FINAL REPORT

Impacts of the New Zealand-UK Free Trade Agreement on the New Zealand Economy

A Dynamic Computable General Equilibrium Analysis

ImpactECON

Impacts of the New Zealand-UK Free Trade Agreement on the New Zealand Economy

A Dynamic Computable General Equilibrium Analysis

Authors: Terrie Walmsley,[1] Peter Minor,[2] and Anna Strutt[3]

[1]   Terrie Walmsley, Managing Director and Chief Economist, ImpactECON, LLC.
[2]   Peter Minor, Director and Senior Economist, ImpactECON, LLC.
[3]   Anna Strutt, Professor, Waikato Management School, University of Waikato, New Zealand.

Table of Contents

Table of Tables

Table of Figures

Acronyms

AIP	agreement in principle
AVE	ad valorem equivalent
BREXIT	United Kingdom's exit from the European Union
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CGE	computable general equilibrium
CIF	cost, insurance and freight
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CSTQ	country-specific tariff rate quota
EIF	entry into force
EU	European Union
FOB	free on board
FTA	free trade agreement
GBP	Great British pound sterling
GDP	gross domestic product
GDyn	Dynamic GTAP
GTAP	Global Trade Analysis Project
HS	harmonised system
IEDyn	ImpactECON Dynamic model
LDP	landed duty paid
MFAT	Ministry of Foreign Affairs and Trade (New Zealand)
MFN	most favoured nation
MFNTQ	most favoured nation tariff rate quota
MPI	Ministry for Primary Industries (New Zealand)
MT	metric ton
NTM	non-tariff measure
NZ	New Zealand
SPS	sanitary and phyto-sanitary
TRQ	tariff rate quota
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
UNITC	United Nations International Trade Commission
WTO	World Trade Organisation

Executive Summary

This report was prepared at the request of the New Zealand Ministry of Foreign Affairs and Trade (MFAT). It presents results from a large-scale modelling effort undertaken to improve understanding of the potential economic impacts on New Zealand (NZ) of a free trade agreement between New Zealand and the United Kingdom (NZ-UK FTA).

We model two scenarios:

— Scenario 1: Tariff reductions, beef and dairy quota liberalisation, plus reductions in goods and services non-tariff measures (NTMs), and improved trade facilitation; and

— Scenario 2: Scenario 1 plus further reductions in goods and services NTMs, and more trade facilitation.

Each of these scenarios is modelled against a baseline projection of the global economy to 2040 that includes the impacts of the UK's exit from the European Union (EU) and tariff reductions already committed to in other trade agreements, as well as a free trade agreement between the UK and Australia.

The overall impacts on New Zealand's real GDP and real exports of the free trade agreement scenarios modelled are summarised in Table E-1. In the first scenario, real GDP is projected to increase by 0.10 percent relative to the 2040 baseline, increasing to 0.12 percent in the second scenario. In constant 2019-dollar terms, these increases range from NZ$710m to NZ$811m. New Zealand's total exports to the world also increase as the extent of the liberalisation modelled increases. In Scenario 1, real exports increase by 0.26 percent (NZ$460m), while in Scenario 2 the increase is 0.30 percent (NZ$527m). These increases in exports are due to strong export growth of more than 50 percent to the UK in both scenarios, dampened by some diversion of exports from other markets. The export growth is largely in the processed foods sectors, particularly beef.

Table E-1 Simulated change in New Zealand's real GDP and exports relative to the 2040 baseline, NZ-UK FTA scenarios 1-2 (percent and NZ$ million*)

	Scenario 1	Scenario 2
R E A L G D P		
Percent	0.10	0.12
NZ$m	710	811
T O T A L E X P O R T S		
Percent	0.26	0.30
NZ$m	460	527
E X P O R T S T O T H E U K		
Percent	51.27	53.01
NZ$m	2,127	2,199

* Constant 2019 NZ dollars.

Source: Authors' model results.

When the scenarios are decomposed by the various components of the FTA modelled, we find that in Scenario 1, tariff liberalisation contributes 38 percent of the increase in real GDP, while quota liberalisation contributes 47 percent. Reductions in goods NTMs contribute 9 percent and reductions in services NTMs contribute 7 percent in the first scenario, while trade facilitation contributes a negligible amount. In the second scenario, the level of tariff and quota liberalisation remains the same, but we model further reductions in NTMs for goods and services trade, as well as further improvements to trade facilitation. In the second scenario, the contribution of tariff reductions to the GDP increase is 33 percent, quota liberalisation is 41 percent, goods NTMs contribute 17 percent, services NTMs contribute 12 percent and improved trade facilitation contributes a slight reduction in GDP.

Our results indicate that reductions in agricultural quota barriers to trade have the potential to contribute substantially to the gains from New Zealand's FTA with the UK. However, sensitivity analysis suggests that the impact of liberalising tariff rate quotas (TRQs) on New Zealand's GDP depends crucially on the initial estimate of quota rents earned by New Zealand's beef exporters to the UK.

1 Introduction and Background

This report was prepared at the request of the New Zealand Ministry of Foreign Affairs and Trade (MFAT). It presents results from a large-scale modelling effort undertaken to improve understanding of the potential economic impacts on New Zealand (NZ) of implementing the proposed New Zealand-United Kingdom (NZ-UK) agreement.

With 2020 GDP of US$2,764 billion, the United Kingdom is the 5th largest economy in the world (World Bank, 2021). In the year to December 2020, the United Kingdom purchased 3.4 percent of New Zealand's exports of goods and services, making it New Zealand's 5th largest trading partner by export value and 7th largest partner for total imports and exports.[4] The NZ-UK free trade agreement (FTA) aims to be a high quality and comprehensive agreement that builds on the already strong trading relationship between New Zealand and the United Kingdom. Negotiations were formally launched in June 2020. While negotiations have not yet concluded, agreement has been reached on the key elements of the FTA, with an Agreement in Principle (AIP) signed on 20 October 2021.[5]

1.1   Our Approach

To model the potential impacts of implementing a NZ-UK FTA, we employ a dynamic computable general equilibrium (CGE), based on the ImpactECON Dynamic model (IEDyn, Walmsley, et al. (2015)).[6] GDyn is a recursive dynamic model that provides a theoretically consistent method for projecting long term macro- and micro economic variables, allowing for the modelling of trade policy impacts in the year and economic environment in which they are projected to occur. This modelling approach enables us to capture key features of the various economies involved, including inter-sectoral and inter-regional linkages, facilitating simulation of the projected direction and magnitude of impacts on the New Zealand economy of different scenarios, over the period of implementation.

---

[4]   https://statisticsnz.shinyapps.io/trade_dashboard/

[5]   See AIP NZ-UK FTA (2021): https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-under-negotiation/new-zealand-united-kingdom-free-trade-agreement/resources/agreement-in-principle/.

[6]   The model is solved using Gempack, Horridge, Jerie, Mustakinov & Schiffmann (2018) and includes complementarities (see Harrison, Horridge, Pearson & Wittwer, 2002).

In the current study, we focus our analysis on reductions in tariff and quota barriers on goods trade; increased harmonisation and reductions in the cost of non-tariff measures (NTMs)[7] on goods trade and services trade; and improvements in trade facilitation. Global CGE models are powerful tools for policy analysis; however, as with any modelling work, simplifying assumptions are needed. The current study is not intended to be a full cost-benefit analysis that captures all potential implications of the FTA. The aspects of the agreement we model, and assumptions made, are discussed in the report, with further detail provided in the appendices.

1.2   Organisation of the Report

The report proceeds as follows: Section 2 briefly summarises the modelling framework, baseline construction and policy scenarios modelled, supplemented by much more detailed explanations and data in the appendices. Section 3 presents results from our modelling, focusing first on an overview of the potential impacts of the FTA on New Zealand and followed by more detailed analysis of selected sectors. Section 4 offers our concluding comments.

---

[7]   NTMs are policy measures, other than tariffs, which may restrict trade. Many NTMs are legitimate mechanisms to achieve particular objectives, such as biosecurity or protecting consumer health and safety, and some measures apply equally to domestic and imported products. Reductions in the costs of NTMs can often be achieved by increased harmonisation of measures, while still achieving the policy objectives.

2 Modelling Framework and Scenarios

2.1 Model and Database

In this study, we employ an extended version of the ImpactECON Dynamic model (IEDyn). This is based on the dynamic GTAP model (GDyn) (Ianchovichina and Walmsley, 2012), which in turn is based on the widely used GTAP model (Hertel, 1997), long considered the benchmark for analysis of trade agreements.

The IEDyn model used here improves on the GDyn model in several important areas.[8] First, our model and database include the number of workers and wages by occupation (5 categories), sector and region. This facilitates analysis of the number of jobs created or lost by occupation and sector. It also enables us to model the movement of workers across sectors and the impact of this movement on wages, which differ by occupation. Second, alternative assumptions regarding labour are incorporated. In particular, it is assumed that while wages are upwardly flexible, they fall only gradually over time, thereby potentially creating unemployment.

The IEDyn model is further extended to allow for improved modelling of NTMs (Walmsley and Strutt, 2021), along with more detailed modelling of selected trade flows in beef, sheep meat and dairy products that are subject to tariff rate quotas (TRQs).

The GTAP v10.1 2014 database (Aguiar et al., 2019) provides the starting point for our analysis. The data are aggregated into 22 regions and 32 commodities, with some further disaggregation of quota sectors, as detailed in Appendix I. The GTAP 2014 database is first adjusted to take account of improved estimates of tariffs,[9] then the database is updated to 2019 using historical data. The updated 2019 data are then further disaggregated for analysis of TRQs (see Appendix I, Table I- 2) and TRQ rents added. The resulting 2019 database is then used as the starting point for our simulations. Separating the baseline into two parts allows us to more accurately track aggregate trade flows for beef & sheep meat and dairy between 2014 and 2019, and to disaggregate these trade flows and incorporate appropriate quota rents for 2019 for beef, sheep meat, butter, cheese and other dairy products. Further details of the inclusion of quotas can be found in Appendix II.

---

[8] Other improvements made to the IEDyn model are outlined in Walmsley, Minor and Strutt (2015).

[9] Using the GTAP altertax facility. However, adjustments were made to the traditional altertax facility developed by Malcolm (1998) to minimise changes in the value of exports at FOB and CIF prices. This ensures a better match between the COMTRADE data and resulting trade data in the updated GTAP Data Base.

2.2   Baseline Projections

2.2.1   MACRO PROJECTIONS

A business-as-usual or baseline scenario must be established for the dynamic model. Our baseline essentially extends from 2014 to 2040, giving ample time for implementation of all the components of the FTA we model. To build the baseline scenario, forecasts are obtained for key exogenous variables, including population, labour by education, real GDP, and investment. Forecasts to 2023 (or 2026 for some variables) for real GDP, investment, savings, and global exports are obtained for 191 countries from the IMF's World Economic Outlook database (April, 2021). After 2023/2026, we assume that technological change, risk premiums and other relevant rates undergo some limited convergence towards steady state rates, unless the evidence prior to 2023/2026 suggests otherwise. Forecasts for labour by education to 2040 are obtained from CEPII (French research organisation Centre d'Etudes Prospectives et d'Informations Internationales), with the methodology documented in Fouré et al. (2012) and updated to reflect more recent forecasts in total labour growth from the UN (2019). Population forecasts to 2040 are obtained from the UN (2019) forecasts.

It is worth noting that the baseline scenario does include a global decline in production and trade due to the closure of business and travel restrictions placed on businesses and people due to the COVID pandemic. This decline in global production results in unemployment that is eliminated gradually over time during our baseline. While it is possible that the FTA may impact the speed of the recovery process, particularly in the UK, we assume that the FTA does not impact the rate at which unemployment returns to pre-pandemic levels. The results may therefore be considered conservative; however, we believe this assumption is likely to best capture the impact of the FTA.

2.2.2   TARIFF AND NON-TARIFF BARRIER PROJECTIONS

To model changes in tariffs since 2014, including BREXIT and major trade agreements ratified since 2019, we employ several data sources reviewed below.

New Zealand

New Zealand's most favored nation (MFN) tariff data were updated employing 2019 tariffs (HS10) and trade values (HS10).[10]

We then applied United Nations International Trade Centre (UNITC) data which projects applied tariff rates for trade agreements ratified before 2019 at the HS6 level.[11] The list of trade agreements includes the Comprehensive and Progressive Agreement for Trans-Pacific Trade Partnership (CPTPP) as well as remaining tariff reductions from earlier trade agreements, such as the New Zealand-China FTA. These tariff reductions, along with macro-economic data, are employed to project the state of the New Zealand economy when a New Zealand-UK trade agreement enters into force (EIF).

---

[10]   Data from Stats NZ as conveyed to ImpactECON, LLC by MFAT.

[11]   Data can be downloaded from https://www.macmap.org/.

United Kingdom

The UK separated from the EU on January 31, 2020. At the time of the UK's withdrawal from the EU, the UK's tariffs and quotas were changed to reflect the UKs priorities and its responsibilities under the WTO (for example, taking its allocation of EU TRQs on red meat (beef and sheep) and dairy (cheese and whole milk products) products. In many cases, UK MFN rates were set to levels below EU tariffs, in an apparent effort to simplify the UK tariff schedule.[12] Specific rates, which include a currency-based unit of tax (such as Euros per litre), were converted into ad valorem rates from pound sterling (GBP) by ImpactECON. In certain cases, such as wine, the specific rates were eliminated, resulting in lower baseline tariffs on products of importance to New Zealand. To accurately estimate the state of UK tariffs at the implementation of a NZ-UK FTA, ImpactECON recalculated the UK tariffs at the HS10 level (the most detailed reporting of the UK tariff schedule), then simple-averaged the HS10 tariffs to the HS8 level, where they were paired with 2019, pre-COVID, trade data to trade weight the tariffs to the HS6 level.[13] These changes in UK tariffs following BREXIT were then implemented as part of the baseline scenario.

