Department for
International Trade

Technical annexes for the Scoping Assessment for UK accession to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP)

June 2021

Introduction

These technical annexes describe the methods used to undertake the analysis presented in the Scoping Assessment for the Comprehensive and Comprehensive Agreement for Trans-Pacific Partnership (CPTPP) and their limitations.

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Annex 1 – Description of computable equilibrium modelling

The macroeconomic analysis in the scoping assessment uses the UK government Computable General Equilibrium (CGE) model, GETRADE. The model is based on the standard GTAP model and GTAP 10A dataset (referenced to 2014 as the base year). The GTAP model and dataset is one of the most widely used tools for international trade analysis; however, it has well known limitations. For a more detailed discussion please see pages 46-47 of the Scoping Assessment.

In addition, the latest available GTAP dataset draws on data from 2014. This means that changes in the pattern of trade between 2014 and today are not fully reflected in the estimates.

The following section highlights key features and assumptions underpinning the model. For a full technical description of the model and dataset please see the original model documentation.[1]

Model Features:

The model captures two key drivers of international trade:

• Ricardian comparative advantage – the gains from trade arising from specialisation across countries

• Armington varieties – using a variety of imported inputs in intermediate production can help firms lower production costs creating gains from trade

The model does not capture dynamic effects, for example on productivity or reductions in resource misallocation across heterogeneous firms.

1.1 Key assumptions on model structure

The model is based upon a set of structural assumptions describing the interactions between agents in the domestic economy, and the trade linkages between different nations and regions, including:

• full employment of labour and capital: In the long run the economy would have time to adjust to new trade policy and displaced workers would be reallocated to jobs in other sectors.[2] The model assumes a fixed labour supply;

• perfect labour mobility between sectors in the same country but not between skill type or different countries;

• countries are linked only via trade in goods and services, there are among others no migration or international capital flows. The primary trade policy levers impacting these links are tariffs, non-tariff measures and regulatory restrictions on services;

• the full employment closure rule is a common assumption employed in CGE modelling. The assumption means that the overall level of equilibrium employment in the long-run (once the economy has adjusted to the agreement) is not affected by the Free Trade Agreement (FTA), but workers experience gains due to increases in wages due to higher productivity and by moving across sectors.

The analysis covers the following regions: UK, CPTPP11, South Korea, Thailand, USA, EU27, the Pacific Islands, Least Developed Countries (LDCs) and the rest of the world. A total of 61 sectors have been modelled, but these sectors are aggregated up to 23 sectors for presentational purposes.

The specification of the CGE model used for CPTPP is based on the standard GTAP model, which relies on an Armington trade theory specification. The Armington specification is used as a base for most CGE models around the world, including the external model used in the department's Japan scoping assessment and impact assessment. Some examples of FTA publications which are modelled using an Armington trade specification include the USITC's TPP CGE assessment (2016), the EU Commission's Impact Assessments for Australia and New Zealand (2017) and the Canadian Government's CPTPP CGE assessment (2018). However, the department's previously published scoping assessments for the US, Australia and New Zealand, use a 'new trade theory' specification resembling a Melitz-style model.[3]

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1 Lanz and Rutherford (2016), "GTAP in GAMS: Multiregional and Small Open Economy Models".
2 As argued by Petri and Plummer (2017:10), the assumption is used in most applied models of trade agreements.
3 See "EU Exit: Long-term Economic Analysis Technical Reference" paper (link) for detailed description of previously used model.

Under the Melitz-style model specification used for previous scoping assessments, the size of FTA impacts have been found to be highly sensitive to the choice of a key scaling factor which determines the size of the supply response for firms who export.[4] The size of this factor would have been particularly important for estimating the impact of UK accession to CPTPP due to the number of countries and variables. The absence of peer reviewed articles and research using this scaling factor means there is no strong empirical or theoretical basis to select a particular value. The choice to use the Armington specification of the model ensures it relies on parameters more routinely used by trade modellers and academics.

This use of the Armington model specification rather than the Melitz-style model specification affects the estimated scale of impacts. Specifically, it generates larger estimated GDP impacts for a given FTA. The use of this Armington model specification, along with updates to the databases and estimations of trade barrier reductions, means that the scale of impacts in this scoping assessment are not directly comparable to those presented in the published scoping assessments for the US, Australia, and New Zealand.

They are also not comparable to those presented in the scoping and impact assessments for Japan. The Japan modelling carried out by Professor Joe Francois used an Armington specification but differed from this model in a number of ways. Among other things, it included projected economic growth and allowed for international capital flows.

1.2 Monte Carlo analysis

The scoping assessment presents ranges around central point estimates of GDP and welfare which are generated by a Monte Carlo statistical process. The ranges are based on 90% confidence intervals meaning that, after accounting for the variation in these parameters, there is a 90% probability that the true value is within the range. The process is similar to that used in previously published Scoping Assessments but omits model parameters not relevant to the model specification used in this publication and does not account for uncertainty arising from the baseline, which is typically founded to be small.

A summary of the parameters varied is provided below (table 2).[5]

Table 2: Summary of parameters

Parameter	Definition	Distribution used	Range of values
UK-FTA partner NTMs	Estimated NTM levels on UK-FTA partner trade (AVE)	Normal	Standard deviations of 0.5 times the central estimate
Technical and rent generating NTM ratio	Ratio of NTMs assumed to be efficiency-reducing or rent-generating	Uniform	55:45 – 85:15 (midpoint 70:30)

Source: DIT (2021)

1.3 Sector aggregations

Table 3 shows how the sectors provided in the source data (GTAP 10A) are grouped together for the purposes of the presentation in the Scoping Assessment.

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4 The scaling factor ETA is the export supply elasticity in the GETRADE model and is one of the two key parameters required to estimate ETAv. ETAv is the elasticity of substitution between sector specific capital and all other inputs and is required to solve the model.
5 For further detail on the parameters common to both this analysis and EU exit, see HMG's publication on EU Exit: Long-term Economic Analysis (HMG, 2018).

Table 3: Sector grouping

Sector Group	Sector Name	Description
Agri-food	Agriculture	Sugar cane, sugar beet; Bovine cattle, sheep and goats, horses; Forestry; Fishing; Cereal grains nec; Animal products nec; Crops nec; Oil seeds; Processed rice; Paddy rice; Plant-based fibers; Raw milk; Vegetables, fruit, nuts; Wheat; Wool, silk-worm cocoons
	Beverages and tobacco products	Beverages and tobacco products
	Semi-processed foods	Bovine meat products; Dairy products; Meat products nec; Sugar; Vegetable oils and fats
	Processed foods	Food products nec
Industry	Chemical, rubber, plastic products	Basic pharmaceutical products; Chemical products; Rubber and plastic products
	Electronic equipment	Computer, electronic and optical products
	Energy	Coal; Electricity; Gas; Gas manufacture, distribution; Crude Oil; Other Extraction (formerly omn Minerals nec); Petroleum, coal products
	Manufactures of materials	Metal products; Ferrous metals; Wood products; Metals nec; Mineral products nec
	Motor vehicles and parts	Motor vehicles and parts
	Other machinery and equipment	Manufacture of electric equipment; Machinery and equipment nec
	Other manufacturing	Manufactures ne
	Other transport equipment	Transport equipment nec
	Paper and printing products	Paper products, publishing
	Textiles, apparel, and leather	Leather products; Textiles; Wearing apparel
Services	Business services	Business services nec; Real estate activities
	Communications	Communication
	Construction	Construction
	Financial Services	Financial services nec
	Insurance	Insurance
	Other services (transport, water, dwellings)	Air transport; Dwellings ; Transport nec; Warehousing and support activities for transportation; Water transport; Water
	Personal services	Recreational and other services
	Public services	Public administration, defense, education, health
	Wholesale and retail trade	Accommodation, Food and service activities; Trade

Source: DIT (2021)

1.4 Moving from percentages to pound figures

The results presented throughout the scoping assessment have been expressed in 2019 pound values. They are derived from the modelling outputs which are expressed in percentage change terms. The methods applied to convert the percentage figures to pound values are detailed in table 1 below.

However, there are important limitations of using the illustrative pound values. While pound values allow us to contextualise results in terms relatable to today's economy, modelling estimates give changes relative to a baseline. Future changes to the economy (for example inflation) could mean the 2019 pound values no longer correspond to the size of the modelled estimates.

Table 4: Method for converting CGE modelling %'s into 2019-pound values.

Key Metric	Data Used	Method
GDP	IMF World Economic Outlook, April 2021, GDP in current prices.	Translated the $ value into £ for UK GDP and multiply this value by the percentage change impact from the CGE modelling.
Total Trade (Exports and Imports)	ONS UK total trade: all countries, non-seasonally adjusted (May 2021 release)	Multiply UK's total exports, and imports by the CGE modelling's percentage change impact for the UK's exports and imports to and from the world.
Trade with CPTPP members (Exports and Imports)	ONS UK total trade: all countries, non-seasonally adjusted (May 2021 release)	Calculate the UK's total exports and imports with CPTPP member countries. Multiply these values by the percentage impacts for trade with CPTPP members from the CGE modelling.
Wages	ONS, UK sector (S.1): Wages and salaries (D.11): Resources: Current price: £million: Not seasonally adjusted (March 2021 release).	
	Multiply the 2019 value for wages and salaries in the UK by the CGE modelling % for wages.	
Welfare	OECD GDP data, in US dollars[6]	Calculated a GDP deflator using 2019 and the year the modelling is based off 2014 data, (GDP 2019/GDP 2014). Obtained a conversion rate for $ into £. Multiplied this conversion value by the deflator to get the multiplier. Then multiplied the $ value for the impact on welfare for CPTPP 11 by this multiplier to get the pound value for 2019.
GVA by region	ONS, Regional GVA in 2017 terms.	See Annex 3 for the methodology for UK Regions
Household spending	Quarterly National Accounts, Q4 (October to December 2020), values for 2019.	Multiplied the 2019 value for final household consumption by the percentage for consumption expenditure from the CGE Modelling results.
Business investment	Quarterly National Accounts, Q4 (October to December 2020), values for 2019.	Multiplied the 2019 value for gross capital formation, of which business investment by the percentage for investment from the CGE modelling results.

1.5 Key results in percentage terms

Table 5: Summary of UK macroeconomic impacts, long run change on baseline, in % terms

Results from CGE model	Scenario 1 - Current CPTPP Membership	CPTPP 13 (CPTPP 11 + Thailand + South Korea)	CPTPP 14 (CPTPP 11 + Thailand + South Korea + USA)
	% Change (CGE Modelling)	% Change (CGE Modelling)	% Change (CGE Modelling)
Change in GDP	0.08%	0.25%	0.25%
Change in UK exports to CPTPP	2.98%	4.36%	2.10%
Change in UK imports from CPTPP	2.96%	7.16%	3.34%
Change in total UK exports	0.29%	0.58%	0.57%
Change in total UK imports	0.24%	0.43%	0.43%
Change in welfare	0.08%	0.28%	0.28%
Change in wages	0.09%	0.21%	0.21%

Source: DIT Modelling (2021)

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6 OECD Data for GDP, Accessed April 2021 (https://data.oecd.org/gdp/gross-domestic-product-gdp.html)

Table 6: Long run impact on welfare and GDP, in percentage terms, Monte Carlo Analysis

Confidence interval percentage	Welfare (% Change)	GDP (% change)
Upper 90%	0.11%	0.10%
Upper 70%	0.10%	0.09%
Upper 50%	0.09%	0.09%
Central estimate	0.08%	0.08%
Lower 50%	0.07%	0.07%
Lower 70%	0.07%	0.07%
Lower 90%	0.06%	0.06%

Table 7: Long-run changes in GDP in full range of baseline scenarios modelled, in % terms

FTAs Assumed in Baseline	CPTPP 91	CPTPP 112	CPTPP 133	CPTPP 144
AUS/NZL/USA	0.02%	0.08%	0.25%	0.26%
USA	0.10%	0.16%	0.34%	0.34%
AUS/NZL	0.02%	0.08%	0.26%	0.92%
None	0.10%	0.16%	0.34%	1.00%

Source: DIT Modelling (2021)

Annex 2 – Derivation of modelling inputs

This section outlines the method used to estimate the inputs used in the modelling.

2.1 Tariff inputs

Assumed tariff reductions on UK imports

Full tariff elimination is assumed in the majority of sectors and 75% tariff elimination in some sectors.[7] The assumptions for specific CPTPP members are set out below.

