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Modelling the Harmonizing of Non-Tariff Measures on Goods in the Comprehensive and Progressive Trans-Pacific Partnership

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Abstract

Regional trade agreements can reduce the significant costs that non-tariff measures (NTMs) can impose on international trade flows. In this study, we explore the potential effects of harmonizing NTMs applying to goods trade in the Comprehensive and Progressive Trans-Pacific Partnership (CPTPP) region. Our study makes significant advances, using comprehensive new data on NTMs to generate sector-specific, bilateral estimates of the price impact of harmonizing NTMs between countries. We estimate the impact of regulatory NTMs in the destination market as well as domestic regulatory measures in the exporting country. The econometric approach used is a price-based model, augmented by NTMs counts that differentiate between the importing countries' measures and exporters' measures, accounting for any cost-reducing regulatory similarity between exporter and importer. These estimates are implemented within a dynamic computable general equilibrium (CGE) framework, using modelling mechanisms designed to reflect the detailed underlying NTM data on which we draw. We find that harmonizing NTMs has overall positive impacts on each country participating in the CPTPP integration modelled, even without reducing the total number of measures imposed by each country. However, the magnitude of results varies by economy and there is significant variation in the sectoral impacts. We also explore the impact of the United States joining the regional NTM harmonization.

JEL: F13, F14, F15, F17, F68

Keywords: International trade; Non-tariff measures; Regulatory convergence; CPTPP; CGE modelling.

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1. Introduction and background

The Trans-Pacific Partnership (TPP) aimed to be a high standard trade agreement that would improve market access for goods and services through the reduction of both tariff and non-tariff measures (NTMs),[2] as well as addressing regulations in areas such as intellectual property (IP), labor standards, state owned enterprises and investment, among others. While the withdrawal of the United States from the agreement in January 2017 was a significant setback, the 11 remaining members have renegotiated a Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) that includes many elements negotiated as part of the original TPP agreement. A number of impact assessments of the original TPP agreement found that reductions in NTMs could bring significant gains; however, there was general acknowledgement that the data and modelling mechanisms were in their infancy. In the current study, we focus solely on goods NTMs to explore the potential impact of harmonizing them in the CPTPP region. We make significant advances in this area, using comprehensive new data on NTMs to generate sector-specific, bilateral estimates of the price impact of harmonizing NTMs for CPTPP countries. These estimates are then implemented in a CGE framework to assess the impacts of harmonizing NTMs on goods trade in the region, using newly developed modelling mechanisms that more appropriately capture the anticipated effects of NTMs.

We use data from a new database on NTMs (UNCTAD, 2017), with data based on official government information aimed at providing a comprehensive list of all (technical) NTMs in force in a country at a specific point in time at the HS 6-digit product level. The data follow the International Classification of Non-Tariff Measures structure and distinguish 178 different measures (UNCTAD, 2013). We estimate the impact of regulatory NTMs in the destination market as well as domestic regulatory measures in the exporting country. We then assess and estimate how 'regulatory overlap' between domestic and foreign regulatory NTMs can reduce the price-raising effect of NTMs. These estimates are based on new, highly detailed and internationally consistent datasets of NTMs, collated through significant national and international efforts. The econometric approach used is a price-based model, augmented by NTMs counts that differentiate between the importing country's measures and exporters' measures, accounting for any existing regulatory overlap between measures in the exporting and importing countries (Knebel and Peters, 2018). These regression results are used to generate estimates of the impact of harmonizing NTM measures between CPTPP countries. We find that each measure that is brought into line with those of trade partners reduces the traded goods price, thus regulatory cooperation and the use of

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[2] Non-tariff measure (NTM) are policy measures, other than tariffs, which may restrict trade. Many NTMs are legitimate measures to achieve particular objectives, such as protecting consumer health and safety, sometimes applying to both domestic and imported products.

international standards can reduce trade costs significantly. We model these estimates within a dynamic global computable general equilibrium (CGE) framework, using new CGE modelling mechanisms that we believe capture the impacts of NTMs in a way that better reflects the detailed underlying NTM data than has been possible in the past. In particular, we incorporate a new methodology for adjusting the exporters' production costs directly (Walmsley and Strutt, 2018).

In the following section, we summarize our econometric approach to estimating regulatory convergence. We then summarize and discuss the implications of our new data estimates for CPTPP countries before outlining the dynamic CGE modelling framework we use and scenarios modelled. In the subsequent results section, we analyse our preliminary estimates of the impacts of harmonization of goods NTMs in the CPTPP region and briefly consider the impact of the United States also harmonising. We then offer our tentative conclusions.

2. Regulatory convergence of technical measures

Many countries have regulations that exporters and importers, as well as local producers, have to comply with. For example, measures may restrict pesticide residues in food products, determine the kind of information that has to be provided to consumers or set product-performance conditions. These types of Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) measures may entail costs of compliance for producers.[3] The divergence of SPS measures and TBT across countries causes trade to become more costly. Since many regulations are necessary to ensure outcomes such as food safety, regulatory convergence through harmonization can bring important gains. Harmonization of regulations reduces trade costs, as products do not need to be customized to meet requirements particular to each export market (Knebel and Peters, 2018).

Collection and classification of NTMs

Recognizing the increasing importance of technical NTMs and the scarcity of available information, UNCTAD established a Group of Eminent Persons and a Multi-Agency Support Team (MAST)[4] who oversaw the development of an internationally agreed classification for NTMs. This common classification facilitates transparency, analysis and comparison of NTMs. Technical measures comprise SPS and TBT measures. Such measures may be imposed to meet objectives such as human, plant and

[3] Though not all SPS measures and TBT have a negative effect on trade and some can facilitate trade.
[4] Comprising the FAO, IMF, ITC, OECD, UNCTAD, UNIDO, WTO and World Bank.

animal health and the protection of the environment. However, even if equally applied to domestic producers, they potentially affect international trade and are thus considered NTMs.