WTO TRQs allocated to the UK as a result of BREXIT on red meat (beef and sheep) and dairy (cheese and whole milk products) products are assumed to remain unchanged over the baseline.[14] Imports under the WTO quota are initially either constrained by a prohibitive WTO quota, constrained by the WTO quota but with out-of-quota imports, or unconstrained by the WTO quota due to low fill rates. Over the baseline, growth in imports leads to changes that alter the fill rates of these constraints, although in this case there was no change in the extent to which the quota constrained trade. For instance, the UK quota on New Zealand exports of beef was binding, while the UK quota on sheep meat remained non-binding over the baseline.

As with New Zealand, we project UK tariffs in the baseline, accounting for trade agreements ratified before 2019, employing the UNITC tariff projections to 2050, contained on the MacMap trade site.[15] The applied tariffs found in the MacMap data were recast to account for the new, lower, UK tariffs, so some trade agreements, which previously may have required a reduction in UK tariffs, may not have an impact if the new UK, post-BREXIT, tariff is lower than the FTA tariff projections.

As a matter of methodology, ImpactECON, does not include "prospective" or unratified trade agreements in the baseline projections. However, in the case of estimating a New Zealand-UK FTA, an exception was made for Australia, which is currently in parallel negotiations for an

---

[12] The WTO allows for unilateral reduction in MFN tariffs without requiring consultation or compensation from parties to the WTO agreements. UK tariffs can be found at: https://www.gov.uk/guidance/tariffs-on-goods-imported-into-the-uk

[13] As of 2020, the UK was reporting its trade data via EuroStat. The greatest level of detail the EU reports trade data are at the HS8 level, while its tariff schedule is defined at the HS10 level. This necessitates the simple averaging of tariffs to the HS8 level, where they can be trade weighted to the internationally harmonised HS6 level.

[14] With the exception of the quotas on exports from Australia, which were liberalised as part of the Australia-UK FTA.

[15] The UNITC does not separate the UK from the EU when projecting FTA tariffs. We assume EU preferential tariffs apply to the UK post-BREXIT. The UK has made extensive efforts to extend all EU ratified trade agreements to the UK employing continuation agreements https://www.gov.uk/guidance/uk-trade-agreements-with-non-eu-countries.

FTA with the UK. This exception was made in recognition of the close, historical, relationship the UK has with both New Zealand and Australia and the high likelihood both trade agreements would be concluded within a short time of one another. It also recognises the potential importance of Australia entering an FTA with the UK contemporaneously with New Zealand, since the two countries share similar trade profiles in agricultural products, from wine to sheep and beef. Australia and the UK have publicly released an Agreement in Principle (AIP) outlining the key elements of the prospective FTA, further cementing their intention to conclude an FTA in the near future.[16] Therefore, an Australia-UK FTA was built into the baseline with similar assumptions as the AIP.

The UK was able to secure free trade access with the EU before BREXIT. As a result, the UK has maintained tariff-free access for its goods in the EU. However, FTA access is not the same as the free flow of goods within a customs union. UK exporters are required to submit customs documents and meet EU rules of origin. By many reports, this process has been complicated for some UK exporters to the EU.[17] There have been numerous reports of UK exports being held up in EU customs due to paper work errors and omissions. EU and UK authorities have maintained these frictions will likely dissipate as UK exporters become familiar with the EU documentation requirements. Currently, the EU maintains that goods have no delay in EU customs offices if the paperwork is completed correctly and submitted electronically. To reflect BREXIT friction, due to customs delays, the baseline includes an average of one day delay for goods entering the EU from the UK. The delay is reduced to zero over three years—assuming UK exporters learn to complete EU import requirements. No delay has been estimated for EU goods entering the UK, since UK officials have publicly announced they would ease customs clearance for EU shipments to the UK in order to relieve supply chain pressures due to COVID.

2.3   Policy Scenarios

We focus our analysis on reductions in tariff barriers on goods trade; changes in quota access; reductions in the cost of NTMs on goods trade; reductions in NTMs on services trade; and improvements in trade facilitation. Table 1 summarises the two main scenarios explored to examine the impact of the NZ-UK FTA. In each scenario, implementation begins in 2023 and is completed by 2038. In addition to the two main scenarios, we also provide some sensitivity analysis around our assumptions regarding the removal of quotas on high quality beef and reductions in goods NTMs.

---

16   See AIP Australia-UK FTA (2021) https://www.dfat.gov.au/trade/agreements/negotiations/aukfta/australia-uk-fta-negotiations-agreement-principle

17   See various newspaper articles: https://www.nytimes.com/2021/01/09/business/Brexit-British-economy.html; https://www.nytimes.com/2021/01/13/world/europe/scotland-seafood-brexit-.html; https://www.nytimes.com/2021/08/26/business/britain-truck-driver-shortage.html

Table 1 Summary of scenarios

Tariffs	Quotas	Goods NTMs	Services NTMs	Trade Facilitation
S C E N A R I O 1 : C O N S E R V A T I V E				
Negative list, as agreed, final reductions in 2030 (excludes tariffs on beef and dairy)	Quotas expanded and tariffs reduced – see Table 2 for details	Zero reduction for animal-based products[a] 5 percent reduction for beverages & tobacco 2.5 percent reduction for other sectors All implemented over 5 years from EIF	5 percent reduction for business & financial services, transportation, and trade & communication 2.5 percent reduction for other services sectors All implemented over 5 years from EIF	7.5 percent reduction in customs processing time for imports from the UK to NZ, implemented over 5 years from EIF
S C E N A R I O 2 : M O D E R A T E				
As for Scenario 1	As for Scenario 1	Zero reduction for animal-based products[a] 10 percent reduction for beverages & tobacco 5 percent reduction for other sectors All implemented over 5 years from EIF	10 percent reduction for business & financial services, transportation, and trade & communication 5 percent reduction for other services sectors All implemented over 5 years from EIF	15 percent reduction in customs processing time for imports from the UK to NZ, implemented over 5 years from EIF

a. Raw milk, cattle & sheep, other animals, wool, beef & sheep meat, other meats, and dairy

Source: Author's construction based on the New Zealand-UK AIP as communicated to ImpactECON, LLC by the Ministry of Foreign Affairs and Trade (MFAT) on October 8, 2021.

Table 2 Changes in quotas under NZ-UK FTA

Commodity	Policy implemented
Beef	Additional country-specific quota provided with zero tariff (EIF). Quota gradually expanded to 2032. Tariffs eliminated in 2032.[a]
Sheep meat	Quota increased over 5 years.[b]
Butter	Country-specific quota provided with zero tariff (EIF). Quota expanded gradually over 5 years. Tariff on existing quota gradually reduced to zero by 2028.[c]
Cheese	Country-specific quota provided with zero tariff (EIF). Quota gradually expanded over 5 years. Tariff on existing quota gradually reduced to zero by 2028.[d]
Apples	Reduction in out-of-quota tariffs in four equal parts and an expansion of in-quota quota.[e]

a. Out-of-quota WTO tariff of 75 percent assumed prohibitive. Product specific safeguard in place starting in year 10 -15 which may be applied if volumes exceed set quota limits.

b. In-quota WTO tariff equal to zero percent (no change) and currently under-utilised.

c. The existing WTO quota is rarely used as in-quota tariff is still prohibitive.

d. The existing WTO quota is rarely used as in-quota tariff and other regulations are prohibitive. Cheese from New Zealand enters the UK primarily under a further processing arrangement.

e. UK WTO apple quotas are seasonal. New Zealand produces and exports most apples in the "off quota" season for the UK and are assumed not to be binding.

Source: Author's construction based on the New Zealand-UK AIP as communicated to ImpactECON, LLC by the Ministry of Foreign Affairs and Trade (MFAT) on October 8, 2021.

2.3.1 TARIFFS

New Zealand

New Zealand tariffs were calculated based on HS10 2019 data. Specific rates were replaced by HS6 averages from the MacMap database (2014). Tariffs were trade weighted to the GTAP sector level.

New Zealand tariffs on UK imports average 2.0 percent (Table 3). On average, the highest New Zealand tariffs are on processed food, averaging 2.8 percent. However, these products make up less than 10 percent of New Zealand imports from the UK. In contrast, manufactures comprise over 91 percent of New Zealand imports from the UK, with applied tariffs averaging 1.9 percent. Both Scenarios 1 and 2 contained in this report call for the elimination of New Zealand tariffs on entry into force, or year one of the FTA.

Table 3 New Zealand imports from the United Kingdom, 2019 (NZ$ and percent MFN tariff rate)

Sector	NZ$	Most Favored Nation (MFN) rate (percent)
AGRICULTURE AND UNPROCESSED FOOD		
Fisheries	214,978	0.0
Fruit and vegetables	88,566	0.0
Live animals and raw milk	10,397,870	0.0
Other crops	1,740,298	0.2
Total	12,441,712	0.0
PROCESSED FOOD		
Beef & sheep	1,231,155	0.1
Beverages & tobacco	60,464,236	1.1
Dairy	8,179,072	4.4
Other food	64,463,724	4.3
Other meats	808,196	3.5
Total	135,146,383	2.8
MANUFACTURES		
Electronics	23,992,849	0.7
Extractive	5,769,106	0.2
Forestry and wood	12,900,407	4.9
Light manufactures	90,021,259	1.8
Other machinery and equipment	411,040,648	2.4
Other manufactures	1,016,183,673	1.7
Total	1,559,907,942	1.9
TOTAL		
All Goods	1,707,496,037	2.0

Source: Data from Stats NZ as conveyed to ImpactECON, LLC by MFAT. Analysis by ImpactECON, LLC.

In summary, New Zealand tariffs on imports from the UK are low and will be reduced to zero. While there is some variation in tariff rates between sectors, the highest average tariffs are less than 5.0 percent, in contrast to overall average tariffs of 2.0 percent.

United Kingdom

Prior to BREXIT, the UK was bound to the EU's external tariff schedule (TARIC). Upon departing the EU customs union, in January 2020, the UK revised its tariff schedule in an apparent effort to simplify tariffs. WTO rules allow members to lower tariffs without consultations, therefore, in an effort to simplify its tariff schedule, the UK lowered tariffs on a large array of goods. In all cases, specific rates, specified in Euros, were converted to pounds sterling (GBP). In some cases, such as wine, specific rates were eliminated in a further effort to simplify and clarify the UK tariff schedule. These changes required the UK tariff schedule in the GTAP Data Base to be entirely revised. Changes in our analysis were made to all UK importers in the baseline projections for the revised MFN rates. Ad-valorem equivalents for specific rates were entirely revised.

Table 4 shows the revised UK tariffs (2022 base) and UK imports from New Zealand. UK tariffs on goods imported from New Zealand average 4.5 percent. While tariffs on manufacturers are relatively low, averaging 1.1 percent, tariffs on agriculture and processed food average approximately 6.0 percent. Significant tariff variations within agriculture and processed food are illustrated by the high average tariff of 14.9 percent on live animals and raw milk to 1.8 percent on raw crops. These high tariffs do not account for TRQ rates, which are often significantly higher (covered in following sections). Since nearly two-thirds of New Zealand's exports to the UK's are agriculture and processed food, free trade access could provide significant new market access for these products.

Table 4 UK imports and average tariffs on imports from New Zealand post-BREXIT and through 2030 (thousand GBPs and percent)

Sector	Average tariff (percent)				2019 UK imports from New Zealand GBP (1,000)
	Base 2022	EIF 2023	2026	2030	
A G R I C U L T U R E A N D U N P R O C E S S E D F O O D					
Fisheries	8.9	0.0	0.0	0.0	316
Fruit and vegetables	1.9	0.0	0.0	0.0	56,343
Live animals and raw milk	14.9	0.0	0.0	0.0	26,442
Other crops	1.8	0.0	0.0	0.0	6,580
Total	5.7	0.0	0.0	0.0	89,681
P R O C E S S E D F O O D					
Beef & sheep	TRQ	TRQ	TRQ	TRQ	227,133
Beverages & tobacco	6.0	0.0	0.0	0.0	249,261
Dairy	TRQ	TRQ	TRQ	TRQ	4,303
Other food	7.5	4.3	0.8	0.0	14,857
Other meats	2.0	1.9	1.8	0.0	4,995
Total	6.0	0.3	0.1	0.0	500,549
M A N U F A C T U R E S					
Electronics	0.0	0.0	0.0	0.0	12,578
Extractive	0.1	0.0	0.0	0.0	83
Forestry and wood	0.2	0.0	0.0	0.0	8,300
Light manufactures	1.9	0.8	0.5	0.0	35,436

Sector	Average tariff (percent)				2019 UK imports from New Zealand GBP (1,000)
	Base 2022	EIF 2023	2026	2030	
Other machinery and equipment	0.4	0.1	0.1	0.0	92,062
Other manufactures	1.7	0.3	0.2	0.0	99,347
Total	1.1	0.3	0.2	0.0	247,806
T O T A L					
Total	4.5	0.2	0.1	0.0	838,036

Source: Tariffs from: https://data.gov.uk/dataset/19890572-14b6-4d37-8a6d-6a5ec3b457fe/most-favoured-nation-mfn-rates-to-trade-with-the-uk-from-1-january-2021. Trade from EuroStat. Calculations by ImpactECON, LLC.