1. For long standing FTA partners including Chile, Mexico, and Peru

> Baseline – GTAP tariffs are used as they already incorporate FTAs in place. The lower of GTAP and UKGT tariffs is applied for each product line

> Scenario – Minimum of CPTPP and baseline applied for each product line

2. For recent FTA partners, including Canada, Japan, Singapore, South Korea and Vietnam

> Baseline – GTAP data updated to reflect new FTAs. Generally full tariff elimination with few exceptions

> Scenario – Minimum of CPTPP and baseline applied for each sector

3. For Current MFN partners with FTAs under negotiation (Australia, New Zealand and US)

> These FTAs are still under negotiation, and it was assumed that CPTPP will offer no tariff liberalisation beyond bilateral deals

> Baseline – Lower of CPTPP tariffs and UKGT

> Scenario – Same as baseline

4. For current MFN Partners (Brunei, Malaysia, and Thailand)

> Baseline – UKGT tariffs

> Scenario – Lower of CPTPP tariffs and UKGT

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7 These are selected to be consistent with AUS/NZL/USA Scoping Assessments. Sensitive sectors are paddy/processed rice, wheat, cereal grains, vegetables and fruits, sugar (incl. sugar cane and beet), bovine cattle, sheep and goats, milk and dairy products, bovine meat products.

Assumed tariff reductions on UK exports

Full tariff elimination is assumed in most sectors and 85% tariff elimination in CPTPP in some sectors.[8] 85% is assumed rather than 75% in order to assume the same liberalisation when expressed as a percentage of implied tariff revenue loss. Where existing FTAs are in place, the lower of the CPTPP tariff and the FTA tariff is taken as the final tariff. The assumptions for specific CPTPP members are set out below.

1. For long standing FTA partners (Chile, Mexico and Peru)

> Baseline – GTAP tariffs used as they already incorporate FTAs in place

> Scenario – First, CPTPP tariff offer is calculated using respective countries MFN Next, the lower of CPTPP offer and GTAP tariff is applied to each sector

2. For recent FTA partners (Canada, Japan, Singapore, South Korea, and Vietnam)

> Baseline – Baseline needs to be adjusted to reflect these FTAs

> Scenario – First, CPTPP tariff offer is calculated using respective countries' MFN Next, the lower of CPTPP offer and preferential tariff (that is, baseline tariff) is applied to each sector

3. For current MFN partners with FTAs under negotiation (Australia, New Zealand and US)

> These FTAs are still under negotiation it was assumed that CPTPP will offer no tariff liberalisation beyond bilateral deals.

> Baseline – Lower of CPTPP tariffs and MFN (GTAP)

> Scenario – Same as baseline

4. For current MFN Partners (Brunei, Malaysia, and Thailand)

> Baseline – GTAP tariffs

> Scenario – Lower of GTAP tariffs and assumed CPTPP tariff offensive schedule

2.2 Inputs for Non-tariff Measures (NTMs) for Goods and Services

NTMs and regulatory restrictions to services are any policy measures that can influence trade by changing what can be traded, and at what price. Even though NTMs and regulatory restrictions to services can serve legitimate policy objectives, these can increase the cost of trade and therefore reduce trade.

NTMs and regulatory restrictions to services can be hard to observe and are often wide-ranging, resulting in difficulties in estimating the costs they place on businesses. This assessment provides estimates of the inputs used in the modelling – expressed in ad valorem equivalent terms, that is in terms of the tariff that would create a similar cost to the measure or restriction – using a gravity model which assesses the patterns of trade between 121 countries for 30 sectors for the years 2004, 2007, 2011, and 2014.

2.2.1 Econometric Inputs for Goods Sectors

The Design of Trade Agreements (DESTA) database is used to consider the depth of the CPTPP agreement in the gravity model. The DESTA database includes a ranking of historic FTAs, which are sorted into seven categories of ambition based on the coverage of the FTAs. This data is included in gravity modelling for goods sectors to estimate the impact of differences in FTA ambition on NTM levels. This is shown in the equation below as $DESTA_{ijt}$. CPTPP has a DESTA score of 7, which is the maximum score.

To account for asymmetric impacts between trading partners, we include in the regression an estimate of the AVE MFN level of NTMs, interacted with the DESTA variable. This gives the interpretation of β_3 in the regression below as being the impact of the FTA ambition for a given level of NTMs. These MFN NTMs are estimated econometrically within the same framework using the methodology of Fontagne et al. (2011).

The specification for the model used is shown below, where y_{ijt} is bilateral trade, π_{it} and $_{jt}$ are sets of exporter-time and importer-time fixed effects respectively, and $_{ijt}$ is a vector of standard gravity resistance variables. GDP_{jt} is importer GDP which is included with a coefficient constrained to unity. Also included are dummy variables for EU and EEA membership and a measure of tariff barriers, which is necessary to ensure the interpretation that gains from the DESTA variable occur due to NTM changes.

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8 CPTPP sectors that are assumed not to be fully liberalised are all agricultural sectors except for Beverages and Tobacco and Other Food sectors.

$$y_{ijt} = \exp\big(\beta_1 EU_{ijt} + \beta_2 EEA_{ijt} + \beta_3 DESTA_{ijt} AVE_{jt} + \beta_4 \ln(Tariff_{ijt}) + GDP_{jt} + \delta_{ijt} + \pi_{it} + \omega_{jt} + \varepsilon_{ijt}\big)$$

2.2.2 Econometric Inputs for Services Sectors

Our approach to derive NTM inputs for services sectors follows the approach of Ciuriak (2018)'s analysis of the CETA FTA.

MFN NTM estimates are obtained using the methodology of Fontagne et al (2011), which estimates NTMS from importer-time fixed effects that capture the relative restrictiveness of importing countries that cannot be attributed to other barriers.[9] For more details on the methodology please see the original paper.

The specification for the model used is shown below where π_it and ω_jt are sets of exporter-time and importer-time time trends respectively, and δ_ijt is a vector of standard gravity resistance variables. GDP_jt is importer GDP which is included with a coefficient constrained to unity in line with standard results of the literature. Also included are dummy variables for EU and EEA membership, a measure of tariff barriers, and a dummy variable indicating the presence of an FTA between trading partners.

$$y_{ijt} = \exp\big(\beta_1 EU_{ijt} + \beta_2 EEA_{ijt} + \beta_3 FTA_{ijt} + \beta_4 \ln(Tariff_{ijt}) + GDP_{it} + \delta_{ijt} + \pi_{it} + \omega_{jt} + \varepsilon_{ijt}\big)$$

Once NTM levels have been estimated for each country in the dataset, we follow the literature in assuming that 1/3 of NTMs are "actionable" that is the maximum level of barriers that could be removed by the FTA is assumed to be 1/3 of their current levels.

The actual assumed reduction that is inputted into the model is determined using the OECD Services Trade Restrictiveness Index (STRI), which is a composite index that provides a score for the restrictiveness of services trade for a given country for each of 22 sectors.

As shown by Ciuriak (2020)[10] the benefits of services liberalisation can come both from 'applied liberalisation' (liberalisation in the actual restrictions affecting services trade) or through 'bound liberalisation' (commitments to maintain liberalisation at a given level in the future, thus providing greater certainty for business). As a result, the NTM reduction is adjusted not just for the reduction in STRI levels but also by a lesser degree by the reduction in the distance between the upper bound of restrictiveness countries could reach if they chose to (previously the terms of the GATS schedule that countries committed to and now the FTA) and actual STRI levels. For more details please see the original paper.

The STRI is calculated based on FTA provisions to derive an estimate for CPTPP and for baseline FTAs. For the new bilateral FTAs that the UK is negotiating with some CPTPP members, the STRI coding reflecting CPTPP terms is used for both the baseline and the scenario. The interpretation of GATS commitments and their mapping to the STRI are based on legal and policy judgments made by the LSE and are outlined in Annex 7.

The section below summarises all the tariff and NTM reduction estimates under the core scenario, CPTPP 11.

2.2.3 NTM input scenarios

UK import NTMs Inputs for different sets of countries within CPTPP:

1. For long standing FTA partners including Chile, Mexico, and Peru

> Baseline – No NTM adjustments

> Scenario –Change from current DESTA score to CPTPP DESTA score of 7 for goods sectors. Change from EU FTA STRI to CPTPP STRI used for service sector.

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9 Where Fontagne et al (2011) use a constraint of 0.8 to reflect a perspective that the income elasticity of imports is less than unity, we change this to unity to reflect the perspective of the wider gravity modelling literature.
10 Ciuriak, D., Dadkhah, A. Lysenko, D. The Impact of Binding Commitments on Services Trade, World Trade Review , Volume 19 , Issue 3 , July 2020 , pp. 365 - 378

2. For recent FTA partners, including Canada, Japan, Singapore, South Korea and Vietnam

> Baseline –NTMs are adjusted for new FTA using FTA's DESTA score taken from DESTA database for goods sectors. For services sectors, EU FTA STRI are used to calculate the proportion of MFN barriers in place

> Scenario – Change from current DESTA score to DESTA=7 for goods sectors.

Change from EU FTA STRI to CPTPP STRI for service sector

3. For Current MFN partners with FTAs under negotiation (Australia, New Zealand and US)

> Baseline – The new FTAs are assumed to have a DESTA score of 7, NTMs are adjusted accordingly for goods. For services, New FTA STRI is assumed to have services preferential terms comparable to CPTPP average across CPTPP members

> Scenario – No further reduction

4. For current MFN Partners (Brunei, Malaysia, and Thailand)

> Baseline – No adjustment

> Scenario – MFN rates are adjusted using a DESTA score of 7 for goods sectors in line with the DESTA database and the CPTPP STRI score is used to calculate service NTM reductions relative to MFN STRI

UK export NTMs Inputs for the different sets of countries within CPTPP:

1. For long standing FTA partners including Chile, Mexico, and Peru

> Baseline – No adjustment. Mexico treated as MFN if not rolled over

> Scenario – Change from current DESTA score to CPTPP DESTA score of 7 for goods sectors. Change from average EU FTA STRI to CPTPP STRI used for service sector

2. For recent FTA partners, including Canada, Japan, Singapore, South Korea and Vietnam

> Baseline – Pre-existing DESTA score taken from DESTA database and AVEs calculated using results from gravity modelling

> Scenario – Change from current DESTA score to CPTPP DESTA score of 7 for goods sectors

Change from average EU FTA STRI to CPTPP STRI used for service sector

3. For Current MFN partners with FTAs under negotiation (Australia, New Zealand and US)

> Baseline – Baseline – DESTA score of 7 assumed for goods. Services preferential terms comparable to CPTPP average for US and to CTPPP actual estimated scores for Australia and New Zealand

> Scenario – No further reduction

4. For current MFN Partners (Brunei, Malaysia, and Thailand)

> Baseline – No adjustment

> Scenario – On goods, DESTA score of 7 is assigned for CPTPP in line with its information in the dataset. On services, CPTPP actual estimated preferential scores applied for Brunei and Malaysia and an average is used for Thailand.

Annex 3 – Method for assessment of impacts on the nations and regions of the UK

3.1 Data and method

The estimated impacts on the GVA of the nations and regions of the UK are produced by apportioning the changes in UK-wide Gross Value Added (GVA) for each sector from the CGE modelling to the NUTS-1 regions and nations of the UK.[11]

This is done by weighting the UK wide change to each sector's output from the CGE modelling (denoted as UK Impact below) by the share of the sector's GVA that is produced in each region. This is then summed across all sectors to calculate the overall impact for each region:

$$Regional\ Impact_r = \sum_s^S Share\ of\ GVA_{rs} \times UK\ Impact_s$$

where r denotes NUTS 1 region and s denotes sectors.

This means that the estimated impact for region (denoted as Regional Impact) is the sum of national impacts weighted by the share of the sector that is located in the region.

However, this approach does not account for second-round effects of changes that could occur due to the concentration of industries in particular regions. Therefore, in an additional step, the approach multiplies the shock by the each sector's location quotient in each region as below (see box 1 for an explanation of how the location quotients are calculated). The sectoral changes are constrained to ensure the overall change in a sector matches the sectoral change from the CGE results.

$$Regional\ Impact_r = \sum_s^S Share\ of\ GVA_{rs} \times UK\ Impact_s \times Location\ Quotient_{rs} \times Constraint_s$$

where r stands for NUTS 1 region and s stands for sector.

Weighting by the location quotient amplifies positive and negative UK regional results, but for most nations and regions the difference is small. To take into account the uncertainty with both methods, the scoping assessment presents estimates reflecting the mid-point for each nation and region between the two approaches.

