> </tr> <tr> <td>Cauliflower/Broccoli</td> <td>2.1-2.3 2.9-3.2</td> <td></td> </tr> <tr> <td>Strawberries</td> <td>0.4-0.8</td> <td>0.6-1.1</td> </tr> </tbody> </table>		FTA	MFN	Wheat & Barley	0.1	0.1	Beef Carcases	1.2-2.9	2.2-5.0	Sheep Carcases	0.9-2.0	1.8-3.4	Cheese	1.1-1.7	1.9-2.7	Potatoes (Ware)	1.3-5.3	1.7-7.2	Cauliflower/Broccoli	2.1-2.3 2.9-3.2		Strawberries	0.4-0.8	0.6-1.1	<p>TCE (%)</p> <p>Meat: 0.7%-1.9%</p> <p>Cut flowers: 0.8%-1.3%</p> <p>SPS</p> <p>Meat – vet health certs, €130-€725/shipment.</p> <p>Flowers – phyto. Certification, €120-€190/shipment.</p>	<p>AVE (%)</p> <p>NI-EU27 (beef and sheep meat)</p> <p>WTO Equivalence: 3.0%</p> <p>WTO Liberal Trade: 5.7%</p> <p>(Table 4, p.6 of study provides breakdown for inputs and outputs by four cost sub-headings assessed – Official controls, customs & transport, administrative, value deterioration.</p>
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Strawberries	0.4-0.8	0.6-1.1																									
Key Underlying Assumptions and Notes	1. NTMs assessed on a ‘checked load’ (full range of regulatory checks applied) and probabilistic basis (averaged over 100 loads to consider physical check rates etc).	1. Assumes hard EU exit and that UK will trade with NL as third country under WTO conditions. 2. Dutch customs expects import declarations to increase by 752,000 per annum due to EU exit.	1. Compares two WTO trading scenarios (Equivalence and Liberal Trade) versus status quo with changes expressed in AVE% change. Implies UK-EU NTBs are zero. 2. WTO Equivalence, mutual recognition of standards (e.g. SPS), physical checks @1% (20% default).																								

2. Uses 25-30 cost sub categories to assess NTM costs on UK-EU trade and UK imports from non-EU.
 3. NTM costs calculated on an ad-valorem (AVE) basis and the full implementation of border controls in both UK and EU.
 4. Regulatory check rates based on official EU and UK rates.
 5. Opportunity cost of capital for money tied-up in to regulatory controls, contingency stocks etc. set at 3.5%.
 6. Load sizes calibrated according to averages suggested by industry experts for each commodity.
3. Two areas of NTBs – general customs formalities; sector-specific requirements.
 4. Not all NTBs quantified, cost estimates represent an expected minimum.
 5. Accountancy services impacts limited as both UK and NL already require foreign accountants to meet additional standards.
3. NI trade with non-EU unaffected by WTO trading with EU.
 4. Live animal load = 30 cattle; average meat load (RoRo), 18 tonnes;
 5. Sampling 5-10% of physically checked loads, 72-hour delay.
 6. Border queuing delays, 30 min-3hrs
 7. Delay cost £1/min/load
 8. Admin: 2-3hr processing time.
 9. Value deterioration: 2-25%

Previous NTM Studies – Bottom-Up (B)

Study	<u>ITC (2016)¹⁰⁸</u>	<u>Godel et al (2016)¹⁰⁹</u>	<u>ABAC (2016)¹¹⁰</u>
Summary Title	Navigating NTMs – EU Business Survey	Reducing costs and barriers for businesses in EU Single Market	NTBs in Agriculture and Food Trade in APEC
NTM Methodology	Bottom-up – business survey	Case-study – based on existing research, using Korean example	Bottom-up – survey based
Regions Covered	Exporters across EU Member States including UK.	EU but seeks examples from elsewhere (e.g. Korea)	Asia-Pacific region
Key NTM Estimates	<p>Gives % of agri-food companies affected by NTMs, not NTM AVEs</p> <p>Crop production, 45%; livestock prod., 44%, forestry, 38%, food products, 50%, beverages etc., 46%.</p> <p>No. of product certification issues: 456, 58% reported by SMEs.</p> <p>No. of labelling issues: 151, 46% reported by SMEs.</p>	<p>Gives indicative estimates of costs and regulatory barriers only.</p> <p>Adapting to national frameworks in new market including VAT costs small (online) businesses €9,000.</p> <p>Annual VAT charges with operating in new market - €5,000 per annum.</p> <p>Using Korean importing case study, suggests import processing times could reduce from 2 days to 1.5 hours; refunds from 2 days to 5.2 hours and payments processing from 4 hours to 10 mins</p>	<p>Does not report NTMs in AVE, only frequency.</p> <p>SPS accounts for 60% of all NTMs reported. 322 respondents reported SPS issues and identified following; new product registration, 57% (of respondents), certification, 53%, tolerance limits, 49%, testing, 43%, treatment for plant & animal pests, 33%, hygienic requirements, 24%.</p> <p>TBT issues also prominent, reported by 111 respondents. They include; labelling, marking & packaging, 76%, product quality / performance, 45%, product identity, 44%, expiry date conditions, 22%, product age conditions, 16%.</p> <p>Procedural obstacles reported by 390 respondents (greater than SPS).</p>

Key Underlying Assumptions and Notes

1. Based on perceptions of EU companies operating in export markets, mainly US, Russia and China.
 2. Limited information on intra-EU, study mainly reviewed for insights on methodology.

1. EU 2007-2012 target was to reduce administrative burden on businesses by 25%, which was achieved. Within this adherence to food safety regulation rose by 1.9%.
 2. Exercise caution when interpreting as admin barriers and regulation will also apply equally on home market as on another EU market in many instances.

Inconsistent or discriminatory behaviour of officials, administrative burdens, lengthy & costly customs clearance procedures and documentation burdens were the most frequently cited procedural obstacles

1. 421 stakeholders interviewed including 216 survey respondents.
 2. Based on UNCTAD TRAINS developed economies more likely to impose NTMs.
 3. As study reports on instances of NTMs, underlying assumptions in capturing NTM costs are not relevant.

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