In the case of New Zealand, all tariffs are assumed to be eliminated on EIF of the FTA. In the case of the UK, we assume that tariffs will be phased out in three stages.[18] Tariffs on ninety-eight percent of tariff lines will be eliminated on EIF. The remaining two percent of tariff lines were divided into three groups: 1) products with TRQs; 2) products with tariffs phased out over three years from EIF (i.e., in four equal annual installments); 3) products with tariffs phased out over seven years from EIF (i.e., in eight equal annual installments). By 2030, effectively, all New Zealand imports into the United Kingdom will be duty free, with the main exception being products covered by TRQs, which are covered in the following section.

2.3.2 TARIFF RATE QUOTAS (TRQS)

As part of the EU, UK trade in selected agricultural products was governed by TRQs. When the UK separated from the EU, the TRQs were split between the EU and the UK, primarily based on TRQ use (imports). Two types of TRQs were available to EU/UK importers: 1) country-specific tariff quotas (CSTQs); 2) MFN tariffs quotas (MFNTQ). As their name suggests, country-specific quotas can only be used by the country named on the CSTQ. On the other hand, MFNTQs are often first come, first served, though they can also be set partially based on historical shipments. Barring the availability/use of TRQs, New Zealand exporters can employ MFN tariffs (which often contain a specific rate component). However, MFN tariffs are often set so high as to be prohibitive. The availability and use of TRQs varies by product and we briefly review the TRQs of significance to New Zealand exporters below.

Table 5 UK country-specific tariff rate quotas (CSTQs) for New Zealand, pre- and post-BREXIT

Product	Metric tons		CSTQ tariff (%)	MFN tariff (AVE, %)			Specific rate[a]
	EU (Pre-Brexit)	UK (Post-Brexit)		Low	Average	High	
High-quality grass-fed beef	1,300	454	20.0	55.0	75.0	85.0	Varies
Sheep and goat	228,389	114,205	0.0	22.0	38.0	56.0	Varies
Butter-aged for at least 6 weeks	74,693	27,516	22.0	39.0	39.0	39.0	193 GBP/DTN

---

[18] Based on the New Zealand-UK AIP as communicated to ImpactECON, LLC by the Ministry of Foreign Affairs and Trade (MFAT) on October 8, 2021. A detailed list of tariff lines and their assumed elimination schedules are available upon request.

Product	Metric tons		CSTQ tariff (%)	MFN tariff (AVE, %)			Specific rate[a]
	EU (Pre-Brexit)	UK (Post-Brexit)		Low	Average	High	
Cheese – mozzarella	--	--	--	--	--	--	154 GBP/DTN
Cheese - for processing	4,000	2,330	7.0	59.0	59.0	59.0	154 GBP/DTN
Cheese – cheddar	7,000	2,639	7.0	59.0	59.0	59.0	154 GBP/DTN

a. DTN is one hundred kilograms.

Source: HM Revenue & Customs - The Customs (Tariff Quotas) (EU Exit) Regulations 2020 – Tariff Quotas, version 2.1, 08 June 2021. Regulation (EU) 2019/216 of the European Parliament and the Council of 30 January 2019, Official Journal of the European Union No 32/2000. Estimates of ad valorem equivalents by ImpactECON, LLC, applying 2019 trade values and volumes.

Beef and Sheep

Historically, EU imports of beef were highly restricted, with New Zealand having access to just 1,300 MT of high-quality beef imports into the EU.[19] Post-BREXIT, the UK was allocated just 454 MT of CSTQ for high quality beef. New Zealand shipped a little over 500 MT to the UK in 2019. It is assumed the CSTQ was fully utilised, and the remainder was imported under the MFNTQ for frozen meat. The estimated MFN ad-valorem equivalent on UK beef imports was an average of 75.0 percent (Table 5). This means that the TRQs on UK imports of beef are binding. New Zealand exporters of beef pay the 20.0 percent tariff under both MFN and CSTQs. This leaves a sizable gap between the TRQ tariff rates and the MFN tariff rate of 75.0 percent. It is likely that New Zealand beef exports become prohibitively expensive because of the 75.0 percent tariff.[20] This suggest that the rents associated with the quota on beef could be as high as 55.0 percent (75 percent out-of-quota tariff less 20 percent in-quota tariff). This estimate of the rents on New Zealand's exports to the UK is considerably higher than the estimate of 14.0 percent for New Zealand's exports to the EU (pre-BREXIT). For our main simulation we assume rents are to equal 34.5 percent, the central estimate between 55.0 and 14.0 percent. However, in Section 3.3.1, we also include sensitivity analysis in our modeling of this beef rent at rates between 14.0 percent, 34.5 percent and 55.0 percent.[21]

---

[19] High quality beef is defined as grass fed beef, among other specifications.

[20] Economists refer to unutilised portions of tariffs as "water" in the tariff. That is, the point where imports become prohibitively expensive.

[21] These rates correspond to the rents estimated in the EU market (pre-BREXIT), midway from this to the maximum rent (no water), and the maximum quota rent.

Table 6 UK most favored nation tariff rate quotas pre- and post-BREXIT

Product	Metric tons		Tariff (percent)	Specific rate
	EU (Pre-BREXIT)	UK (Post-BREXIT)		
Frozen meat of bovine	54,875	11,143	20.0	--
Frozen beef intended for processing - includes offal	63,703	44,027	20.0	--
Sheep and goat	200	22	Varies	Varies
Butter - includes fats and oils*	11,360	0	-	94.8 GBP/DTN
Cheese – mozzarella	5,360	0	-	13.00 GBP/DTN
Cheese - for processing	20,007	8,266	32.0 (AVE of specific rate)	83.50 GBP/DTN
Cheese – cheddar	15,005	64	14.0 (AVE of specific rate)	21.00 GBP/DTN

Source: HM Revenue & Customs - The Customs (Tariff Quotas) (EU Exit) Regulations 2020 – Tariff Quotas, version 2.1, 08 June 2021. Regulation (EU) 2019/216 of the European Parliament and the Council of 30 January 2019, Official Journal of the European Union No 32/2000. Estimates of ad valorem equivalents by ImpactECON, LLC. Applying 2019 trade values and volumes.

The UK FTA is expected to eliminate the tariff on imported beef with a CSTQ of 38,000 MT in 10 years and become tariff-free from year 10.[22] This is a potential increase in New Zealand exports to the UK by over 130 times current levels. We discuss possible supply constraints in Appendix II.

In contrast to beef, New Zealand holds a unique position in the exports of sheep to both the EU and UK. With a CSTQ of 114,205 MT into the UK market, post-BREXIT, and shipping approximately 40,000 MT of sheep meet in 2019, New Zealand is largely an unconstrained exporter of sheep meet to the UK. Moreover, the CSTQ tariff rate is zero. Therefore, we do not project any change in its margin of preference into the UK market as a result of the NZ-UK FTA.

Dairy

Dairy is comprised of two broad categories of goods relevant to this analysis: 1) butter and; 2) cheese.

The UK CSTQ on natural butter (in contrast to oils) is 27,516 MT, significantly higher than New Zealand's 2019 exports of butter to the UK of approximately 800 MT. The NZ-UK FTA will eliminate the 22.0 percent tariff on UK imports of butter under the CSTQ, starting with 7,000 MT duty free on EIF rising to 15,000 MT duty free in year five and tariff-free on all imports in year six.

EU imports of cheese from all sources have been historically restrictive. Restrictions have included both modest TRQs volumes and complex rules under which the TRQs are administered. Given these facts, and that the MFN rate on out-of-quota cheese imports exceeds

---

[22] Importantly, UK producers will have access to a product specific special safeguard, from year ten through year 15, which might be applied. In the case the safeguard is implemented, the out-of-quota tariff would be 20 percent.

50.0 percent, New Zealand's exports of cheese to the UK have been modest, well within the CSTQ at about three metric tons. The New Zealand UK FTA will establish a new CSTQ with a zero tariff for 24,000 MT on EIF, expanding to 48,000 MT in year five and duty-free trade in these products starting in year six. An important factor in New Zealand's ability to take advantage of these new cheese quotas will be their administration by the UK, including of NTMs.

2.3.3 NON-TARIFF MEASURES (NTMS)

Goods NTMs

NTMs on goods take many forms, including technical standards, import licensing, sanitary and phytosanitary regulations. While goods NTMs often serve legitimate purposes (UNESCAP, 2019), they can raise costs and inhibit international trade. Thus an important focus for trade agreements can be reducing the costs of NTMs by lowering unnecessary barriers or harmonising regulations in ways that support trade. Unlike with tariffs, specific duties and TRQs, direct measures of the restrictiveness of these measures are limited; therefore, econometric estimates of the ad valorem equivalents (AVEs) of the NTM's trade restrictiveness are generally employed in analysis such as this.

For modelling the impact of reductions in goods NTMs in the NZ-UK agreement, we use new econometric estimates of AVEs from United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).[23] These estimates are based on highly detailed and internationally consistent datasets of NTMs collated through significant national and international efforts, led by United Nations Conference on Trade and Development (UNCTAD) and supported by other key international agencies (UNCTAD, 2013).[24] The econometric estimates are undertaken at the HS6 level to capture the magnitude of bilateral NTMs at a very detailed level, which we then aggregate to the GTAP sectoral level for modelling. Table 7 summarises the trade-weighted average goods NTM estimates for imports to the UK from New Zealand and to New Zealand from the UK, as well as indicating the proportion of merchandise imports each of these aggregate sectors contributes.[25]

Given that the NZ-UK FTA recognises equivalence for animal welfare standards and sanitary and phyto-sanitary (SPS) regimes, we take a relatively conservative approach of not modelling any reduction in NTMs for animal-based products. Based on the recognition of wine making practices in the agreement, for beverages & tobacco, we assume a 5 percent reduction in NTMs in the first scenario and a 10 percent reduction in the second scenario. For other commodities, we model a 2.5 percent reduction in the first scenario and a 5 percent reduction in the second scenario. All reductions are implemented evenly over the 5 year period from EIF.

---

[23] We are grateful to Alex Kravchenko for providing an updated version of UNESCAP's (2019) econometric estimates of AVEs of goods NTMs.

[24] Including the Food and Agriculture Organization of the United Nations, International Monetary Fund, International Trade Centre, Organization for Economic Cooperation and Development, United Nations Industrial Development Organization, World Bank, World Trade Organization. As part of this international effort, a highly detailed database of New Zealand's NTMs was developed then later updated by a team at the University of Waikato (Webb & Strutt, 2017, Webb & Strutt, 2020).

[25] In our modelling, we apply more disaggregated NTM estimates at the sectoral level that matches our GTAP aggregation.

Table 7 Average AVE estimates for imported goods NTMs and sectoral contributions to bilateral goods imports, by aggregate sector (percent)

Sector[a]	United Kingdom		New Zealand	
	Proportion of UK goods imported from NZ, 2023 base (%)	AVE (%)	Proportion of NZ goods imported from UK, 2023 base (%)	AVE (%)
Crops	12.7	6.0	0.2	18.3
Animal products	35.4	0.5	0.7	7.0
Other processed foods	2.5	17.0	3.8	17.8
Beverages & tobacco	23.0	78.7	2.9	1.5
Light manufactures	1.9	4.5	32.9	13.7
Heavy manufactures	24.5	8.2	59.5	9.8

a. Aggregated sectors are detailed in Appendix I, further split to crops (sectors 1 and 2), animal products (sectors 3-9 and 14), other processed foods excluding beverages & tobacco, light manufactures (sectors 13 and 16-20), with heavy manufactures accommodating remaining manufacturing sectors.

Source: Authors estimates, based on GTAP model results and UNESCAP (2019) NTM estimates.

Services NTMs

For services NTMs, we employ services barrier estimates from CEPII (Fontagné et al., 2016). Given commitments made under the business & financial services, transportation, and trade & communication sectors, we model a 5 percent reduction in NTMs in the first scenario and a 10 percent reduction in the second scenario. For other services sectors, we assume a 2.5 percent reduction in the first scenario and a 5 percent reduction in the second scenario. All reductions are implemented evenly over the 5 year period from EIF. Table 8 illustrates the estimated initial services NTMs for the UK and New Zealand, as well as the proportional contribution to services imports made by each sector.

Table 8 Services NTMs AVE estimates and sectoral contributions to bilateral services imports (percent)

Sector	United Kingdom		New Zealand	
	Proportion of UK services imported from NZ, 2023 base (%)	AVE (%)	Proportion of NZ services imported from UK, 2023 base (%)	AVE (%)
Air and other transport	37.7	9.1	20.2	22.9
Government services	11.9	n.a.	5.2	62.5
Business and financial services	16.5	26.6	47.0	62.4
Trade and communication	22.5	31.5	20.1	52.0
Construction	0.1	44.8	0.5	52.8
Other services	11.3	--	7.0	--

Source: Import values from GTAP database version 10. Ad-valorem equivalent (AVE) from Fontagné et al., 2016 with additional analysis by ImpactECON to estimate missing values.

Modelling of NTMs

In each of the scenarios modelled, the reductions in costs imposed by goods and services NTMs are divided into changes in import productivity and a productivity gain that captures the impacts

on exporters' production costs (Walmsley and Strutt, 2021). We split these impacts evenly, with half of each shock implemented through each mechanism, drawing on insights from Webb et al. (2020), based on detailed empirical analysis of this issue.