Box 1: Location quotient

Location quotients are used to reflect how concentrated or specialised a sector is within a given nation or region. The location quotient is calculated by dividing a sector's employment share in a region by the employment share in the UK. A value of 1 indicates that that an industry's share of employee jobs in the region is the same as its share of employee jobs nationally. A value greater than 1 means that the industry makes up a larger share of employee jobs in the region than at the national level (that is, the nation or region is particularly specialised in a sector). For example, Northern Ireland has a location quotient of 4.61 for semi-processed foods, meaning the share of jobs in the semi-processed foods sector in Northern Ireland is over four times the share of jobs in the sector in the UK as a whole.

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11 NUTS-1 regions of the UK are used. These include Northern Ireland, Scotland, Wales and nine English regions. Further information on the NUTS-1 classification can be found at "The establishment of a common classification of territorial units for statistics (NUTS), Eurostat 2018

Table 8 - Specialisation of sectors across the 12 NUTS 1 regions of the UK (using location quotient approach)[12]

GTAP sectors	Region											
	North East	North West	Yorkshire and The Humber	East Midlands	West Midlands	East of England	London	South East	South West	Wales	Scotland	Northern Ireland
Agriculture, forestry, and fishing	0.47	0.58	0.79	1.38	1.14	1.36	0.03	1.16	1.38	1.55	2.22	2.27
Semi-processed foods	0.34	0.92	2.25	2.01	1.32	1.25	0.16	0.23	1.45	1.55	1.03	4.61
Other processed foods	0.86	1.27	1.90	2.25	0.67	0.78	0.50	0.55	0.80	1.41	1.16	1.16
Beverages and tobacco products	0.47	0.55	1.37	0.89	1.39	0.92	0.84	0.39	0.66	1.02	2.91	0.78
Energy	1.30	0.75	0.73	1.69	0.92	0.51	0.37	0.89	0.93	1.10	3.03	0.73
Textiles, apparel, and leather	0.83	1.49	1.81	3.07	0.86	0.47	0.46	0.41	0.72	0.64	1.21	1.18
Manufactures	1.60	1.14	1.72	1.58	1.83	0.82	0.14	0.66	0.83	1.72	0.87	1.29
Paper and printing products	0.67	0.85	1.01	1.09	0.68	1.21	1.48	1.00	0.79	0.97	0.58	0.70
Chemical, rubber, plastic products	1.69	1.56	1.32	1.89	1.10	1.14	0.16	0.76	0.88	1.33	0.75	1.35
Manufacture of motor vehicles	2.73	1.35	0.81	0.84	3.81	0.31	0.15	0.66	0.63	1.71	0.27	0.98
Manufacture of other transport equipment	0.82	1.45	0.34	2.15	0.58	0.90	0.17	0.72	2.46	1.85	1.02	1.75
Manufacture of electronic equipment	0.98	0.71	0.38	1.01	0.81	1.51	0.15	1.84	1.71	1.26	1.16	1.53
Manufacture of machinery and equipment n.e.c	1.86	1.01	1.28	1.37	1.57	1.29	0.18	0.87	1.18	0.83	0.96	1.19
Manufacturing n.e.c	0.63	1.05	1.93	1.68	1.41	0.87	0.35	0.98	0.94	1.24	0.66	0.99
Other services (transport, water, dwellings)	0.81	1.05	1.07	1.09	1.15	1.04	1.08	0.99	0.83	0.65	0.86	0.74
Construction	0.92	0.99	1.00	0.91	0.90	1.13	0.83	1.14	1.10	0.87	1.18	0.94
Wholesale and retail trade	1.02	1.00	1.01	1.02	1.04	1.04	0.86	1.05	1.14	0.95	0.97	1.07
Communications	1.34	1.03	0.83	0.48	0.66	0.87	1.08	1.56	0.82	0.80	1.09	0.71
Financial services	0.69	0.80	0.93	0.52	0.61	0.65	2.14	0.77	0.99	0.54	0.92	0.74
Insurance	0.60	0.97	0.30	0.19	0.87	1.04	1.12	1.24	1.05	2.06	1.42	0.47
Business services	0.78	0.94	0.88	0.86	0.88	1.10	1.43	1.00	0.84	0.77	0.80	0.65
Personal services	0.79	0.95	0.74	0.72	0.90	0.97	1.34	1.07	0.91	1.03	1.02	0.79
Public services	1.17	1.03	1.02	0.98	0.99	0.92	0.86	1.01	1.02	1.23	1.12	1.21

Source: DIT calculations using Business Register and Employment Survey, 2017 (ONS, NISRA).

12 The SIC-GTAP concordance has been updated for this analysis. SIC industries 1081,1083 and 1084 are not publicly available in NISRA BRES data for reasons relating to statistical disclosure control. As a result, these sectors are not included for Northern Ireland in this analysis. However, this has no bearing on results.

The table below outlines the results of regional modelling in percentage terms.

Table 9: Indicative change in regional value added, long-run % changes, assuming 2017 prices.

Regions	CPTPP 11
	Indicative GVA Impact, %
North East	0.09%
North West	0.08%
Yorkshire and The Humber	0.08%
East Midlands	0.09%
West Midlands	0.13%
East of England	0.08%
London	0.08%
South East	0.08%
South West	0.08%
Wales	0.08%
Scotland	0.12%
Northern Ireland	0.11%

3.2 Limitations

The aim of the analysis is to provide a high-level overview of potential UK regional impacts, using an intuitive analytical approach. The results are not forecasts.

The analysis relies on several simplifying assumptions and is subject to limitations, for example, it:

> is based on sector results at an aggregate level, so will not fully reflect differences in patterns of production across nations and regions of the UK

> does not explicitly consider the varying trade patterns of individual sectors across each part of the UK

> uses employment Location Quotients (ONS and NISRA) and GVA (ONS) data from 2017 to weight the apportionment of the national, sectoral GVA shock, which may not accurately reflect the structure of regional economies

> assumes the long- term structures of regional economies are consistent with employment location quotients calculated using 2017 Business Register Employment Survey data (ONS, NISRA)

> assumes that the sector GVA shock is the same for all regions that is, the CGE model provides only a UK-wide sectoral shock

> does not give any insight into how regions adjust to a new long-term equilibrium position.

> the modelling does not explicitly take account of any impacts arising from the Protocol on Ireland/Northern Ireland (to the Withdrawal Agreement)

Annex 4 – Distribution of Small and Medium Enterprises (SMEs) across sectors

4.1 Data and method

Small and Medium Enterprises (SMEs) are defined as:

> firms employing fewer than 50, and fewer than 250 employees respectively; and

> firms not exceeding either (a) £44 million in annual turnover or (b) an annual balance-sheet total of £38 million

BEIS Business Population Estimates (BPE) show that the concentration of SMEs varies markedly across sectors of the economy.[13] The BPE data – classified according to the Standard Industrial Classifications (SIC) – are mapped according to the sectors included in the modelling.

SMEs are present in all sectors of the economy, but four sectors – Construction, Business Services, Public Services, and Retail and Wholesale Trades – are estimated to make up over two-thirds of the total number of UK SMEs.

Table 10: SME Contributions to Business Activity by Sector

GTAP sector	Sectoral distribution of SMEs	SMEs Turnover by Sector (£m)	Estimated Contribution to Turnover (%)		
			Micro/Small	Medium	Large
Agriculture, forestry, and fishing	2.60%	42,650.0	80.97%	9.29%	9.74%
Energy	0.52%	34,442.2	14.89%	8.77%	76.34%
Semi-processed foods	0.36%	15,274.3	14.71%	18.06%	67.23%
Other processed foods	0.72%	30,548.6	14.71%	18.06%	67.23%
Beverages and tobacco products	0.24%	10,182.9	14.71%	18.06%	67.23%
Textiles, apparel, and leather	0.36%	15,274.3	14.71%	18.06%	67.23%
Manufactures	0.48%	20,365.7	14.71%	18.06%	67.23%
Paper and printing products	1.30%	32,871.7	23.82%	17.67%	58.52%
Chemical, rubber, plastic products	0.36%	15,274.3	14.71%	18.06%	67.23%
Manufacture of electronic equipment	0.12%	5,091.4	14.71%	18.06%	67.23%
Manufacture of machinery and equipment	0.84%	35,640.0	14.71%	18.06%	67.23%
Manufacture of motor vehicles	0.12%	5,091.4	14.71%	18.06%	67.23%
Manufacture of other transport equipment	0.60%	25,457.1	14.71%	18.06%	67.23%
Other Manufacturing	0.24%	10,182.9	14.71%	18.06%	67.23%
Other services (transport, water, dwellings)	8.74%	166,922.1	36.43%	14.48%	49.08%
Public services	16.11%	141,777.7	44.07%	14.41%	41.52%
Construction	16.61%	259,231.0	60.36%	12.84%	26.81%
Wholesale and retail trade	15.00%	867,912.0	35.89%	16.97%	47.14%
Personal services	9.39%	91,084.7	31.29%	12.92%	55.79%
Communications	1.06%	22,688.8	29.69%	17.41%	52.89%
Business services	22.69%	422,268.0	44.89%	17.24%	37.86%
Financial services	1.02%	£ -	-	-	-
Insurance	0.51%	£ -	-	-	-

Source: DIT Internal Analysis of BEIS Business Population Estimates (2020), no turnover data available for Financial or Insurance sectors

The data on sectors where SMEs are located are combined with the sectors where output is expected to change from the modelling. This provides a preliminary assessment of whether SMEs as a group are likely to be impacted disproportionately by the FTA.

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13 BEIS Business Population Estimates (BPE) combines a number of data sources on the business population (UK Business: Activity, Size and Location (ONS), Business Demography (ONS) and Small and Medium Enterprise Statistics (BEIS)) to generate holistic estimates for all active businesses, including sole-traders and unregistered businesses. See 'Economic & Labour Market Review Vol. 5, No. 4' 2011 (ONS). Please note in the turnover data, data is not available for Financial Services and Insurance sectors.

4.2 Limitations

The aim of the analysis is to provide an indication of whether the potential implications of long run changes to the sectoral composition of output are likely to exert a disproportionate impact on SMEs.

The preliminary analysis requires several simplifying assumptions and is subject to several limitations:

> this approach does not take into account whether SMEs may be more or less affected by changes in trade barriers than other businesses

> mapping the Standard Industrial Classifications to the sector aggregations used in the GTAP modelling requires several simplifying assumptions which could result in biases in the estimated distribution of SMEs across GTAP sectors

> BEIS BPE data captures data on unregistered and sole traders, however it does not allow for disaggregation between small and micro businesses and there is no available turnover data for Finance or Insurance sectors.

Annex 5 – Method of assessment of impacts on groups in the labour market

5.1 Data and method

This annex describes the data and method used to provide a preliminary assessment of the potential implications of accession for various groups in the labour market including sex, ethnicity, disability, and age.[14]

The international evidence suggest that trade agreements and trade liberalisation have the potential to affect various sectors of the economy and groups differently.[15] This is because consumption patterns and employment patterns can differ systematically across groups.

The CGE modelling provides estimates of the changes in share of overall employment accounted for by each sector of the UK economy resulting from accession. For the purpose of estimating potential impacts on different groups in the labour market, the analysis focusses on sectors in which employment changes by more than +/- 0.05% relative to the baseline.

The table below shows the proportion of the workforce in each sector that come from particular groups according to DIT analysis of the labour force survey (LFS).

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14 These characteristics are a subset of those protected under Equalities Act 2010. Other characteristics are not analysed due to a lack of data covering their demographics across sectors of the economy.
15 The characteristic that has been studied in the greatest depth is sex. (UNCTAD, 2017) uses a method similar and (OECD, 2018) extends this approach to look at how women are affected as a result of impacts to global value chains.

Table 11 - Proportion of employment by sector and protected characteristics[16]

GTAP Sector (23 Disaggregation)	Females	Disabled	Ethnic Minorities	Age (16-24)	Age (65+)
Agriculture, forestry, and fishing	27.39%	14.46%	1.42%	10.03%	18.29%
Semi-processed foods	31.26%	7.85%	12.07%	10.19%	2.62%
Other processed foods	37.93%	11.44%	14.99%	8.97%	2.08%
Beverages and tobacco products	26.47%	6.85%	5.82%	8.96%	1.21%
Energy	21.17%	10.07%	6.75%	8.46%	2.03%
Textiles, apparel, and leather	49.58%	11.63%	16.62%	9.67%	4.79%
Manufactures	16.42%	10.53%	5.02%	10.75%	4.02%
Paper and printing products	36.92%	12.11%	8.83%	7.12%	4.56%
Chemical, rubber, plastic products	32.40%	9.52%	8.03%	8.66%	2.43%
Manufacture of motor vehicles	13.04%	10.44%	9.09%	9.11%	2.44%
Manufacture of other transport equipment	13.17%	10.40%	4.69%	9.64%	2.55%
Manufacture of electronic equipment	30.43%	8.22%	10.88%	7.61%	2.75%
Manufacture of machinery and equipment n.e.c	18.68%	11.32%	6.08%	8.33%	3.33%
Manufacturing n.e.c	31.33%	12.14%	8.55%	8.00%	3.88%
Other services (transport, water, dwellings)	25.63%	12.19%	16.61%	7.69%	4.45%
Construction	12.41%	11.05%	5.53%	9.76%	3.72%
Wholesale and retail trade	48.38%	13.63%	14.17%	24.59%	3.49%
Communications	26.35%	11.45%	14.05%	9.46%	0.85%
Financial services	42.46%	9.26%	16.12%	8.26%	1.64%
Insurance	46.66%	10.25%	9.09%	11.76%	1.62%
Business services	40.16%	11.41%	13.60%	8.73%	4.52%
Personal services	54.78%	13.35%	9.11%	18.43%	5.11%
Public services	68.65%	13.76%	12.16%	7.55%	3.40%
Total	46.87%	12.56%	11.95%	11.89%	3.80%

Source: ONS 3-year Annual Population Survey (Mapped using an internal DIT GTAP-SIC mapping)

5.2 Limitations

The aim of the analysis is to provide an indication of the potential implications of long run changes in employment in various sectors for various groups. This provides a preliminary assessment as to whether the labour market impacts of the agreement may result in a disproportionate impact on specific groups.

The analysis is in line with international best practice in this area but requires several simplifying assumptions and is subject to several limitations.

> the data from the Annual Population Survey only allows descriptive analysis of where groups are employed in the economy, not inferential analysis of how groups or employers will respond to sectoral shocks. The analysis therefore cannot make inference about how groups will be impacted

> the analysis uses the available data sources to describe the characteristics of workers in sectors which are estimated to be affected by the agreement. It does not assess the welfare impacts of the trade agreements on various groups

> mapping the employment data which is recorded in the Annual Population Survey by Standard Industrial Classifications to the sector aggregations used in the GTAP modelling requires several simplifying assumptions which could result in inaccuracies in the estimated distribution of employment across GTAP sectors

> the proportions estimated here are based on a snapshot of the demographics. By only using the years available in the APS, the analysis does not consider trends that may be present in the proportions

> there is a potential problem of missing data in the APS. Employees in some groups, such as those with a disability, may be less likely to respond to the survey meaning that the data collected is not representative of the true employee demographics

> the analysis is based on the structure of the UK workforce from 2016-18.[17] Whereas the CGE modelling results reflect the global economy in the long run when the composition of the workforce may have changed.

Annex 6 – Method to assess impacts on UK CO2 emissions due to changes in UK production

6.1 Method and data

With reference to the literature on trade and the environment,[18] and using data from the ONS environmental accounts, the impact of increased production on environmental variables due to trade is broken down into three channels: the scale, the composition and the technique effects.

The estimated output changes from the CGE-based economic analysis are linked to ONS data to estimate the impact of production changes from a new trade agreement on two environmental outcomes: greenhouse gas emissions (CO_2 and Non-CO_2), and energy consumption from fossil fuels.

For each, the impact is decomposed into three effects:

1) Scale: The scale effect reflects environmental changes resulting from an expansion in economic activities resulting from the new trade policy, holding the existing economic structure constant

2) Composition: The composition effect reflects environmental changes arising from changes in economic structure directly linked to the new trade policy. The net effect of structural change on the levels of emissions and energy uses depends on whether emission-intensive and energy-intensive activities expand or contract

3) Technique: The technique effect represents on-going progress of environmental quality in the UK owing to the adoption of new environmental technologies and a better enforcement of environmental regulations, which are independent of the implementation of a new trade policy. Trade-induced income creates demand for tougher environmental standards which in turn bring forth cleaner techniques of production.

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17 The data on the UK total workforce is sourced from the Annual Population survey, using a 3-year average (2016-18).
18 Grossman & Krueger (1994) and Copeland & Taylor (1994),

CGE-estimated changes in production output are converted to emissions output using ONS data for sector-level emissions intensity. These are used to estimate the scale and composition effects.

Due to the lack of available projection data for green-house gas emissions, historical trends from between 1998 and 2018 are extrapolated to the year 2035 (when the agreement is expected to be fully implemented) in order to calculate the technique effect.

6.2 Breakdown of results by type of effect

Table 9 presents the estimated impact of the free trade agreement, broken down into the three effects outlined above.

Table 12 – Estimated impact of the FTA broken down into scale, composition and technique effects

Emissions by Type and Weight	Scale Effect	Composition Effect	Trade induced impact	Technique Effect	Total	2035 UK Total emissions/ energy usage	% increase in 2035 UK emissions/ energy usage resulting from accession
Greenhouse gas emissions - kt CO2e	376.49	-110.16	266.33	-180.37	85.96	350,000	0.025%
- Of which CO2 emissions- kt CO2e	313.84	-80.07	233.77	-48.96	184.81	285,000	0.065%
- Of which Non-CO2 emissions - kt CO2e	62.04	-30.06	31.98	-17.92	14.06	65,000	0.022%
Energy consumption from fossil fuels - TJ	11,013.23	-1,885.14	9,128.09	-1,382.31	7,745.78	8,038,656	0.096%

Source: DIT calculations 2021

6.3 Limitations

The quantitative assessment of the environmental impacts are driven by the estimated economic changes to the agreement. Therefore, the environmental assessment inherits the same limitations as the economic modelling.

With respect to the environmental impacts, there are some caveats concerning the interpretation of the results:

> the results do not factor in known policy measures to deliver net zero;

> the historical data used to reflect the technique effect assumes that the trend of the last twenty years will be an indicator for the on-going progress in reducing emissions-intensity;

> the results of the environmental modelling reflect the impacts based on the indicators used in the analysis and do not capture the breadth of environmental issues that could occur as a result of accession;

> the analysis does not capture direct emissions from UK households resulting from changes in consumption patterns as the analysis models the changes in the production pattern only;

> this approach does not take into account the change in emission intensity (emission per unit of output) that could result from the implementation of the agreement. The pre- and post-CPTPP emission intensity may not be the same. The removal of barriers could affect firms' choices of production inputs (domestic vs. foreign or less fuel efficient vs. more fuel-efficient), resulting in a different emission intensity.

Annex 7: Externally commissioned research analysing the services liberalisation under CPTPP

In 2020 DIT commissioned research from the London School of Economics (LSE). This research analysed the services and investment schedules of non-conforming measures and the level of liberalisation under CPTPP compared to existing agreements.[19] The research compares the services commitments that each country has undertaken through existing agreements, to those made under the CPTPP. The existing agreements are either the General Agreement on Trade in Services (GATS) or bilateral agreements with the EU.[20],[21] The OECD's STRI scoring methodology is used to quantify the differences in services trade restrictiveness implied by each of the commitments.[22]

The research finds that, for CPTPP members as a group, the CPTPP commitments provide for greater commitments than those undertaken by each within the GATS (figure 1). The sectors which are estimated to see the greatest reduction in services trade restrictiveness are sound recording and road freight.[23]

Figure 1: Simple average restrictiveness before and after implementation of CPTPP[24]
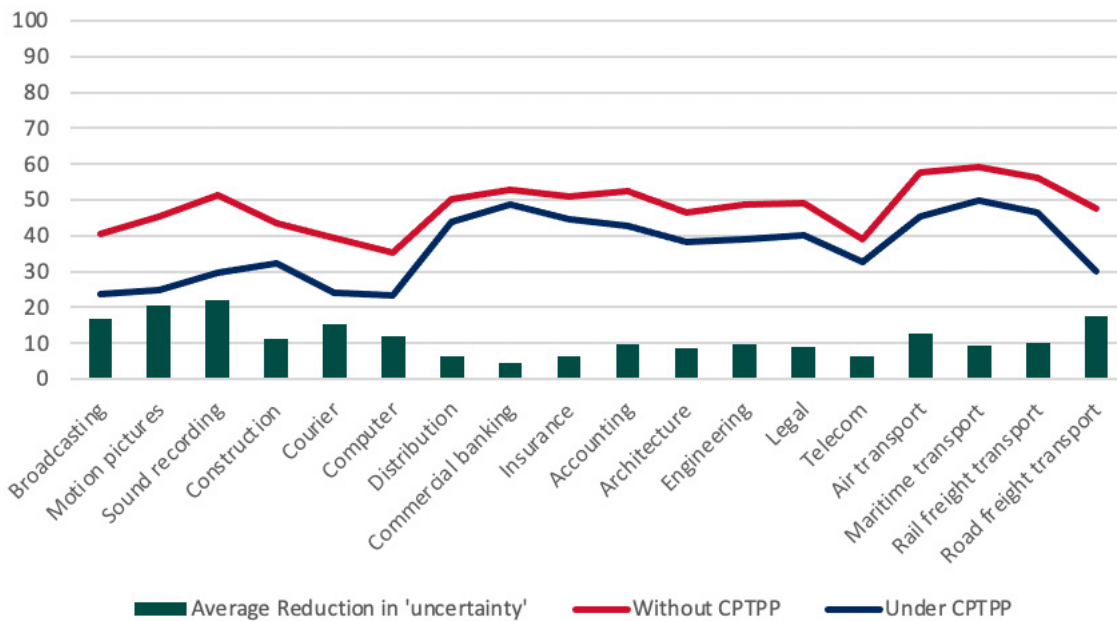
Source: DIT Calculations using LSE research results.

19 LSE research see Annex 5.

20 The analysis is based on the services schedules in the EU FTAs, rather than the final transitioned FTAs agreed between the UK and the EU. However, the differences between the EU FTAs and transitioned FTAs are estimated to be small; notable differences include Japan-UK being less restrictive than Japan-EU on digital, and Mexico-UK being more restrictive than Mexico-EU on a range of areas.

21 This research is experimental. The full details are in Annex 5. Where OECD STRI measures were not available for certain countries these were calculated by LSE,

22 The OECD Services Trade Restrictiveness Index (STRI) is a composite index that provides a score for the restrictiveness of services trade for a given country for each of 22 sectors. Scores are assigned between 0 and 100 where 0 is fully liberalised and 100 is fully restricted. Scores are assigned based on the results to a series of detailed questions that examine the actual regulations that exist in the country and sector.

23 This refers to the difference between CPTPP STRI scores and EU FTA/GATS STRI scores where applicable.

24 This is a straight average and the chart includes all CPTPP members regardless of whether they have an EU FTA. This chart includes all CPTPP countries except Australia, New Zealand, Brunei, and Malaysia. The calculations in the chart assume that the UK has secured ambitious FTAs with Australia and New Zealand.

7.1 Background

The study estimates the trade restrictiveness in the services industry based on the OECD Services Trade Restrictiveness Index (STRI) – specifically for the eleven countries that are members of the Comprehensive and Progressive Trans-Pacific Partnership (CPTPP).[25] By applying the STRI criteria and weighting methodology, this study also quantifies the commitments of the members under CPTPP, the WTO General Agreement on Trade in Services (GATS), and bilateral EU free trade agreement (FTA) with the European Union – if such an agreement has been concluded.

STRI scores for CTPTPP members that are also OECD member countries (Australia, Canada, Chile, Japan, Mexico, New Zealand) and Malaysia were assessed by OECD Secretariat, with the latest update published for 2019.[26] This study supplements this work by also adding the STRI scores for Brunei, Peru, Singapore and Vietnam.[27]

Although the STRI methodology is intended to quantify restrictiveness in domestic regulations, its criteria have been used to assess the services trade commitments in the eighteen sectors. The next section describes the underlying assumptions and adjustments necessary to use STRI criteria on FTAs: Unlike domestic laws, FTA commitments do not directly regulate markets, but typically bind governments to refrain from imposing certain regulatory restrictions.

Prior quantification work that builds on STRI is limited to primarily the market access schedules.[28] This study encompasses all chapters (including non-service chapters such as IPRs, state-owned enterprises, government procurement), schedules, non-conformity measures and other annexes that are integral to the original agreement, that are relevant for STRI criteria. Scores have been generated for all eleven CPTPP members, and eighteen sectors. However, there are trade commitments in sectors that are not implemented by OECD STRI that cannot be evaluated as there are no scoring criteria created for those sectors.