While we believe the NTM estimates used here are the most appropriate currently available, this remains an emerging area of empirical research and we acknowledge a range of challenges, including in the estimating of AVEs, the modelling of reductions and uncertainty about the level of reductions in NTM costs that may be achieved in practice through implementation of trade agreements. Caution is therefore appropriate when assessing the results of liberalisation of these barriers.

2.3.4   TRADE FACILITATION

Since improvements in trade facilitation have already been achieved through implementation of the WTO trade facilitation agreement and other agreements, the gains from trade facilitation are expected to be relatively small. We do not model any reduction in time to trade from New Zealand to the UK.[26] For imports from the UK to New Zealand, the World Bank Doing Business-Trading Across Borders, reports, on average, it takes 25 hours, or 1 full day, to clear New Zealand customs. On average, a one-day delay is estimated to be the equivalent of a 1.2 percent tariff on New Zealand imports. We assume a 7.5 percent reduction in the first scenario and a 15 percent reduction in the second scenario, implemented evenly over the 5 year period from EIF.

---

[26]   The most current data available at the time of analysis were for 2019. The 2019 Trading Across Border report indicates customs clearance in the UK of less one day. https://www.doingbusiness.org/en/data/exploretopics/trading-across-borders

3 Potential Impacts of NZ-UK FTA

In this section, we present results for the two scenarios modelled (Table 1):

— Scenario 1: Tariff reductions and quota liberalisation, plus limited reductions in goods and services NTMs and small improvements in trade facilitation; and

— Scenario 2: Scenario 1 plus increased reductions of goods and services NTMs, and further trade facilitation.

We focus primarily on the effects of these scenarios on New Zealand, and on results relative to the baseline for 2040, since all scenarios modelled will be fully implemented before then. We begin by examining the overall impacts on GDP, investment, and trade flows. We then turn to detailed analysis of selected sectors. Finally, we examine the sensitivity of our results to assumptions regarding beef quota rents and the goods NTMs reductions. All results are reported as percentage changes relative to the 2040 baseline, or in millions of 2019 New Zealand dollars.[27]

3.1 Macroeconomics Impacts

We first explore the potential impacts of the NZ-UK FTA on aggregate economic indicators including real gross domestic product (GDP), investment, and trade flows. We also use decompositions to explain some of mechanisms driving the results.

3.1.1 REAL GDP

Simulated changes in real GDP in 2040, due to the NZ-UK FTA scenarios modelled, are summarised in Table 9. In the first scenario, New Zealand's real GDP is projected to increase by 0.10 percent relative to the 2040 baseline. This increases to 0.12 percent in the second scenario. In constant 2019-dollar terms, this means that in 2040, real GDP is between NZ$710m and NZ$811m more than the baseline. The UK also gains around 0.01 percent of real GDP, or NZ$660m in Scenario 1 and NZ$745m in Scenario 2.

Figure 1 shows the impact of the various contributors to the scenario individually and over time. Both of our scenarios assume a common reduction in tariffs and TRQs. The difference between the scenarios stems from differences in the extent to which goods and services NTMs are liberalised and trade facilitation occurs, with more conservative reductions assumed in Scenario 1 than in Scenario 2 (dashed lines). Figure 1 clearly illustrates that the largest gains stem from the liberalisation of TRQs (grey line), in particular the liberalisation of TRQs on beef, that

---

27 To update values from their 2014 GTAP US dollar base to 2019 NZ dollars, we first adjust from real to nominal using World Bank GDP deflators for New Zealand, the UK, the EU or the world (https://databank.worldbank.org/). We then convert to New Zealand dollars, applying a 2019 exchange rate of 0.6593, calculating using the simple average of B1 monthly exchange rates from the Reserve Bank of New Zealand (https://www.rbnz.govt.nz/statistics/b1/).

contributes most to the increases in real GDP. This is followed by tariffs (orange) and then Scenario 2's goods (dashed red) and services (dashed blue) NTMs. While the gains are largest from the liberalisation of TRQs (grey), it is interesting to note that these gains peak in 2028, and then partly dissipate as quota rents disappear. The removal of tariffs and NTMs, on the hand, tend to have smaller impacts, but these do not dissipate.

Table 9 Simulated effects on real GDP, 2040 (cumulative percent and NZ$ million differences from baseline)

	Percent		NZ$m	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
New Zealand	0.10	0.12	710	811
UK	0.01	0.01	660	745
EU	0.00	0.00	128	-26
RoW	0.00	0.00	-874	-751

Source: Authors' model results.

Figure 1 Decomposition of New Zealand's real GDP growth, relative to baseline (percent cumulative change over time)
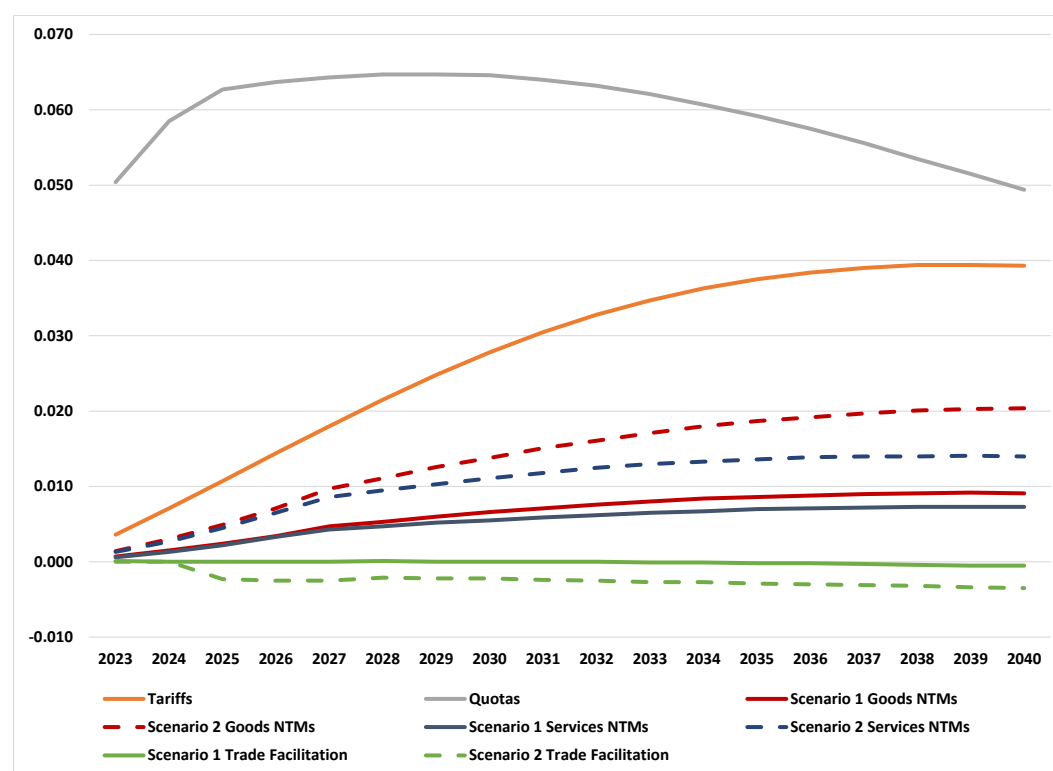
Source: Authors' model results.

The impact of trade facilitation is found to be very small, but negative (Figure 1). This stems from the fact that the UK, like the EU, has zero customs delays and hence trade facilitation only reduces the cost of customs delays for New Zealand's imports of UK goods. While the reduction in customs delays increases New Zealand's imports of goods from the UK, it reduces imports of services. Since most of New Zealand's imports from the UK are of services, total imports also fall with more goods trade facilitation, which has a very small negative impact on real GDP. In Scenario 2, the improved facilitation of goods trade is larger, hence New Zealand's total imports from the UK decline further, due to the fall in services imports.

3.1.2 DECOMPOSITION OF IMPACTS ON GDP

Figure 2 (a and b) illustrates how each of the main components impact real GDP to cumulate to the total change for each of the two scenarios respectively. The liberalisation of TRQs contributes 47 percent of the gain in Scenario 1 and 41 percent of the gain in real GDP in Scenario 2. The liberalisation of tariffs on other goods contributes 38 percent and 33 percent to Scenarios 1 and 2 respectively, followed by reductions in goods NTMs, which contribute 9 and 17 percent and reductions in services NTMs which contribute 7 and 12 percent to scenarios 1 and 2, respectively. The larger increases in the proportions attributable to goods and services NTMs in Scenario 2 reflect the fact that more liberalisation of NTMs is assumed in Scenario 2. The increased liberalisation of NTMs also explains the fall in the proportion of the total attributable to tariffs and TRQs in Scenario 2 relative to Scenario 1, although they still explain the bulk of the changes in both scenarios.

Figure 2 Decomposition of New Zealand's real GDP growth, relative to baseline (percent cumulative contribution of each component) [28]

a. Scenario 1
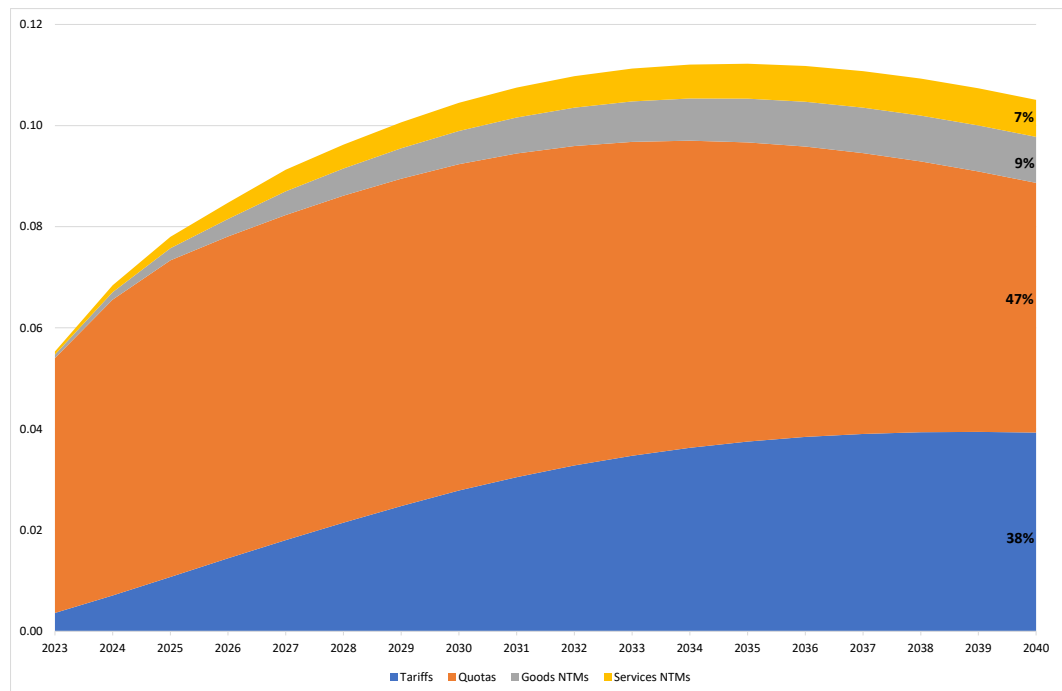
Source: Authors' model results.

---

[28] Excluding the impact of improved trade facilitation, which has a negligible impact on results in these scenarios.

b. Scenario 2
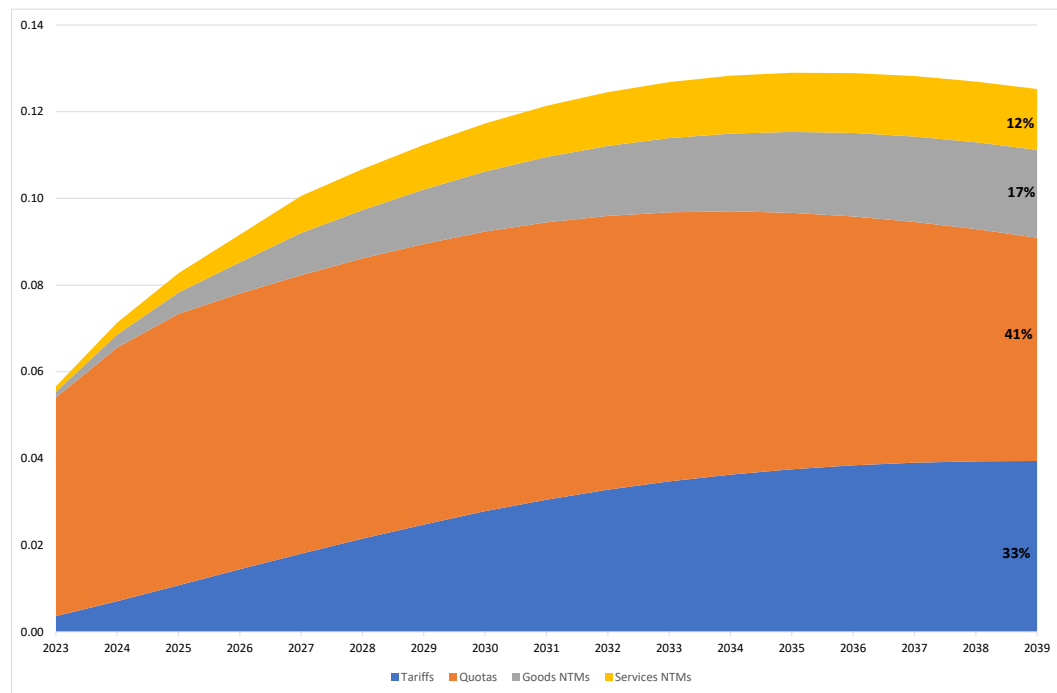
Source: Authors' model results.