In addition, the study quantifies STRI scores based on commitments under the EU-Japan Economic Partnership Agreement (EPA), Comprehensive Economic and Trade Agreement (between the EU and Canada), EU-Chile Association Agreement, EU-Mexico Trade Agreement (1997; 2018 Modernisation), EU-Andean Community Comprehensive Trade Agreement (for commitments relevant to Peru), EU-Singapore agreements on trade and investment protection, and EU-Vietnam agreements on trade and investment protection.

7.2 Scoring methodology

STRI scoring of the non-OECD economies

The scoring criteria and weighting principles used for the non-OECD economies are consistent with the STRI methodology as described by the OECD,[29] and we refer to its documentation for details.

Scores are provided for all areas with only a minor exception. Some jurisdictions lack market regulations for certain transport sectors (for example, restrictions on domestic air traffic, inland maritime transports) as the countries do not have the geographical features to accommodate such a market.

FTA Scoring Criteria

As the criteria used in the STRI methodology is designed to assess applied regulations rather than trade agreements, scoring of FTAs follow certain assumptions and scoring principles that were consistently applied to all countries and sectors within scope.

The general principle in scoring the FTA commitments is whether they allow a country to impose a hypothetical restriction that would inflict an unfavourable score in the STRI criteria. If the FTA contains a commitment that bars a country from imposing a restriction, the criteria do not generate an unfavourable score. The hypothetical measure is typically described or exemplified in the STRI methodology. They are assumed to be enforced in a manner that is typical for the sector or policy area in question.

25 Official CPTPP texts (through the Government of New Zealand, the official depositary of CPTPP text), available at: https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/cptpp/comprehensive-and-progressive-agreement-for-trans-pacific-partnership-text-and-resources/
26 OECD Statistics, 2020
27 OECD, Services Trade Restrictiveness Index (STRI): Scoring and Weighting Methodology, OECD, 2015
28 Mirodout, Pertel, Water in the GATS: Methodology and Results, OECD, 2015.
29 Supra note 3.

Unless specified by the STRI criteria, the hypothetical restriction is assumed to be applied on most favourable nation (MFN) basis, but non-national treatment (NT), that is, equally discriminatory to all foreign supply. To avoid a score, a commitment for openness must apply on MFN-basis and be binding. Any non-binding language (that is, 'endeavour' provisions, enabling clauses that allow for a certain mechanism to resolve an issue), or provisions that set up an institutional framework (dialogue or mechanisms with no outcome pre-judged) do not affect scoring.

Partial restrictions (for example, commitment in some sub-sectors or sub-central geographic entities, but not all) are given unfavourable scores since the methodology does not typically apply weighted, fractional scores on individual criteria. A particular case is government procurement, where it is impractical to take into account covered entities. As all countries apply some thresholds or maintain caveats for sensitive government agencies, such an approach would disqualify all countries, and the study would forego an analysis on sectoral or geographical coverage in government procurement.

Exceptions warrants a similar discussion. Exceptions that are unconditionally or subjectively applied, such as the national security exception (for example, GATS XIV bis) would exempt the signatory from any commitment in the treaty. Unless they are ignored, the exception would result in a full restriction score for all members. Conversely, specific exceptions for the restriction that are described in the STRI criteria result in an unfavourable score even if there are conditionalities (for example, necessity, proportionality or least-trade restrictiveness tests) attached to the use of exceptions.

As a final note, certain STRI measures are metrics rather than criteria. These metrics include the cost or number of days to obtain a business permit, visa or customs handling. These measures tend to be scored unfavourably since FTAs do not directly bind the members to set specific ceiling on days or cost for processing permits.

7.3 Aggregate STRI and FTA scores

Aggregate scores by country

The following scores are the STRI and FTA scores per country based on simple averages of all sectors in the OECD STRI scoring methodology (table 31). Sectors not covered by OECD STRI are excluded. Note that a score of 100 is the most restrictive, and a score of 0 is the least restrictive.

Benchmarks are comparisons with the CPTPP scores – or the "distance" between a particular score and the CPTPP. This comparison of STRI and CPTPP scores is the difference between the applied openness in the economy (STRI) compared to the bindings in the CPTPP – popularly referred to as the "water in the schedules". As the domestic economies are more open than the generalised disciplines can actually manage to bind the members through trade agreements, the scores are consistently negative for all countries. Unsurprisingly, more recent agreements generate lower restrictiveness scores overall.

Table 13: CPTPP STRI and FTA score by country

CPTPP country	Country score			Benchmarks			
	STRI	CPTPP	EU FTA	GATS	STRI vs CPTPP	EU FTA vs CPTPP	GATS vs CPTPPP
Australia	19	55	-	78	-36	-	+23
Brunei	53	74	-	98	-21	-	+24
Canada	31	73	76	89	-51	+3	+3
Chile	20	61	71	92	-41	+10	+31
Japan	20	69	75	82	-49	+6	+13
Mexico	32	72	76	89	-40	+4	+17
Malaysia	35	72	-	93	-37	-	+21
New Zealand	20	62	-	75	-41	-	+13
Peru	43	70	81	91	-27	+12	+21
Singapore	34	77	80	88	-43	+4	+12
Vietnam	55	79	82	90	-24	+3	+10
CPTPP country average	33	69	77	88	-37	+6	+17

Aggregate scores by sector

The following scores are the STRI and FTA scores per sector based on simple averages of all CPTPP countries. As in the previous section, benchmarks are comparisons with the CPTPP scores, or the "distance" between a particular score and the CPTPP. "Peak" generally point to sector-wide exceptions in the FTAs.

Table 14: CPTPP STRI and FTA score by sector

STRI sector	Sector score				Benchmarks		
	STRI	CPTPP	EU FTA	GATS	STRI vs CPTPP	EU FTA vs CPTPP	GATS vs CPTPP
Broadcasting	49	71	90	93	-22	14	22
Motion pictures	31	56	80	78	-25	24	21
Sound recording	31	60	80	89	-29	18	28
Construction	31	65	70	86	-34	2	19
Courier	45	70	75	96	-25	2	24
Computer services	32	58	59	83	-25	1	24
Distribution and retail	25	69	73	83	-44	1	12
Comm Banking	29	79	82	88	-50	-2	8
Insurances	26	72	73	84	-46	-1	11
Accounting	26	69	76	84	-43	7	14
Architecture	31	70	73	83	-39	2	11
Engineering	29	68	75	85	-39	7	14
Legal	37	77	81	94	-40	3	15
Telecommunications	35	69	71	78	-34	0	9
Air transport	39	85	95	100	-45	10	15
Maritime transport	27	78	87	93	-50	4	14
Rail transport	27	75	79	94	-48	0	19
Road transport	29	59	76	86	-30	13	28
CPTPP sector average	32	69	77	88	-37	6	17

7.4 Country and sector-specific STRI and FTA scores

Notes on scoring

The measures that are evaluated by the STRI criteria often cover a different (and more granular) scope than trade agreements, why a lower score cannot always be interpreted as better or less restrictive by default.

Given the treatment of exceptions and other features common to FTAs, some results may seem contradictory with more recent trade agreements having higher (that is, more restrictive) scores than older ones. In any case, each party could rely on GATS instead of later agreements in the case that it delivers a higher binding for a specific sector. The list below provides a key to the sector abbreviations used in the following tables and figures:

> ASbrd = Broadcasting

> ASmot = Motion pictures

> ASsou = Sound recordings

> CO = Construction

> CR = Courier

> CS = Computer-related services

> DS = Distribution and retail

> FSbnk = Banking

> FSins = Insurances

> PSacc = Accounting

> PSarch = Architecture

> PSeng = Engineering

> PSleg = Legal services

> TC = Telecommunications

> TRair = Air transport

> TRmar = Maritime transport

> TRrai = Rail transport

> TRrof = Road transport

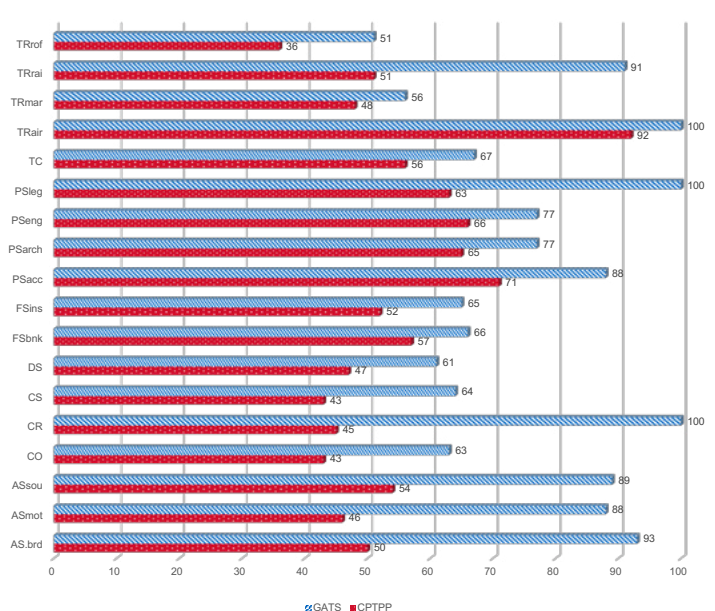### Figure 2: Australia country and sector-specific STRI and FTA scores

Table 15: Australia country and sector-specific STRI and FTA scores

Sector code	GATS	CPTPP	STRI
AS.brd	93	50	21
ASmot	88	46	16
ASsou	89	54	15
CO	63	43	19
CR	100	45	38
CS	64	43	17
DS	61	47	14
FSbnk	66	57	18
FSins	65	52	19
PSacc	88	71	19
PSarch	77	65	16
PSeng	77	66	14
PSleg	100	63	14
TC	67	56	19
TRair	100	92	30
TRmar	56	48	19
TRrai	91	51	16
TRrof	51	36	13

Figure 3: Brunei country and sector-specific STRI and FTA scores
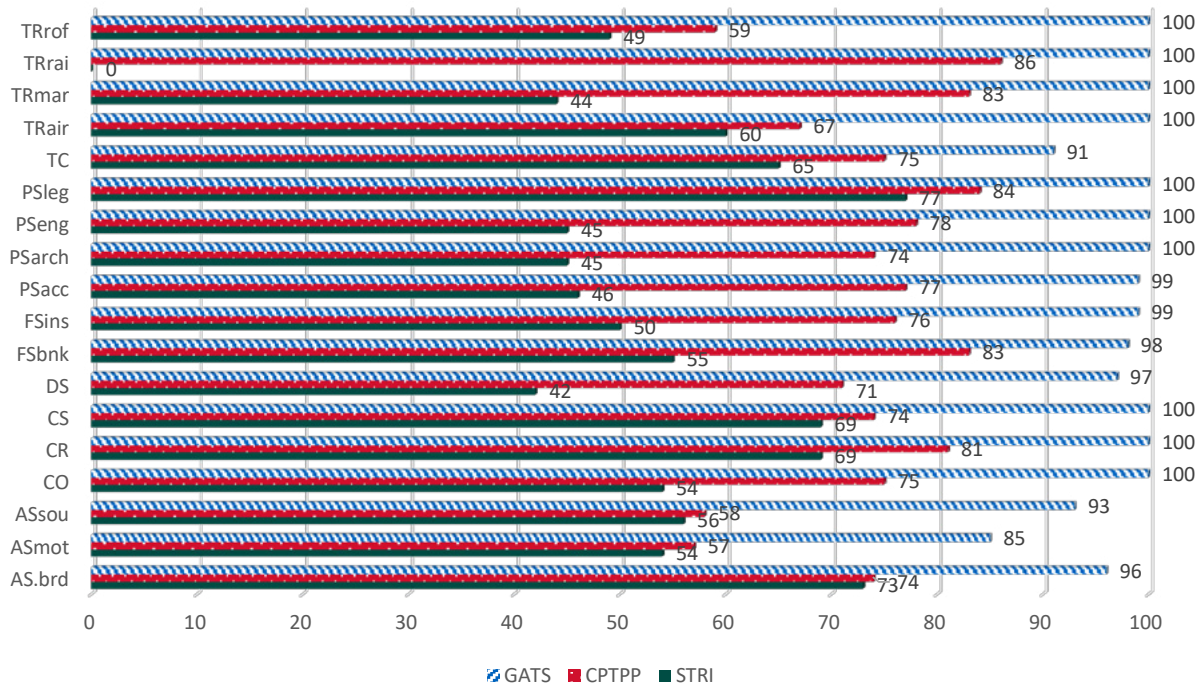
Table 16: Brunei country and sector-specific STRI and FTA scores

Sector code	GATS	CPTPP	STRI
AS.brd	96	74	73
ASmot	85	57	54
ASsou	93	58	56
CO	100	75	54
CR	100	81	69
CS	100	74	69
DS	97	71	42
FSbnk	98	83	55
FSins	99	76	50
PSacc	99	77	46
PSarch	100	74	45
PSeng	100	78	45
PSleg	100	84	77
TC	91	75	65
TRair	100	67	60
TRmar	100	83	44
TRrai	100	86	0
TRrof	100	59	49

Figure 4: Canada country and sector-specific STRI and FTA scores
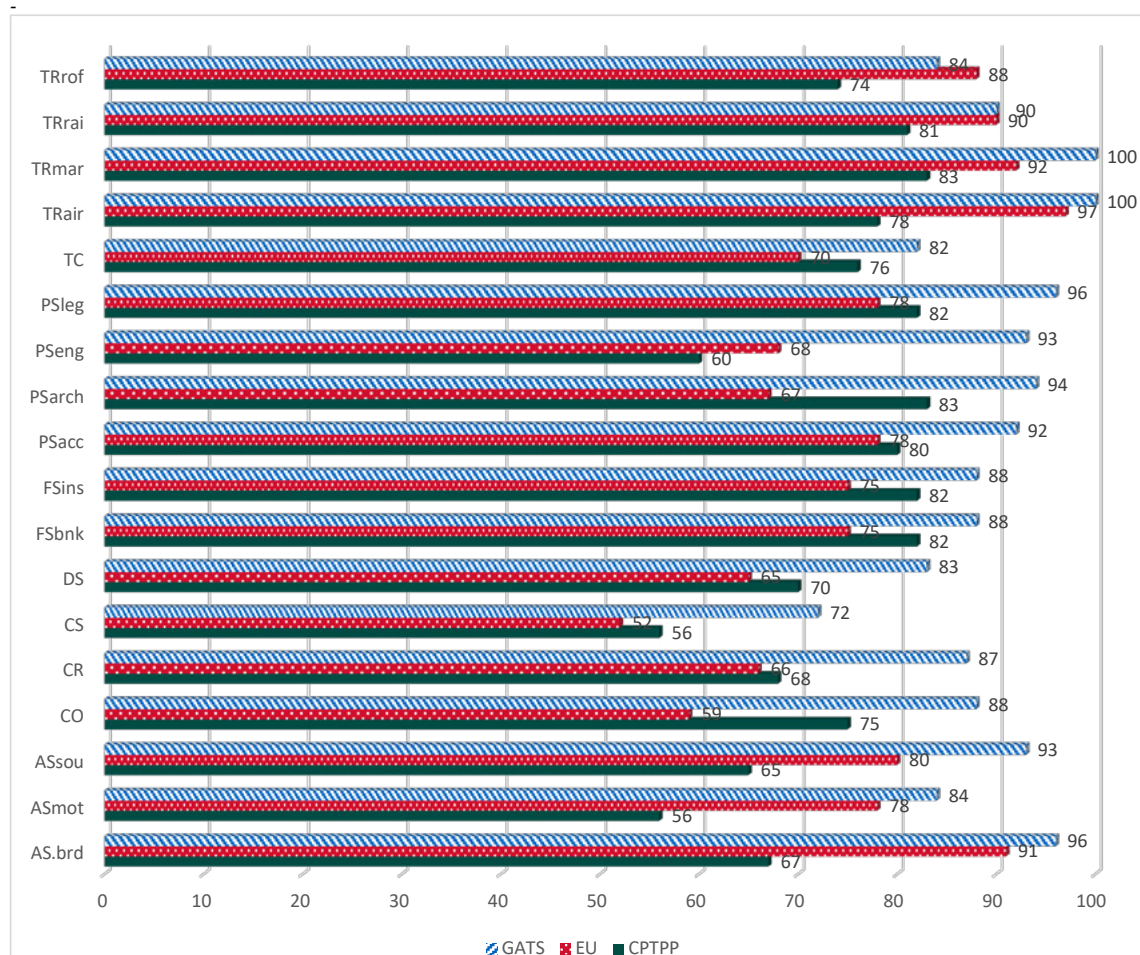
Table 17: Canada country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP
AS.brd	96	91	67
ASmot	84	78	56
ASsou	93	80	65
CO	88	59	75
CR	87	66	68
CS	72	52	56
DS	83	65	70
FSbnk	88	75	82
FSins	88	75	82
PSacc	92	78	80
PSarch	94	67	83
PSeng	93	68	60
PSleg	96	78	82
TC	82	70	76
TRair	100	97	78
TRmar	100	92	83
TRrai	90	90	81
TRrof	84	88	74

Figure 5: Chile country and sector-specific STRI and FTA scores
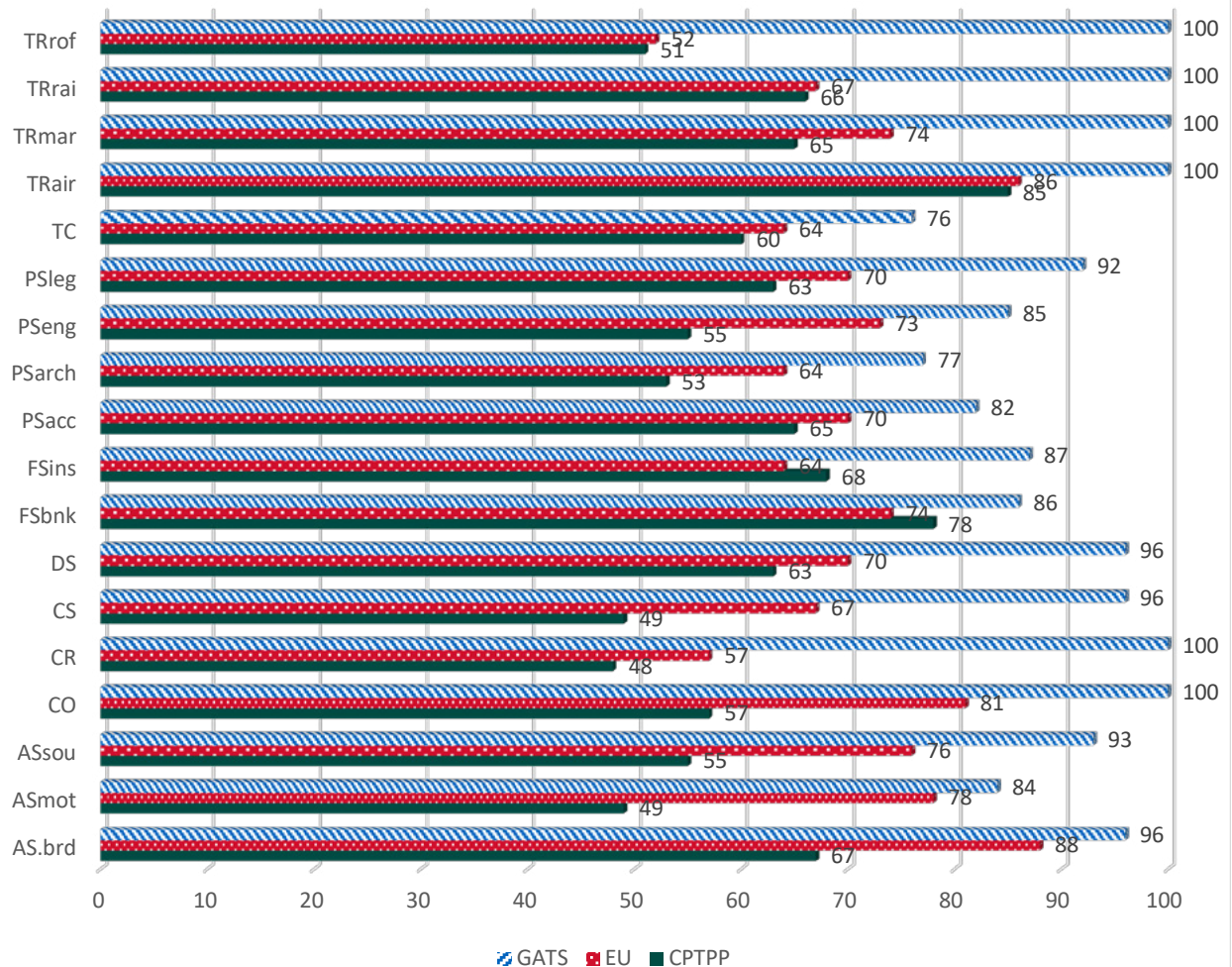
Table 18: Chile country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP
AS.brd	96	88	67
ASmot	84	78	49
ASsou	93	76	55
CO	100	81	57
CR	100	57	48
CS	96	67	49
DS	96	70	63
FSbnk	86	74	78
FSins	87	64	68
PSacc	82	70	65
PSarch	77	64	53
PSeng	85	73	55
PSleg	92	70	63
TC	76	64	60
TRair	100	86	85
TRmar	100	74	65
TRrai	100	67	66
TRrof	100	52	51

Figure 6: Japan country and sector-specific STRI and FTA scores
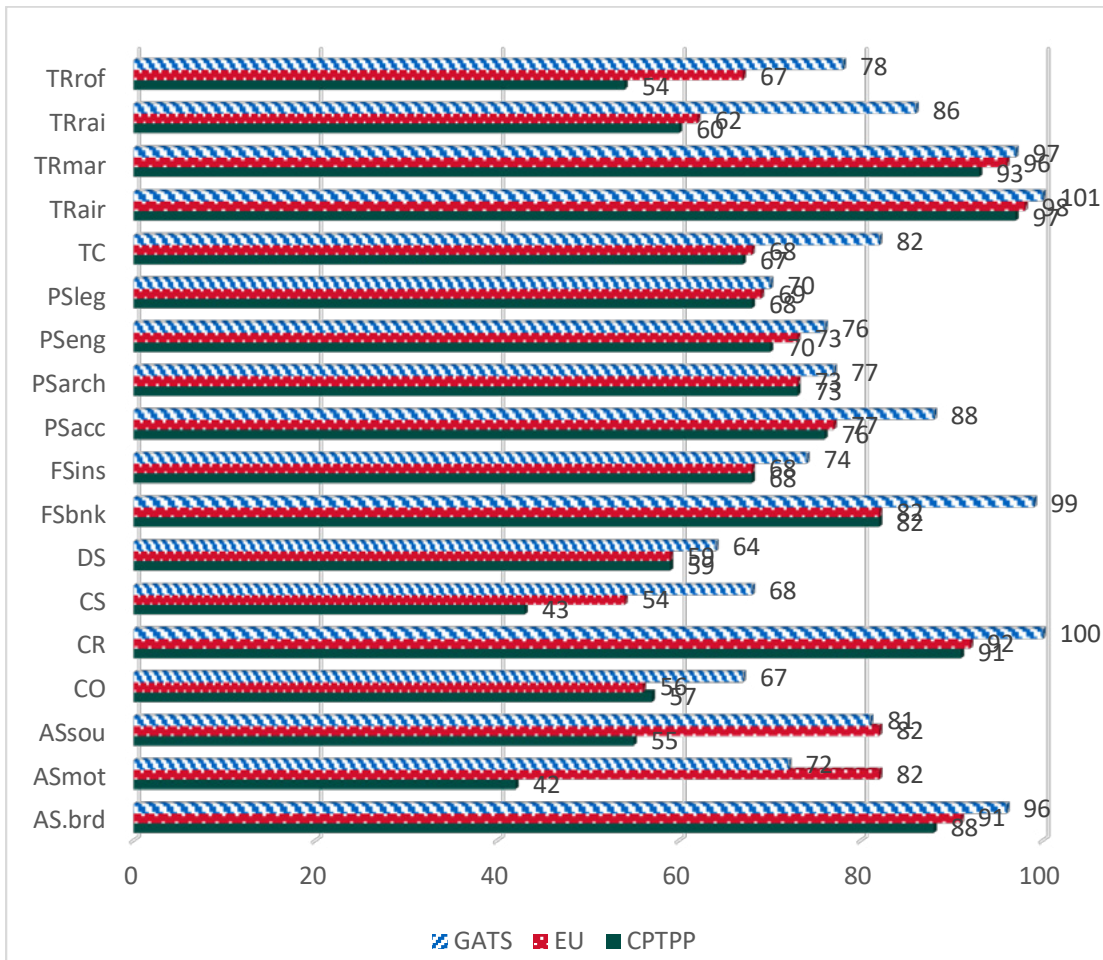
Table 19: Japan country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP
AS.brd	96	91	88
ASmot	72	82	42
ASsou	81	82	55
CO	67	56	57
CR	100	92	91
CS	68	54	43
DS	64	59	59
FSbnk	99	82	82
FSins	74	68	68
PSacc	88	77	76
PSarch	77	73	73
PSeng	76	73	70
PSleg	70	69	68
TC	82	68	67
TRair	101	98	97
TRmar	97	96	93
TRrai	86	62	60
TRrof	78	67	54