3.1.3 REAL INVESTMENT

New Zealand's real investment increases to a peak of more than 0.25 and 0.30 percent above baseline values under scenarios 1 and 2 respectively, before falling to an increase of 0.10 and 0.12 by 2040 (Figure 3). The rise in investment is due to the rise in returns to capital and fall in the price of capital goods. This rise in investment adds to the capital stocks, causing real GDP to increase further over time. The increase in investment is accompanied by an increase in the trade deficit as investment rises faster than savings; although by 2040 the impact of the NZ-UK FTA on the trade balance has reversed and becomes positive.

Figure 3 New Zealand's real investment, relative to baseline (cumulative percent change over time)
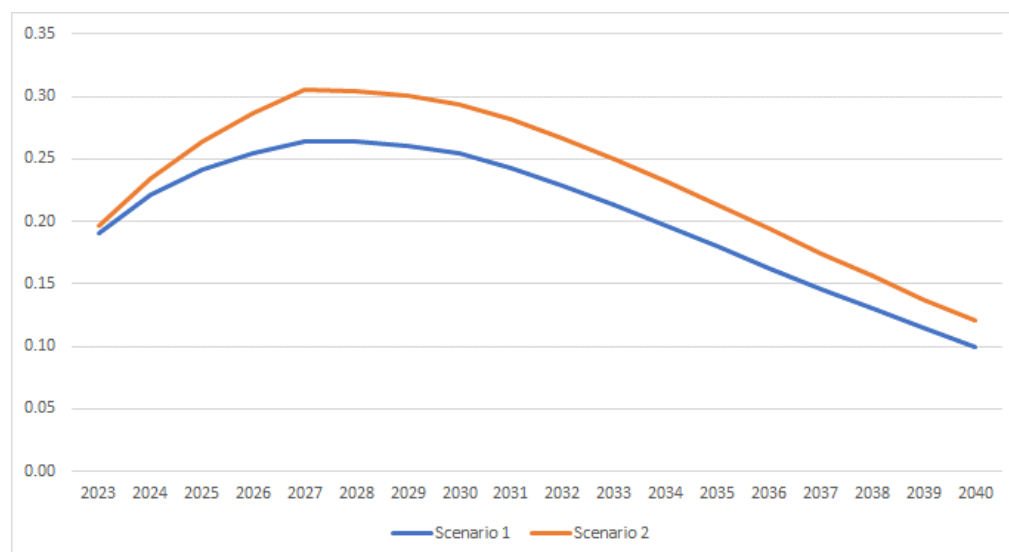
Source: Authors' model results.

3.1.4 INTERNATIONAL TRADE

Table 10 illustrates that New Zealand's total real exports rise by 0.26 percent in Scenario 1 and 0.30 percent in Scenario 2, relative to the 2040 baseline. Real imports increase by 0.22 percent in the first scenario and 0.26 percent in the second scenario. UK exports and imports increase by approximately 0.03 percent in each scenario.

The overall changes in trade for New Zealand and the UK are largely driven by changes in bilateral trade resulting from the FTA. Table 11 shows that bilateral trade for New Zealand and the UK rises considerably as a result of the NZ-UK FTA. New Zealand's real exports to the UK increase by 51.27 percent in Scenario 1 and 53.01 percent in Scenario 2. In the case of New Zealand, a large portion of the bilateral trade with the UK is in beef. NZ's exports to and imports from the EU and the rest of the world (RoW) fall, as trade with the UK rises. The reason for this fall is in part due to domestic constraints on beef production in New Zealand that cause beef exports to be diverted from the EU and the RoW to the UK, as a result of the NZ-UK FTA. New Zealand's overall real exports to the EU and RoW reduce by 0.75 to 0.78 percent in both scenarios (Table 11). The UK's exports to New Zealand increase by 8.71 percent in Scenario 1 and 11.32 percent in Scenario 2, with exports to the EU and RoW also rising slightly as a result of the FTA with New Zealand.

Table 10 Simulated impact on overall real exports and imports, 2040 (cumulative percent and NZ$ million differences from baseline)

	Percent		NZ$m	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
E X P O R T S				
NZ	0.26	0.30	460	527
UK	0.03	0.04	830	850
I M P O R T S				
NZ	0.22	0.26	413	487
UK	0.03	0.03	646	708

Source: Authors' model results.

Table 11 Simulated impact on New Zealand and UK bilateral exports at fob prices, 2040 (cumulative percent and NZ$ million differences from baseline)

	Percent		NZ$m	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
E X P O R T S F R O M N Z T O :				
UK	51.27	53.01	2,127	2,199
EU	-0.78	-0.77	-88	-87
RoW	-0.76	-0.75	-1,230	-1,217
E X P O R T S F R O M U K T O :				
NZ	8.71	11.32	574	747
EU	0.00	0.00	42	-26
RoW	0.02	0.01	225	144

Source: Authors' model results.

3.2 Sectoral Results

3.2.1 OVERVIEW

In this section we consider the impact of the NZ-UK FTA on production, exports and imports for New Zealand's aggregate sectors of agriculture, processed food, manufactures and services, as summarised in Table 12. The direction of the changes in sectoral trade and production are driven by the liberalisation of tariffs, quotas and NTMs. These effects are decomposed to show the impacts of different policy instruments in Table III- 1, Appendix III.

The liberalisation of tariffs and NTMs generally stimulates New Zealand's imports of all goods and services. Production also increases for most goods and services, but the increase is largest (in percentage terms) for the production of processed food, namely beverages & tobacco (wine) and the rice, sugar & oils sector (see Table III- 2, Appendix III), which gain most from the removal of tariffs. Reductions in goods NTMs stimulate exports of processed food and manufactures, while liberalisation of services NTMs stimulates exports of services and, to a lesser extent, manufactures and processed goods exports.

The liberalisation of quotas, on the other hand, raises exports of processed food, and to a lesser extent imports, but has a negative impact on production. This is due to the assumption that production of beef cannot expand due to environmental constraints on land use in New Zealand, hence the increase in exports of beef to the UK comes at the expense of domestic sales and exports to other countries. Only production of services rises with the removal of TRQs. Finally, trade facilitation has a slightly negative impact, lowering imports and production of manufacturers and services.

Table 12 Simulated impact on New Zealand sectoral production, exports and imports, 2040 (cumulative percent and NZ$ million differences from baseline)

	Percent		$NZm	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
PRODUCTION				
Agriculture & unprocessed food	0.01	0.01	9	11
Processed food	0.12	0.15	134	177
Manufactures	-0.01	0.01	-22	18
Services	0.08	0.09	685	787
EXPORTS				
Agriculture & unprocessed food	0.07	0.06	9	8
Processed food	0.65	0.7	483	523
Manufactures	0.04	0.07	24	44
Services	-0.02	0.08	-5	23
IMPORTS				
Agriculture & unprocessed food	0.27	0.31	8	9
Processed food	0.45	0.47	56	58
Manufactures	0.17	0.19	242	266
Services	0.26	0.40	90	136

Source: Authors' model results.

3.2.2 BEEF AND SHEEP MEAT

In this analysis we assumed that the quota rents were 34.5 percent, midway between the rents estimated for the EU (pre-BREXIT) of 14.0 percent and for the UK of 55.0 percent.[29] Figure 4 illustrates that under this assumption, New Zealand's exports of beef to the UK increase in 2023 driven by the new CSTQ, as the in-quota tariff of 20.0 percent is eliminated EIF. It is the removal of the tariff and the reduction in-quota rents, due to the gradual removal of the quantity constraint, that drives this initial expansion in trade (blue line in Figure 4). New Zealand's exports of beef to the UK do not exceed the CSTQ, because out-of-quota trade is still not justifiable. By 2026, quota rents will have fallen to zero due to increased production costs and reduced demand from rising prices, causing demand and supply forces to stabilize. Demand falls slightly with increased competition from other countries. The CSTQ, still grows (orange dashed line, Figure 4), and becomes non-binding. In the sensitivity analysis provided in Section 3.3.1, it is shown that the extent to which New Zealand's exports of beef to the UK expand depends crucially on the initial level of the rent, assumed here to be 34.5 percent. Finally, since New Zealand production of beef & sheep meat is assumed to be fixed, the increased exports to the UK come at the expense of New Zealand consumers and New Zealand exports to the EU and the rest of the world. The increase in GDP caused by quotas does not stem from an increase in beef production, but an increase in the extraction of rents.

Figure 4 New Zealand's simulated beef exports to the UK compared to liberalised quota over time (metric tons)
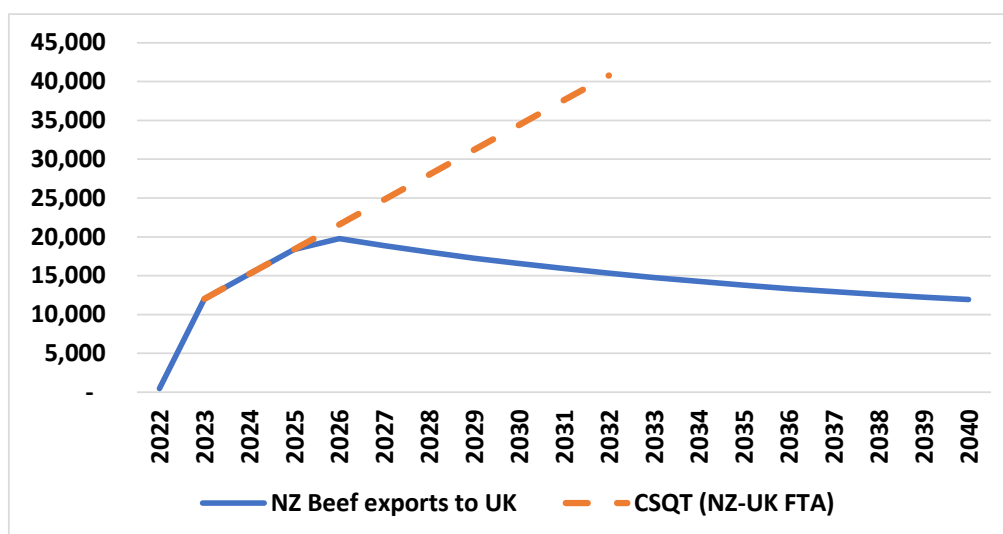
Source: Authors' model results.

In the case of sheep meat, we see a decline in exports to the UK as farmers substitute towards producing and exporting more beef or dairy in response to reductions in tariffs and quotas. Unlike beef, sheep meat exported under the existing quota is not binding and is already duty free.

---

[29] Quota rents can occur if the quantity of the good traded is equal to the quota. When this occurs the price of the imported commodity will be somewhere between the c.i.f price plus the in-quota tariff and the c.i.f. price plus the out-of-quota tariff, depending on demand. In these cases, the difference between the domestic price and the c.i.f price plus the in-quota tariff represent rents earned by the exporter as a result of the quota. Quota rents will decrease with increasing imports from all sources (domestic prices decease) and from any increase in production costs.

3.2.3 DAIRY

The two primary dairy commodities subjected to TRQs by the UK are butter and cheese. Neither of these commodities are exported to the UK in significant quantities using existing quotas, although New Zealand does export butter duty free under a further processing arrangement. As tariffs are removed on EIF and quotas expanded, there is some expansion in New Zealand's exports of both butter and cheese to the UK, relative to 2022. In the case of butter, the quota becomes binding for the first years and then exports stabilise at around 9,000 MT. For cheese, the removal of tariffs is not sufficient to increase exports to the UK significantly (around 1,700 MT of cheese is exported after the FTA, up from 63 MT prior to the FTA) and the quota remains non-binding after the initial elimination of the in-quota tariff.

It is worth noting that the simulated gains from the removal of the TRQs on butter and cheese are likely to be conservative estimates, since the model uses existing trade flows between the UK and New Zealand, which are very low, to estimate the potential for trade under the FTA. In a highly constrained market, where costly tariffs, quotas, rules and regulations, cannot be offset by rents, New Zealand firms lack the incentives needed to export their product to the UK, preferring instead to export to larger markets in Asia, where New Zealand has had more success in developing open trading relations.

Figure 5 New Zealand's simulated butter exports to the UK compared to liberalised quota over time (metric tons)
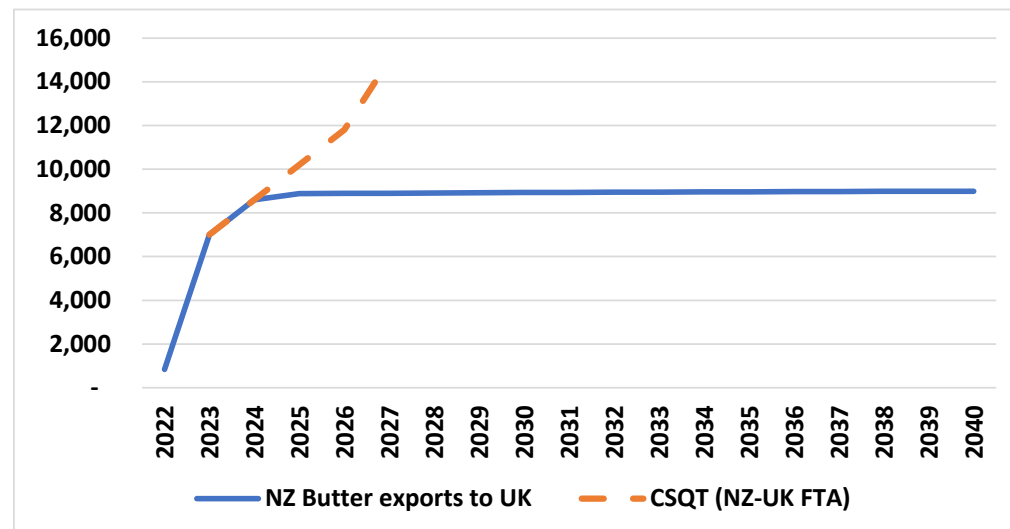
Source: Authors' model results.