Figure 7: Mexico country and sector-specific STRI and FTA scores
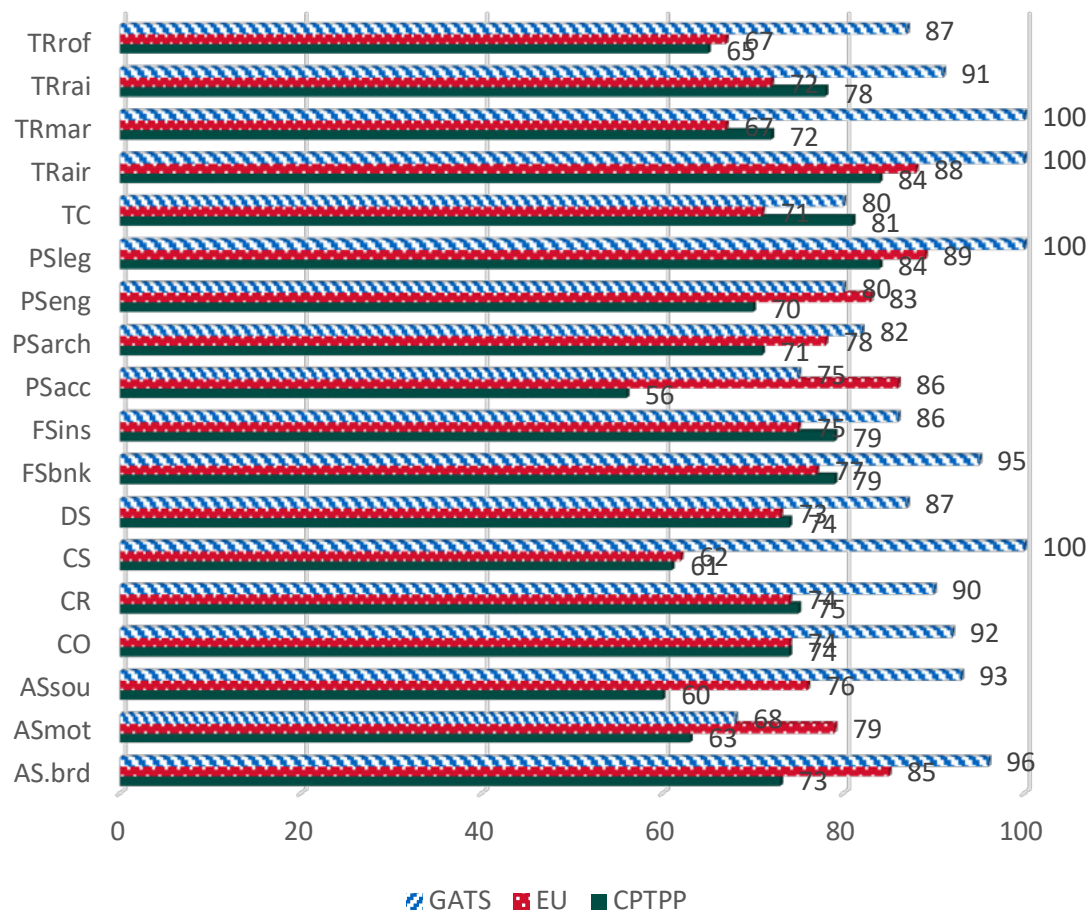
Table 20: Mexico country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP
AS.brd	96	85	73
ASmot	68	79	63
ASsou	93	76	60
CO	92	74	74
CR	90	74	75
CS	100	62	61
DS	87	73	74
FSbnk	95	77	79
FSins	86	75	79
PSacc	75	86	56
PSarch	82	78	71
PSeng	80	83	70
PSleg	100	89	84
TC	80	71	81
TRair	100	88	84
TRmar	100	67	72
TRrai	91	72	78
TRrof	87	67	65

Figure 8: Malaysia country and sector-specific STRI and FTA scores
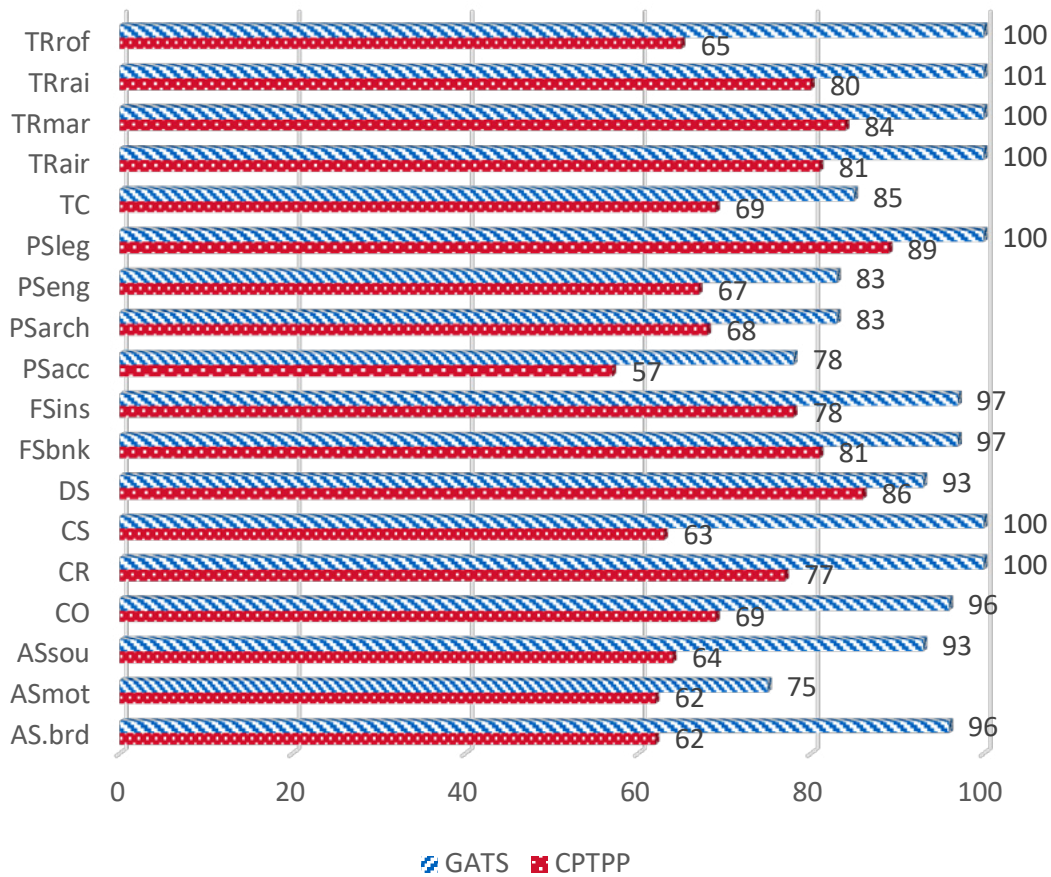
Table 21: Malaysia country and sector-specific STRI and FTA scores

Sector code	GATS	CPTPP
AS.brd	96	62
ASmot	75	62
ASsou	93	64
CO	96	69
CR	100	77
CS	100	63
DS	93	86
FSbnk	97	81
FSins	97	78
PSacc	78	57
PSarch	83	68
PSeng	83	67
PSleg	100	89
TC	85	69
TRair	100	81
TRmar	100	84
TRrai	101	80
TRrof	100	65

Figure 9: New Zealand country and sector-specific STRI and FTA scores
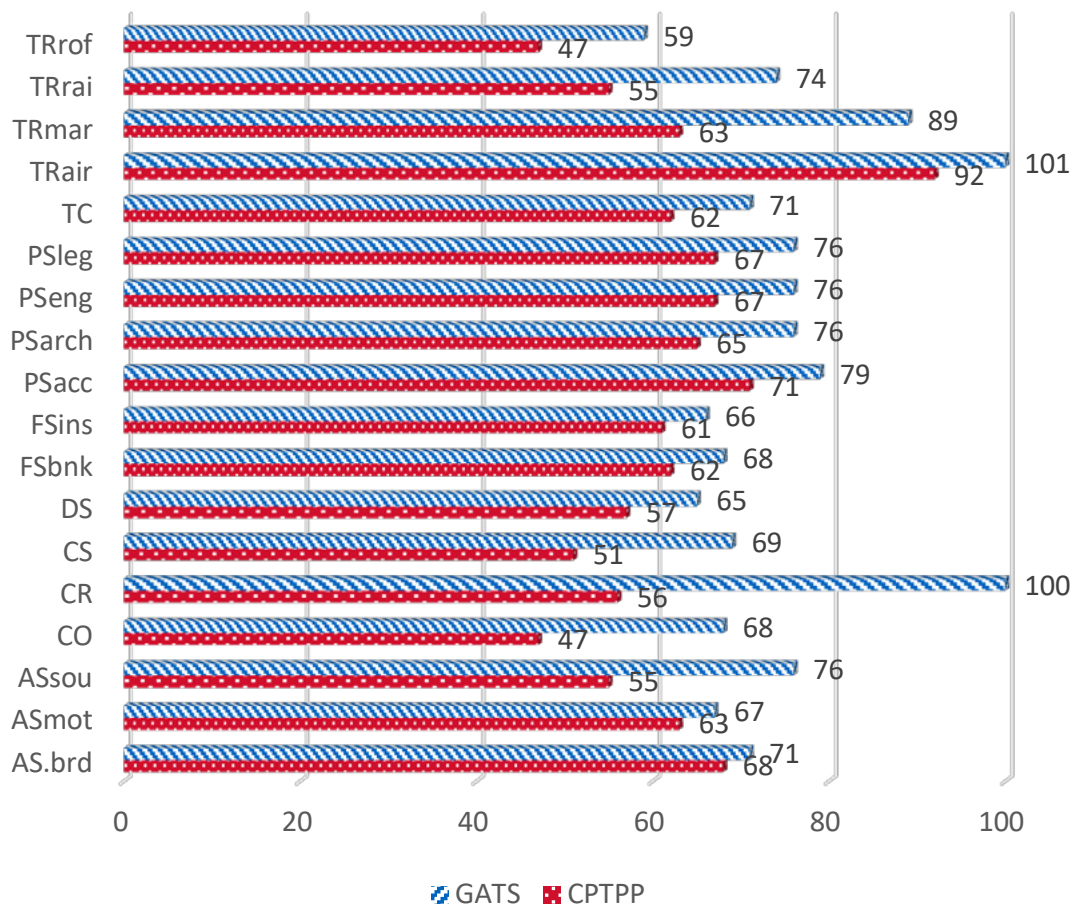
Table 22: New Zealand country and sector-specific STRI and FTA scores

Sector code	GATS	CPTPP
AS.brd	71	68
ASmot	67	63
ASsou	76	55
CO	68	47
CR	100	56
CS	69	51
DS	65	57
FSbnk	68	62
FSins	66	61
PSacc	79	71
PSarch	76	65
PSeng	76	67
PSleg	76	67
TC	71	62
TRair	101	92
TRmar	89	63
TRrai	74	55
TRrof	59	47

Figure 10: Peru country and sector-specific STRI and FTA scores
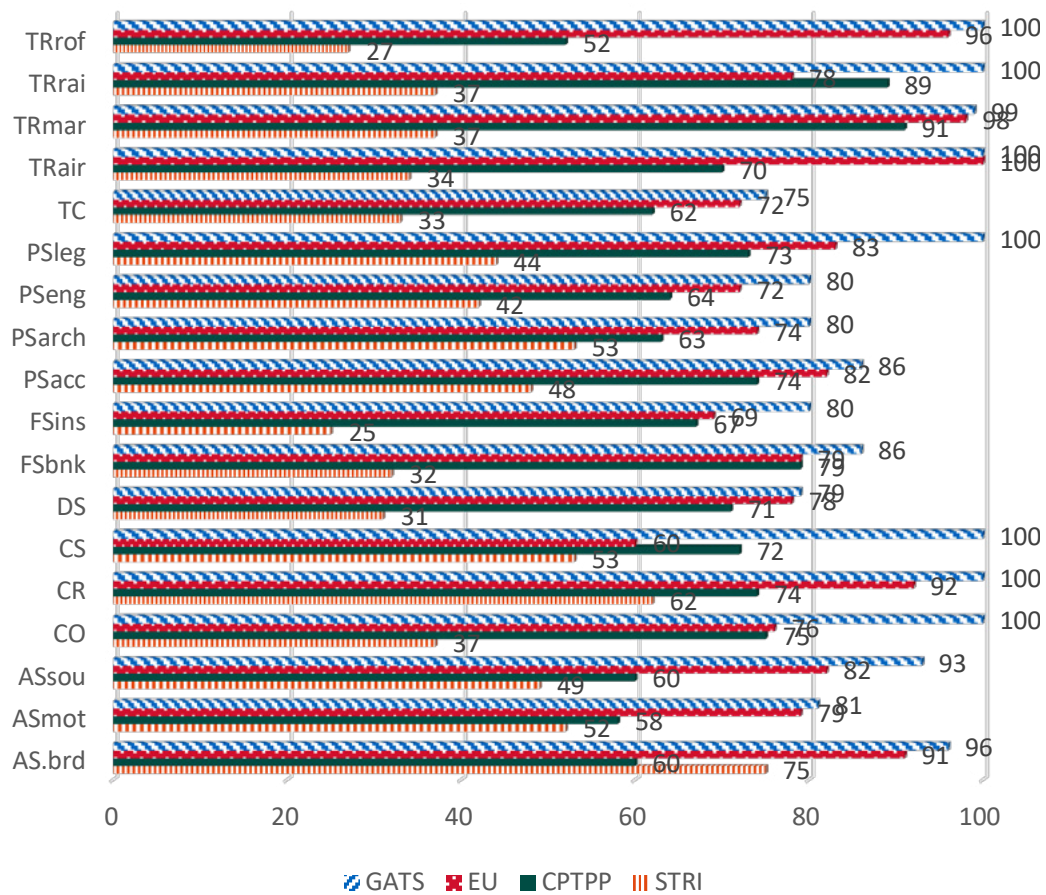
Table 23: Peru country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP	STRI
AS.brd	96	91	60	75
ASmot	81	79	58	52
ASsou	93	82	60	49
CO	100	76	75	37
CR	100	92	74	62
CS	100	60	72	53
DS	79	78	71	31
FSbnk	86	79	79	32
FSins	80	69	67	25
PSacc	86	82	74	48
PSarch	80	74	63	53
PSeng	80	72	64	42
PSleg	100	83	73	44
TC	75	72	62	33
TRair	100	100	70	34
TRmar	99	98	91	37
TRrai	100	78	89	37
TRrof	100	96	52	27

Figure 11: Singapore country and sector-specific STRI and FTA scores
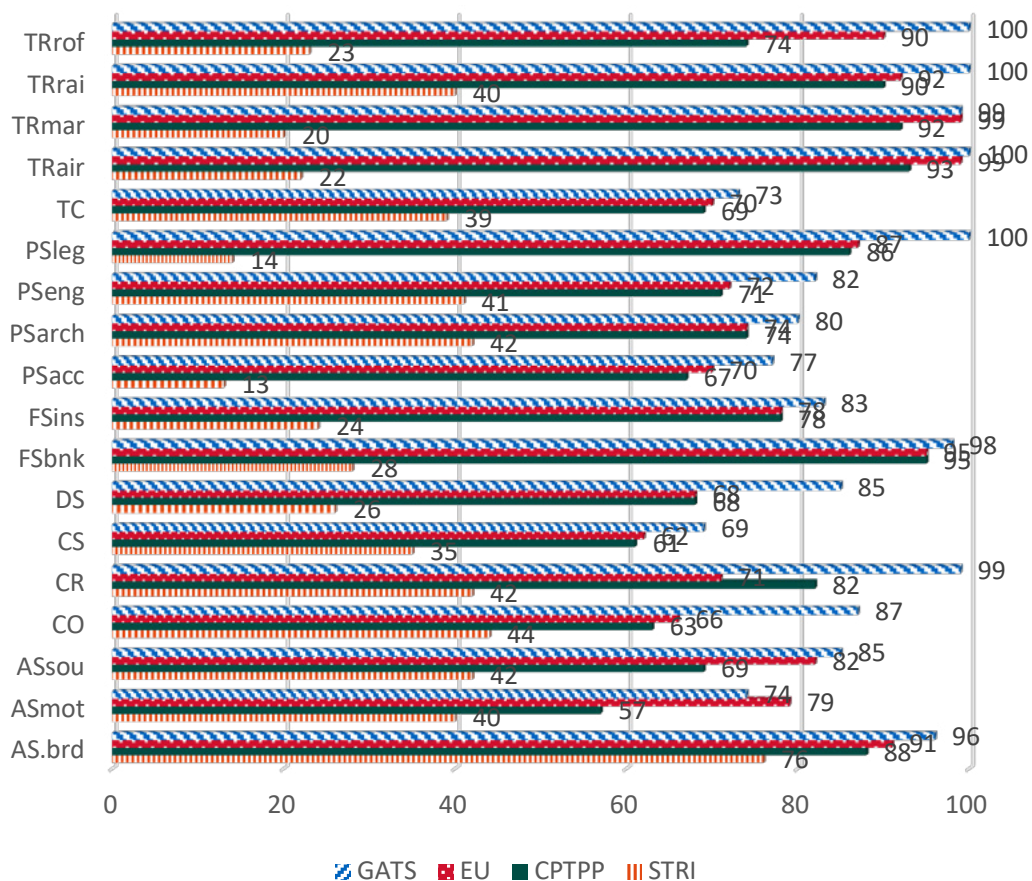
Table 24: Singapore country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP	STRI
AS.brd	96	91	88	76
ASmot	74	79	57	40
ASsou	85	82	69	42
CO	87	66	63	44
CR	99	71	82	42
CS	69	62	61	35
DS	85	68	68	26
FSbnk	98	95	95	28
FSins	83	78	78	24
PSacc	77	70	67	13
PSarch	80	74	74	42
PSeng	82	72	71	41
PSleg	100	87	86	14
TC	73	70	69	39
TRair	100	99	93	22
TRmar	99	99	92	20
TRrai	100	92	90	40
TRrof	100	90	74	23

Figure 12: Vietnam country and sector-specific STRI and FTA scores
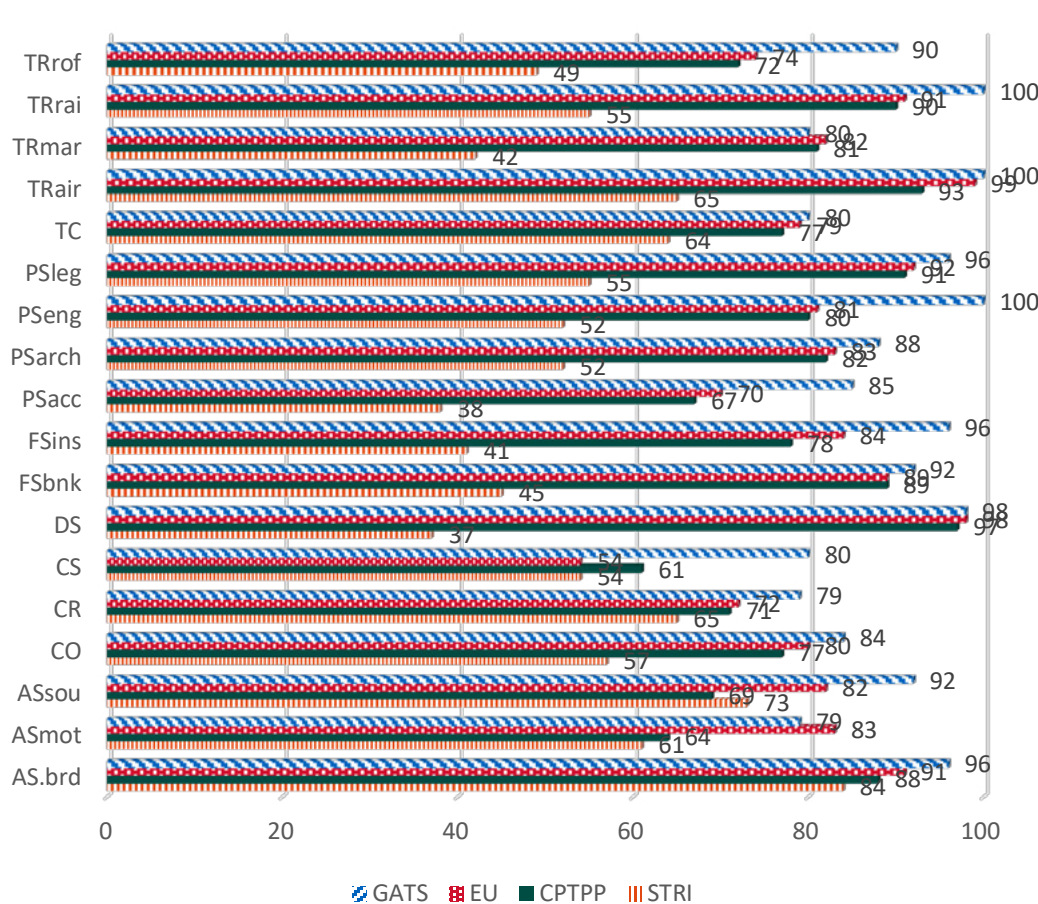
Table 25: Vietnam country and sector-specific STRI and FTA scores

Sector code	GATS	EU	CPTPP	STRI
AS.brd	96	91	88	84
ASmot	79	83	64	61
ASsou	92	82	69	73
CO	84	80	77	57
CR	79	72	71	65
CS	80	54	61	54
DS	98	98	97	37
FSbnk	92	89	89	45
FSins	96	84	78	41
PSacc	85	70	67	38
PSarch	88	83	82	52
PSeng	100	81	80	52
PSleg	96	92	91	55
TC	80	79	77	64
TRair	100	99	93	65
TRmar	80	82	81	42
TRrai	100	91	90	55
TRrof	90	74	72	49

Annex 8: Analysis of tariff schedules

This section sets out the method used and limitations of the analysis of potential value of UK trade eligible for tariff reductions on accession to CPTPP.

8.1 Method and data for tariff liberalisation on UK exports

Analysis was conducted by compiling the full tariff schedules of each CPTPP member, under WTO MFN, CPTPP, and EU-FTAs. MFN rates were sourced from WTO TAO (2016), and CPTPP and EU-FTA rates were compiled from the actual tariff schedules submitted and published under the agreement.

Each tariff line was classified according to whether CPTPP unambiguously provided further liberalisation than WTO MFN or EU-FTAs once staging was complete. They were combined with data on each countries' imports from the UK, sourced from ITC TradeMap (2014-16 average and 2015-17 average).

The total % of UK trade that would be eligible for tariff-free access on accession to CPTPP was calculated by summing the value of all UK exports where any of the MFN rates, CPTPP rates or EU-FTA rates were free or staged to zero. This was compared with the % of UK trade that was eligible for tariff-free access prior to CPTPP.

Results by country were combined with the total number of product lines (97349) and total value of imports from UK (22.7bn) to calculate the % of UK exports that could benefit from greater liberalisation on accession to CPTPP.

8.2 Method and data for tariff liberalisation on UK imports

Analysis was conducted by combining the UK tariff schedules under UKGT, under EU-FTAs and under the Generalised Scheme of Preferences (GSP). This was combined with HMRC data (2017/2018 average) on UK imports by country and product line. The value of goods subject to tariffs was taken as the total value of imports not free or staged to zero under UKGT (or, in the case of Vietnam, under GSP), or under EU-FTAs. This was then broken down according to the UN Broad Economic Classification of Goods to determine whether products were classified as intermediate or final goods.

For Australia and New Zealand, two different scenarios were constructed depending on whether or not there was an existing zero-tariff FTA between the UK and these countries was assumed.

This was combined with data on total value of imports (£37 billion) and number of product lines (104,863) to calculate the percentages presented in the Scoping Assessment.

Limitations

The limitation of this analysis includes:

> the analysis excludes some product lines where both CPTPP and UK FTAs have TRQs and where UK exporters would therefore benefit from accession to CPTPP through being able to access two separate TRQs. In this respect it underestimates the potential reduction in trade costs on acceding to CPTPP;

> it is also a 'static' analysis which is based on historic trade data in which tariffs or TRQs may have been partially or entirely restricting UK exports. In this respect it underestimates the potential value of trade that could benefit from tariff reduction;

> the analysis considers the value of trade that would become 'eligible' for tariff reduction. In practice, it is likely that some UK exports will not utilise available preferences;

> tariff schedules are based on the EU-FTA with that country. For Japan and Mexico these differ slightly from the final UK FTA with these countries.