Figure 6 New Zealand's simulated cheese exports to the UK compared to liberalised quota over time (metric tons)
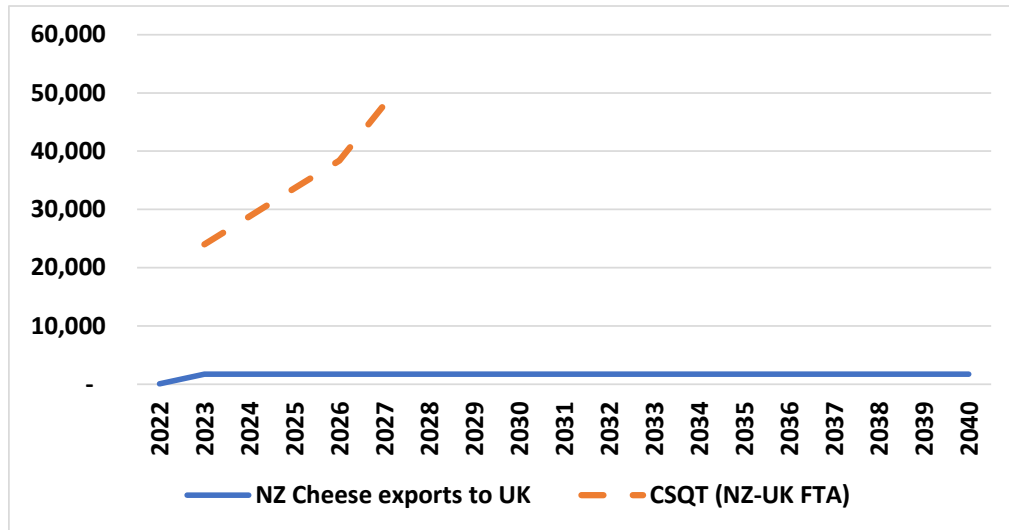
3.2.4 BEVERAGES AND TOBACCO (WINE)

Wine is an important export from New Zealand to the UK that is included in the GTAP beverage & tobacco sector.[30] Results summarised in Table 13 indicate that in Scenario 1, New Zealand production in this sector increases by 0.91 percent (NZ$158m) and exports to the UK increase by 18.18 percent (NZ$150m), relative to the 2040 baseline. Scenario 2 leads to further expansion, with production increasing by 1.15 percent and exports to the UK expanding by 22.72 percent. When we decompose the key policy drivers of these changes, we find that tariff reductions have a particularly strong impact, with reductions in goods NTMs also contributing. The average tariff faced by wine exports to the UK is 6 percent (Table 6) and elimination of these leads to an expansion of wine exports to the UK of 13.93 percent, contributing to a 0.69 percent expansion of New Zealand production. The beverages & tobacco sector faces relatively high NTMs (Table 7) and the reductions modelled in these expand New Zealand's wine exports to the UK by a further 3.79 percent in Scenario 1 and 7.78 percent in Scenario 2. Quotas and services NTMs do not change for this sector, thus have limited impacts.

Table 13 Simulated impact on New Zealand production and exports to the UK of beverages & tobacco, 2040 (cumulative percent and NZ$ million differences from baseline)[a]

	Common		Scenario 1			Scenario 2		
	Tariffs	Quotas	Goods NTMs	Services NTMs	Total	Goods NTMs	Services NTMs	Total
P R O D U C T I O N								
Percent	0.69	0.00	0.22	0.01	0.91	0.44	0.02	1.15
$NZm	119	-1	38	2	158	77	3	199

---

[30] For exports from New Zealand to the UK, this sector is almost entirely wine.

	Common		Scenario 1			Scenario 2		
	Tariffs	Quotas	Goods NTMs	Services NTMs	Total	Goods NTMs	Services NTMs	Total
			E X P O R T S T O U K					
Percent	13.93	-0.09	3.79	0.01	18.18	7.78	0.02	22.72
$NZm	115	-1	36	0	150	73	0.2	187

a. The impacts of trade facilitation are negligible and not reported here.

Source: Authors' model results.

3.3   Sensitivity Analysis

In this section we examine the sensitivity of results to alternate assumptions. In the first subsection, we examine the impact of our assumption regarding the initial quota rent assumed on quota constrained exports of beef to the UK. In the second subsection, we undertake a more detailed examination of the impact of further reductions in goods NTMs.

3.3.1   SENSITIVITY OF RESULTS TO ASSUMPTIONS ON BEEF QUOTA RENTS

The extent to which quota rents are obtained on New Zealand's exports of beef to the UK is not known, although the difference between the out-of-quota tariff of 75.0 percent and the in-quota tariff of 20.0 percent is often used as an estimate of the value of these quota rents. This estimate of 55.0 percent is considered to represent the upper bound of potential rents. We also note that quota rents for exports of New Zealand beef to the EU are estimated using the same methodology to be only 14.0 percent, which may be viewed as the lower bound estimate.[31] In the absence of clear empirical evidence to confirm the current rent, our main scenario assumes quota rents of 34.5 percent for beef; i.e. the mid-point of the upper and lower bound estimates. In this section, we conduct sensitivity analysis to examine the implications of this assumption.

Table 14 compares the results on real GDP and exports of using the alternative quota rents. In column I, quota rents are assumed to be 14.0 percent; column II is our main simulation (34.5 percent quota rents); and column III assumes quota rents of 55.0 percent. The results show that the initial value of the rent can have a significant impact on the model results. For instance, raising the quota rent from 34.5 percent to 55.0 percent quadruples the impact of the quota on real GDP and leads to a much larger increase in New Zealand's exports of beef to the UK. On the other hand, lowering the initial quota rent to 14.0 percent reduces the GDP impact of quotas to almost zero.

Figure 7 shows the impact of the alternative scenarios on the time path of exports, relative to the quota. When the quota rent is 14.0 percent (column I, Table 14), the increase in exports in 2040 is relatively small (302.0 percent) and at no stage does the increase in exports approach

---

[31]   The conversion of specific tariffs to ad valorem equivalents requires the calculation of average unit values for beef imports, which can vary depending on the quality and cuts of meat, among other factors. A lower average unit value results in a higher rent, for a given specific tariff rate. The calculation of ad valorem equivalents is common in applied trade analysis but is subject to data limitations. We, therefore, provide sensitivity analysis to understand the potential implications of this uncertainty.

the available quota (Figure 7, green line compared to orange dashed line). Alternatively, when the quota rents are raised to 55.0 percent, New Zealand's exports of beef to the UK increase by over ten thousand percent (column III, Table 14), compared to just 2,525.00 percent in the main scenario (column II, Table 14). This rise in exports is significant, with exports continuing to rise beyond 2026 to 2035. In this case, where rents are 55.0 percent, we assume that the safeguard will be initiated in 2033 (Figure 7, red dashed line represents commencement of safeguard) to ensure New Zealand's exports do not rise above the safeguard quota (Figure 7, grey line compared to dashed orange line).[32]

Exports to other countries in Scenario III fall by around one-third, since the total beef production is constrained in New Zealand and exports must be diverted from other locations to the UK to capture these quota rents. When quota rents are set at 34.5 percent (main simulation and column II), exports to other countries fall by approximately 13 percent.

Table 14 Results from the implementation of quotas under alternative quota rent assumptions (cumulative percent differences in 2040)[a]

Quota rents	I	II	III
	14.0 percent	34.5 percent	55.0 percent
Exports of beef from NZ to the UK	302.00	2,525.00	10,312.00
Real GDP	0.00	0.05	0.24

Excludes changes in tariffs, NTMs and trade facilitation.

Source: Authors' model results.

Figure 7 New Zealand's simulated beef exports to the UK compared to liberalised quota over time assuming alternative initial quota rents (metric tons)
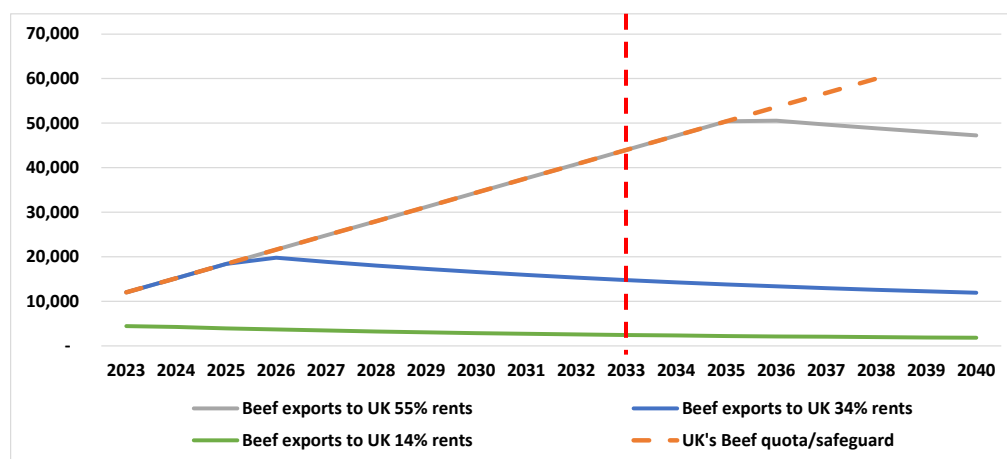
a. Dashed red line represents the commencement of the safeguard.

Source: Authors' model results.

---

[32] The safeguard would be initiated in 2033, as the out of the out-of-quota tariff is removed. At this point in time the remaining rent is slightly above the now zero out-of-quota tariff. The removal of the safeguard would cause exports to rise above the quota in 2033, before tailing off to a similar long run change in exports as shown in Figure 7, grey line.

3.3.2 SENSITIVITY OF RESULTS TO REDUCTIONS IN GOODS NTMs

We also undertake sensitivity analysis to explore the impact of more ambitious goods NTM shocks, including the possibility of reductions for livestock sectors. In particular, we consider how the results for Scenario 2 might change if there were a 10 percent reduction across all goods NTMs, including for livestock sectors (Scenario 2a).[33] With the exception of the beverage and tobacco sector, that already has a 10 percent reduction in Scenario 2, all sectors are assumed to have further reductions in NTMs in this sensitivity simulation. Table 15 presents results highlighting the difference between Scenario 2 and the more ambitious NTM reductions in Scenario 2a. With a 10 percent reduction across all goods NTMs, we find that New Zealand's GDP increases a further NZ$56m relative to the impact of NTM reductions in Scenario 2. The more ambitious NTM reductions also raise New Zealand's total exports and imports, as well as exports to the UK (Table 15).

Table 15 Impact of goods NTM reductions on New Zealand, Scenario 2 and Scenario 2a, 2040 (cumulative NZ$ million differences from baseline)

	Scenario 2	Scenario 2a	Difference: Scenario 2a-2
GDP	138	195	56
Total exports	77	111	34
Total imports	95	153	58
Exports to UK	96	124	28

Source: Authors' model results.

Given the relatively low NTMs estimated for livestock products exported from New Zealand to the UK in the database we use (Table 7), including cuts to NTMs on animal products has little impact on results. The main differences in results between Scenario 2 and Scenario 2a are due to the larger reductions in NTMs costs for other good sectors, particularly those with relatively high initial AVEs. The key sectors driving additional changes in exports from New Zealand to the UK in this sensitivity scenario are the heavy manufacturing sectors, as well as some increases due to crops and processed foods.

---

[33] These are modelled along with tariff reductions and quota expansions to ensure interactions are captured. However, results presented in this section report the impacts due only to goods NTM liberalisation.

4 Conclusions

This report modelled impacts of a proposed NZ-UK FTA, including on New Zealand's GDP, trade and investment. The elements of the NZ-UK FTA modelled were reductions in tariffs, liberalisation of TRQs, reductions in goods and services NTMs, and improvements in trade facilitation. Two scenarios were constructed with common liberalisation of tariff and quotas, but more ambitious liberalisation of goods and services NTMs and trade facilitation included in the second scenario.

In both scenarios, New Zealand and the UK gain from the FTA. Overall, the proposed FTA represents an opportunity to increase New Zealand's market access and real GDP. We find the extent of the gains from the FTA for New Zealand depend in large part on elimination of TRQs on beef. Removal of tariffs also contributes relatively strongly to New Zealand's overall gains from the FTA, with reductions in goods and services NTMs also contributing gains, but to a somewhat lesser extent. Overall exports to the UK from New Zealand expand by over 50 percent, with strong gains for processed foods, particularly beef, as well as some significant gains for wine.

Given that the size of the gains from the liberalisation of TRQs on beef depend crucially on our assumption regarding the quota rent earned by New Zealand's beef exporters to the UK, in addition to the two main scenarios, we undertook sensitivity analysis to examine the impact of alternative quota rents assumptions for beef. This sensitivity analysis illustrates the uncertainty surrounding the impact of liberalising the TRQ on beef. The extent to which New Zealand beef exporters are earning rents due to the existence of the initial quota has a significant effect on the impact of removing those TRQs and the consequent overall gains from the FTA. We also undertake sensitivity analysis to explore the impact of further reductions in goods NTMs. While further reductions in NTMs will lead to increased overall gains, these impacts remain less significant than those we find for TRQs.

References

Agreement in Principal (AIP) Australia-UK FTA (2021). Australian Department of Foreign Affairs and Trade, June 17, 2021, available at: https://www.dfat.gov.au/trade/agreements/negotiations/aukfta/australia-uk-fta-negotiations-agreement-principle

Agreement in Principal (AIP) NZ-UK FTA (2021). New Zealand Foreign Affairs and Trade, October 2021, available at: https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-under-negotiation/new-zealand-united-kingdom-free-trade-agreement/resources/agreement-in-principle/

Aguiar, A., Chepeliev, M., Corong, E. L., McDougall, R., & van der Mensbrugghe, D. (2019). The GTAP Data Base: Version 10. *Journal of Global Economic Analysis, 4*(1), 1-27. doi:doi:http://dx.doi.org/10.21642/JGEA.040101AF

Fontagné, L., Mitaritonna, C., & Signoret, J. (2016). *Estimations of Tariff Equivalents for the Services Sectors*. CEPII.

Fouré, J., Bénassy-Quéré, A. & Fontagné, L. (2012). *The Great Shift: Macroeconomic Projections for the World Economy at the 2050 Horizon.* CEPII Working Paper, 2012-03.

Harrison, W. J., Horridge, J.M., Pearson, K. R., & Wittwer, G. (2002). 'A Practical Method for Explicitly Modeling Quotas and Other Complementarities', Computational Economics, June 2004, Vol. 23(4), pp. 325-341. [A preliminary version was Centre of Policy Studies and the Impact Project Preliminary Working Paper No. IP-78, Melbourne (April), pp.19. See: http://www.copsmodels.com/elecpapr/ip-78.html]

Hertel, T. W. (Ed.) (1997). *Global Trade Analysis: Modeling and Applications*. Cambridge and New York: Cambridge University Press.

Horridge, J.M., Jerie, M., Mustakinov, D. & Schiffmann, F. (2018). *GEMPACK Manual*, GEMPACK Software, ISBN 978-1-921654-34-3

Ianchovichina, E. I., & Walmsley, T. L. (Eds.) (2012). *Dynamic Modeling and Applications for Global Economic Analysis*. New York: Cambridge University Press.

International Monetary Fund (IMF) (2021). *World Economic Outlook Database*. Retrieved from http://data.imf.org

Malcolm, G. (1998). *Adjusting Tax Rates in the GTAP Data Base.* GTAP Technical Paper, 15. Center for Global Trade Analysis: West Lafayette.

United Nations (UN) (2019). *World Population Prospects: The 2019 Revision.* Retrieved from https://esa.un.org/unpd/wpp/

UNCTAD (2013). *Classification of Non-Tariff Measures*. February 2012 Version. UNCTAD/DICT/TAB/2012/2, UN: New York and Geneva.

UNESCAP (2019). "Evaluating the Impact of Non-tariff Measures on Trade and Investment in Asia and the Pacific." Chapter 2 in *Asia-Pacific Trade and Investment Report 2019:*

Navigating Non-tariff Measures towards Sustainable Development. New York: United Nations.

United Nations International Trade Centre (UNITC), Market Analysis and Research Division of Market Development (2014). *Trade statistics for international business development. Geneva, Switzerland*. Retrieved from https://www.trademap.org/Docs/TradeMap-Userguide-EN.pdf

Walmsley T. L., Minor, P., & Strutt, A. (2015). The Vietnamese Economy through 2035: Alternative Baseline Growth, State-Owned Enterprise Reform, a Trans-Pacific Partnership and a Free Trade Area of Asia and the Pacific. Report to the World Bank. Retrieved from https://impactecon.com/potential-scenarios-for-growth-in-vietnam/

Walmsley, T., & Strutt, A. (2021). A Comparison of Approaches to Modelling Non-Tariff Measures. Journal of Global Economic Analysis, 6(1), 1-33. doi:http://dx.doi.org/10.21642/JGEA.060101AF

Webb, M., & Strutt, A. (2017). *New Zealand NTM Database*. Prepared for UNCTAD and ERIA, University of Waikato.

Webb, M., & Strutt, A. (2020). Non-Tariff Measures in New Zealand. In D. P. Rial & M. R. Anandika (Eds.), *Non-Tariff Measures in Australia, China, India, Japan, New Zealand and the Republic of Korea: Preliminary Findings* (pp. 55-65). Geneva: United Nations Conference on Trade and Development (UNCTAD).

Webb, M., Strutt, A., Gibson, J., & Walmsley, T. (2020). Modelling the Impact of Non-tariff Measures on Supply chains in ASEAN. *The World Economy*, 43(8), 2172-2198. doi:10.1111/twec.12955

World Bank (2019). *World Bank Doing Business Data*. Retrieved from http://www.doingbusiness.org/data

World Bank (2021). *World Development Indicators*. Retrieved from https://databank.worldbank.org/source/world-development-indicators

Appendix I Aggregation of the GTAP Data Base

Table I-1 Sectoral aggregation

No.	Sector modelled	Description	GTAP sectors*	Major sectors used for reporting results
1	Fruit & Veg	Vegetables, fruit, nuts	V_F	Agriculture & unprocessed food
2	Other Crops	Other crops: rice, sugar, wheat, other grains, oilseeds, other crops and plants.	PDR, C_B, WHT, GRO, OSD, PFB, OCR	Agriculture & unprocessed food
3	Raw Milk	Raw milk	RMK	Agriculture & unprocessed food
4	Cattle & sheep	Live cattle, sheep, goats, horses etc.	CTL	Agriculture & unprocessed food
5	Other Animals	Live pigs, poultry, eggs, honey etc.	OAP	Agriculture & unprocessed food
6	Wool	Raw wool, silk etc.	WOL	Agriculture & unprocessed food
7	Beef & Sheep meat	Beef and sheep meat etc.	CMT	Processed food
8	Other Meats	Other meat: pork, poultry etc.	OMT	Processed food
9	Dairy	Dairy products	MIL	Processed food
10	Rice, Sugar and & oils	Processed rice, sugar and vegetable oils	PCR, SGR, VOL	Processed food
11	Processed Foods	Other processed foods including fish, vegetables, cereals etc.	OFD	Processed food
12	Beverages & Tobacco	Beverages and tobacco products	B_T	Processed food
13	Forestry & Wood	Forestry and wood products	FRS, LUM	Manufactures
14	Fisheries	Fisheries	FSH	Agriculture & unprocessed food
15	Extractive	Extraction of coal, oil, gas & other minerals; manufacture of petroleum & coke	COA, OIL, GAS, P_C, OXT	Manufactures
16	Textiles	Textiles	TEX	Manufactures
17	Apparel	Wearing apparel	WAP	Manufactures
18	Leather	Leather products	LEA	Manufactures
19	Paper Products	Paper and paper products	PPP	Manufactures
20	Motor Vehicles	Motor vehicles & parts	MVH	Manufactures
21	Electronics	Office and electronic equipment	ELE, EEQ	Manufactures
22	Other Machinery	Other machinery and equipment	OME	Manufactures
23	Other Manufactures	Transport equipment and other manufactures	OTN, OMF	Manufactures
24	Chemicals, Rubbers and Plastics	Chemicals, rubber and plastic products	CHM, BPH, RPP	Manufactures
25	Mineral & metal products	Fabricated metal products and non-metallic mineral products	FMP, NMM	Manufactures
26	Metals	Iron & steel and non-ferrous metals	I_S, NFM	Manufactures

No.	Sector modelled	Description	GTAP sectors*	Major sectors used for reporting results
27	Construction	Construction	CNS	Services
28	Business and Financial services	Business, insurance and financial services	OBS, OFI, INS, RSA	Services
29	Transportation	Air and other transport	ATP, WTP, OTP, WHS	Services
30	Trade & Communications	Trade and communications	AFS, CMN	Services
31	Public services	Government services	OSG, HHT, EDU	Services
32	Other Services	Other services	ELY, GDT, WTR, ROS, DWE	Services

* See https://www.gtap.agecon.purdue.edu/databases/v10/v10_sectors.aspx#Sector65 for details of the 65 GTAP sectors.

Source: Authors' aggregation of the GTAP Data Base (Aguiar et al., 2019)

Table I- 2 Disaggregation undertaken to implement quotas

No	Sector modelled	Description	GTAP sectors*	Disaggregated sectors
7	Beef & Sheep meat	Beef and sheep meat etc.	CMT	Beef Sheep meat Other ruminant meats
9	Dairy	Dairy products	MIL	Butter under quota Butter for processing Cheese Milk powder* Whey* Other dairy

* These sectors are not important for the NZ-UK FTA, since trade between New Zealand and the UK is essentially zero, but they are needed for EU-NZ analysis.

Source: Authors' construction

Table I- 3 Regional aggregation

No.	Countries modelled	Description	Original GTAP regions*
1	New Zealand	New Zealand	NZL
2	United Kingdom	United Kingdom	GBR
3	Germany	Germany	DEU
4	France	France	FRA
5	Ireland	Ireland	IRL
6	Denmark	Denmark	DNK
7	Netherlands	Netherlands	NLD
8	Spain	Spain	ESP
9	Italy	Italy	ITA
10	Belgium	Belgium	BEL
11	Poland	Poland	POL
12	Greece	Greece	GRC
13	Rest of Western EU	Austria, Finland, Luxembourg, Portugal, Sweden	AUT, FIN, LUX, PRT, SWE
14	Rest of Eastern EU	Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Romania, Slovakia, Slovenia	BGR, HRV, CYP, CZE, EST, HUN, LAT, LIT, MLT, ROU, SVK, SVN

No.	Countries modelled	Description	Original GTAP regions*
15	Western Europe not in EU	Norway, Switzerland etc.	CHE, NOR, XEF
16	Turkey	Turkey	TUR
17	Australia	Australia	AUS
18	China	China	CHN
19	Rest Asia	Japan, Taiwan, Korea, Hong Kong, Mongolia, Rest of East Asia, Singapore, Indonesia, Vietnam, Brunei, Malaysia, Lao PDR, Cambodia, Philippines, Thailand, Rest of South-east Asia, India, Bangladesh, Nepal, Pakistan, Sri Lanka, Rest of South Asia	JPN, TWN, KOR, HKG, MNG, XEA, SGP, IDN, VNM, BRN, MYS, LAO, KHM, PHL, THA, XSE, IND, BGD, NPL, PAK, LKA, XSA
20	US	United States	USA
21	Rest Americas	Canada, Mexico, Central and South America	CAN, MEX, PER, CHL, BOL, BRA, ARG, XNA, COL, ECU, PRY, URY, VEN, XSM, CRI, GTM, HND, NIC, PAN, SLV, XCA, DOM, JAM, PRI, TTO, XCB
22	Rest of world (RoW)	Rest of world – including: Oceania, Middle East, Russia, Eastern Europe and Former Soviet Union, and Africa	XOC, BHR, IRN, ISR, JOR, KWT, OMN, QAT, SAU, ARE, XWS, EGY, MAR, TUN, XNF, BEN, BFA, CMR, CIV, GHA, GIN, NGA, SEN, TGO, XWF, XCF, XAC, ETH, KEN, MDG, MWI, MUS, MOZ, RWA, TZA, UGA, ZMB, ZWE, XEC, BWA, NAM, ZAF, XSC, XTW, ALB, BLR, RUS, UKR, XEE, XER, KAZ, KGZ, XSU, ARM, AZE, GEO, SER, IRQ, LBN, PSE, SYR, SDN

See https://www.gtap.agecon.purdue.edu/databases/regions.aspx?version=10.211 for details of the 147 GTAP v10 countries and regions.

Source: Authors' aggregation of the GTAP Data Base (Aguiar et al., 2019)

Appendix II Modelling Quotas

Beef, sheep meat and dairy are important components of New Zealand's trade with the UK, covered by a number of TRQs that are expected to be liberalised as part of the FTA with the UK. A major constraint in modelling these quotas is that the quotas involve products that are aggregated into broader commodity groups in the underlying GTAP database. For instance, beef and sheep are aggregated into 'beef & sheep meat' (CMT), while butter and cheeses are aggregated into 'dairy products' (MIL). Given the importance of these quotas in the analysis of the FTA, we have chosen to disaggregate imports of these two commodities by the UK to allow the model to capture the impact of changing or adding quotas, as well as differences in in-quota or out-of-quota tariffs. To explain how quotas are incorporated, we will first discuss the disaggregation of the data, followed by how they were modelled.

Disaggregating beef & sheep meat imports and dairy

In deciding how to disaggregate the GTAP beef & sheep meat and dairy sectors, special attention is paid to which products, at the HS-8 level, are subject to quotas or likely to become subject to quotas as part of the FTA, and which are not. In the case of those goods subject to quotas, we grouped commodities subject to the same WTO quota (CSTQs and/or MFN) into one category. When the commodity was not subject to quotas, it was usually aggregated into a rest of category (e.g., other ruminant meat), unless there were special circumstances that suggested disaggregation might be useful. For instance, New Zealand's butter can be exported to the UK under a WTO quota or duty free under a "further processing" agreement; as such it was useful to keep both of these commodities disaggregated. A list of disaggregated commodities for analysis of the quotas is available in Table I- 2, Appendix I.[34]

Modelling quotas

TRQs are a mix of tariffs and quantitative restrictions applied by importers to specific commodities, often agricultural goods. Traditionally a tariff, called an in-quota tariff, is applied on imports of the commodity from one or more countries up to a pre-specified quantity (the quantitative restrictions). Once the pre-specified quantity is reached, any further imports must pay a higher, often prohibitive tariff, called an out-of-quota tariff. If the quantity traded is less than the quota, then the price is equal to the CIF price plus any in-quota tariff (called landed duty paid (LDP)); and if the quantity traded is equal to greater than the quota, the out-of-quota LDP price is equal to the CIF price plus the out-of-quota tariff. If the quantity traded is equal to the quota then the domestic price will fall somewhere between the in-quota LDP price and the out-quota LDP price, with any difference between the domestic price and the in-quota LDP prices being extracted by the exporter as rents, known as quota rents.

In many FTAs, negotiations involve offering the partner country country-specific quotas and reduced in-quota (and occasionally out-of-quota) tariff rates that can be used by exporters in addition to existing WTO quotas, resulting in multiple tiers of tariffs and quantity constraints.

---

[34] Milk powder and whey are included due to their importance to the EU; they are less relevant to the UK.

These tiers are order to reflect our assumption that exporters will use the quota with the lowest tariff first (usually the CSTQ negotiated as part of the FTA), then look at other quota arrangements (e.g., WTO quota), before finally exporting under the out-of-quota tariff rate.

In this model we allow two types of quotas to be implemented consecutively on any commodity. The first quota assumes the out-of-quota tariff rate is not prohibitive (we refer to this as a 'soft' quota), while the second quota assumes that the out-of-quota tariff is prohibitive (we refer to this as a prohibitive quota). For instance, using beef quotas as an example, Figure II- 1 illustrates the quotas that exist in the baseline (before the implementation of the NZ-UK FTA). UK imports of beef are subject to a WTO quota where the in-quota tariff is 20.0 percent and the out-of-quota MFN tariff rate of 75.0 percent. Since the WTO quota is binding, it is assumed that this out-of-quota tariff rate of 75.0 percent is prohibitive and hence we treat this as a prohibitive quota in the model. This is implemented using a complementarity (inequality) in which quota rents prohibit imports from rising above the quota.[35] The rent is assumed to be earned by the exporting firms. One issue with modelling binding quotas, such as this one, is that we need an estimate of the rents earned by the exporting firms from these quotas. We know that the demand curve will cross the supply curve (orange line in Figure II- 1) at the quantity of the WTO quota, but we are not always able to determine whether this occurs at 20.0 percent (in-quota tariff rate), 75.0 percent (out-of-quota tariff rate) or somewhere in-between. In the main simulation, we assume that demand (blue line in Figure II- 1) crosses the orange quota line at 54.5 percent (20.0 percent in-quota tariff plus a 34.5 percent rent).

The extent to which there are rents being collected by firms from the quotas can have important implications for the impact of removing quotas, as discussed in the sensitivity analysis, Section 3.3.1 of this report. In the sensitivity analysis, we also consider alternative assumptions for where demand crosses the orange quota line at 34.0 percent (20.0 percent plus a 14.0 percent rent, green line in Figure II- 1) and at 75.0 percent (20.0 percent plus the maximum rent of 55.0 percent, grey line in Figure II- 1). Over the baseline, the quota is assumed to remain fixed and any changes in demand will alter the rents obtained by exporting firms.

---

[35] A final check is made to ensure that the rents do not exceed 55.0 percent, that is, the MFN tariff of 75.0 percent less the in-quota tariff of 20.0 percent, as this would indicate that the MFN tariff rate of 75.0 percent is not prohibitive.

**Figure II- 1 Implementation of multiple quotas on beef in baseline**
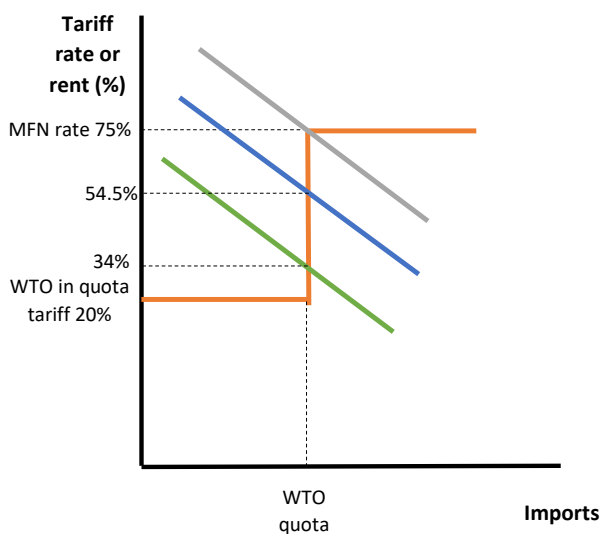
Source: Authors' construction

Figure II- 2 illustrates the impact of the NZ-UK FTA on the UK quota on New Zealand beef. As part of the FTA, a CSTQ will be added which allows some New Zealand beef to be imported into the UK, duty free. Any additional beef exported by New Zealand to the UK over and above the CSTQ, is assumed to first enter under the WTO CSTQ, and then enter at the out-of-quota tariff rate of 75.0 percent. We assume that New Zealand's access to the WTO CSTQ does not change and it is added to the CSTQ provided under the FTA, hence the supply curve (orange line in Figure II- 2) shifts right.

The FTA CSTQ is therefore treated as a 'soft' quota in the model, where the average tariff applied on UK beef imports from New Zealand is a weighted share of the FTA CSTQ in-quota tariff of zero percent and the WTO CSTQ in-quota tariff (20.0 percent). The weights are based on the quantity of imports obtained from the model that fall under the FTA CSTQ and the WTO CSTQ respectively, assuming the WTO CSTQ is fixed at the initial level in the data. If demand for imports reaches enough to fill the WTO CSTQ quota (as was the case in the baseline), then rents rise to prohibit further increases in imports, as long as the out-of-quota tariff remains prohibitive or the safeguards are initiated. Figure II- 2 also illustrates that the resulting expansion of trade from the removal of the TRQs will depend on the initial demand curves and the rents assumed.

Quotas on sheep, butter and cheese are treated in a similar way, except that in these cases, the WTO quotas were under-filled in the baseline, hence quota rents were assumed to be zero. The in- and out-of-quota tariff rates, as well as any changes in those rates and the quotas under the NZ-UK FTA are outlined in Section 2.3.2.

Figure II- 2 Implementation of multiple quotas on beef under the NZ-UK FTA
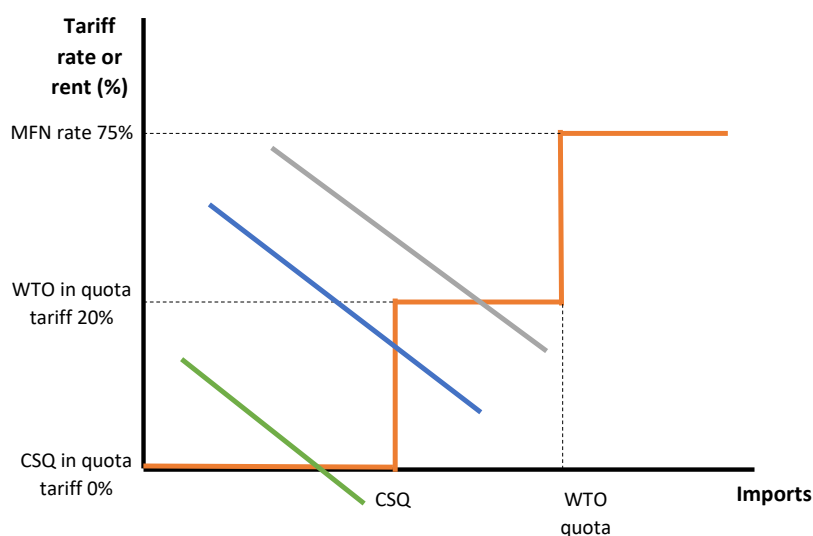
Source: Authors' construction

Additional assumptions on beef and cattle

A number of additional assumptions were made in an attempt to capture the complexities of beef production and improve the modelling of the removal of tariffs and the quota on New Zealand exports of beef to the UK. We assumed that:

— the supply of land was very sluggish between sectors[36] and hence land did not move between agricultural sectors, and specifically into the cattle and sheep sector to raise production;

— cattle production could not be increased by resorting to more capital equipment or labour (i.e., reduced substitutability between value added for cattle and sheep production);

— imported cattle & sheep or beef & sheep meat could not be used instead of domestic varieties in the production of beef & sheep meat (i.e., the top level Armington elasticity between domestic and imported varieties for the beef & sheep sector was reduced); and

— the production of beef & sheep was fixed.

These assumptions were made to help address two issues. First, New Zealand's environmental concerns about increased cattle production and land use in cattle production; and second, while we separated exports of beef from exports of sheep meat, the GTAP Data Base does not separate the production of cattle and sheep, or that of beef and sheep meat. These assumptions ensure that a) there is no transhipment of beef from Australia to the UK, through New Zealand; and b) there is a limit on the extent to which sheep can shift from sheep meat and wool production to beef production.

---

[36] Parameter used in GTAP to reflect supply of land across sectors was reduced to (almost) zero.

Appendix III Detailed Sectoral Results

Table III- 1 Simulated impact on New Zealand aggregated sectoral production, exports and imports decomposed by policy instrument, 2040 (cumulative differences from baseline, NZ$ million and percent)

	Common		Scenario 1			Scenario 2		
	Tariffs	**Quotas**	**Goods NTMs**	**Services NTMs**	**Trade facilitation**	**Goods NTMs**	**Services NTMs**	**Trade facilitation**
P R O D U C T I O N (P E R C E N T)								
Agriculture	0.02	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
Processed food	0.11	-0.03	0.03	0.00	0.00	0.07	0.01	0.00
Manufactures	0.04	-0.07	0.00	0.01	0.00	0.01	0.03	-0.00
Services	0.04	0.02	0.01	0.00	-0.00	0.02	0.01	-0.00
P R O D U C T I O N ($ N Z M)								
Agriculture	18	-10	0	1	0	-0	2	0
Processed food	128	-35	37	4	-0	75	8	1
Manufactures	85	-143	8	29	-0	20	58	-2
Services	374	224	56	40	-7	137	71	-17
E X P O R T S (P E R C E N T)								
Agriculture	0.12	-0.05	-0.01	-0.00	0.00	-0.01	-0.01	0.00
Processed food	0.17	0.43	0.05	0.00	0.00	0.1	0.01	0.00
Manufactures	0.16	-0.15	0.02	0.02	0.00	0.03	0.04	0.00
Services	0.00	-0.11	-0.00	0.09	0.00	-0.00	0.18	0.00

	Common		Scenario 1			Scenario 2		
	Tariffs	Quotas	Goods NTMs	Services NTMs	Trade facilitation	Goods NTMs	Services NTMs	Trade facilitation
				EXPORTS ($NZM)				
Agriculture	13	-6	-1	-1	0	-2	-1	0
Processed food	125	319	37	2	0	74	4	1
Manufactures	95	-92	9	12	0	17	23	1
Services	1	-31	-0	26	0	-0	54	0
				IMPORTS (PERCENT)				
Agriculture	0.25	0.00	0.03	0.01	0.00	0.05	0.02	0.00
Processed food	0.25	0.18	0.02	0.00	0.00	0.04	0.00	-0.00
Manufactures	0.12	0.04	0.01	0.00	-0.00	0.03	0.00	-0.00
Services	0.04	0.10	0.01	0.12	-0.00	0.02	0.25	-0.00
				IMPORTS ($NZM)				
Agriculture	8	0	1	0	0	2	0	0
Processed food	31	22	2	0	0	5	0	-0
Manufactures	162	59	19	4	-2	43	6	-4
Services	13	33	2	42	-0	6	85	-1

Source: Authors' model results.

Table III- 2 Simulated impact on New Zealand sectoral production, 2040 (cumulative differences from baseline, NZ$ million and percent)

	Percent		$NZm	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
A G R I C U L T U R E & U N P R O C E S S E D F O O D				
Fruit & Veg	0.04	0.04	5	6
Other Crops	0.03	0.04	1	1
Raw Milk	-0.01	-0.01	-4	-4
Cattle & sheep	0.00	0.00	0	0
Other Animals	0.19	0.19	10	11
Wool	-0.21	-0.22	-3	-3
Fisheries	0.00	0.00	0	0
P R O C E S S E D F O O D				
Beef & Sheep meat	0.00	0.00	0	0
Other Meats	-0.67	-0.65	-31	-30
Dairy	-0.04	-0.05	-21	-22
Rice, Sugar and & oils	1.01	1.03	50	51
Processed Foods	-0.09	-0.08	-21	-20
Beverages & Tobacco	0.92	1.15	158	199
M A N U F A C T U R E S				
Forestry & Wood	0.01	0.03	2	5
Extractive	-0.00	0.00	0	0
Textiles	-0.03	-0.00	0	0
Apparel	0.20	0.22	5	6
Leather	0.31	0.34	2	2
Paper Products	0.03	0.05	4	6
Motor Vehicles	-0.09	-0.10	-3	-3
Electronics	-0.06	-0.03	-6	-3
Other Machinery	-0.17	-0.13	-23	-18
Other Manufactures	0.01	0.06	1	4
Chemicals, Rubbers and Plastics	-0.04	-0.03	-13	-9
Mineral & metal products	-0.04	-0.02	-11	-5
Metals	0.05	0.08	20	32
S E R V I C E S				
Construction	0.09	0.11	135	161
Business and Financial services	0.07	0.07	192	202
Transportation	0.04	0.06	22	33
Trade & Communications	0.07	0.08	104	127
Public services	0.07	0.08	111	121
Other Services	0.10	0.12	123	143

Source: Authors' model results