On the basis of this classification, a globally comprehensive inventory of NTMs is collected. Country coverage and data quality are rapidly increasing, with over 80 percent of world trade currently covered in the UNCTAD TRAINS NTMs database (UNCTAD, 2017). In this study, we use data on technical NTMs collected for CPTPP countries, along with the United States, using an improved quality control approach between 2013 and 2016. These new data enable much more detailed analysis of the impacts of NTMs than has previously been possible. Examples of recent studies using these detailed new data include Webb et al. (2017) who apply the data to consider impacts of NTM reform on New Zealand fruit and vegetables and Webb et al. (2018) who focus on the impact of reducing the costs of NTMs in ASEAN supply chains. In the current study, we also make use of the very detailed data available in these new datasets, but here we focus on regulatory harmonization among CPTPP countries.

Using fine-grained NTM data to assess the impact of regulatory convergence

Using the TRAINS NTMs data, it is possible to compare the regulatory structure across countries and across over 5,000 disaggregated products. We follow Knebel and Peters (2018) in using these detailed new NTM datasets to econometrically estimate the costs of NTMs in domestic and foreign markets, taking into account reduced impacts due to measures that are already harmonized. Using these data, we are able to estimate the impact of CPTPP countries maintaining the same initial number of NTMs, while bilaterally harmonising where measures differ.[5]

The basic intuition of our estimation is that *cost-insurance-freight* (c.i.f.) product prices at the border are "treated" by different types of NTMs, taking into account regulatory overlap. The estimation is based on a worldwide cross-section of 46 recently collected countries, including most CPTPP members, at a disaggregated product-level.

Cost-insurance-freight (c.i.f.) unit values are used instead of *free-on-board* (f.o.b.) as they are likely to capture more of the NTM-related costs. While unit values at the bilateral- and product-level are known to be statistically noisy, we use the dataset provided by Berthou & Emlinger (2011) which improves data quality significantly. The estimated effects are therefore ad valorem equivalents (AVEs) in terms of the impact on the final *c.i.f.* unit value goods price.

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[5] This harmonization is at a fairly broad level of classification. For example, the SPS chapter consists of up to 34 different types of measures and the TPT chapter consists of up to 24 different measures (UNCTAD 2013).

We count the number of distinct technical measures (SPS and TBT) applied by the importer (*ImpNTM*) and domestically by the exporter (*ExpNTM*). To measure the impact of regulatory convergence, we also count the number of overlapping measures between importer and exporter (*sameNTM*).[6]

Furthermore, control variables are included to capture overall price levels (*log* of exporter's and importer's per capita GDP) and transport costs (*log* of distance, landlockedness and common borders). Product-specific effects are absorbed through product-level fixed effects. The simple log-linear estimation equation reads as follows with sub-indices for product *k*, importer *I* and exporter *j* :

$$\ln\left(p_{ijk}\right) = \alpha + \beta_1 \text{ImpNTM}_{ijk} + \beta_2 \text{ExpNTM}_{ijk} + \beta_3 \text{sameNTM}_{ijk} + \beta_4 \text{QR}_{ijk} + \beta_5 \ln\left(\text{GDPpc}_i\right) + \beta_6 \ln\left(\text{GDPpc}_j\right) + \beta_7 \text{landlocked}_i + \beta_8 \text{landlocked}_j + \beta_9 \ln\left(\text{distance}_{ij}\right) + \beta_{10} \text{contig}_{ij} + FE_k + \varepsilon_{ijk}$$

Specifications (1) and (2) run the same regression for agri-food sectors and manufacturing sectors, respectively. The results of the estimation are presented in Appendix Table C.

The included control variables and main explanatory NTM variables show the expected signs and magnitude of effects.

In the agricultural sub-sample we find a marginal effect of about 1 percent (1.2 percent for importer's NTMs and 0.93 percent for domestic NTMs) for each additional NTM. Given that most country apply between five and fifteen measures per product, the total effect is significant. The most important novelty of the regression is the inclusion of the number of overlapping measures: We find that a pair of overlapping measures almost cancels out the effect of an additional foreign NTMs. In other words, a pair of overlapping measures between importer and exporter is about half as costly as a pair of non-overlapping measures.

We also find the same pattern for manufacturing sectors. While the incidence of NTMs is generally lower, the respective marginal effects are higher (3.4 percent for importer's NTMs, 2.9 percent for domestic NTMs and minus 2.6 percent in case of overlapping measures). Again, a pair of overlapping measures is almost half as costly as non-overlapping measures.

To generate shocks for the CGE simulation, we take the marginal regression results to conduct a linear extrapolation of the marginal results. We multiply the marginal effects from the respective regressions for agriculture and manufacturing with the respective observations of three main NTMs variables.

[6] Founded on GATT and WTO agreements and the principle of equal regulatory treatment of foreign and domestic producers, we assume that NTMs applied by the exporting country would also hold for domestic production.

While the extrapolation is based on the imperfect assumption of linearity, they provide a decent approximation.

The total 'gross' price-increasing impacts of domestic/exporter's and foreign NTMs range between 17 and 22 percent in agricultural sectors and between 3 and 14 percent in manufacturing sectors. The price-reducing effect of current regulatory overlap already reduces these figures by 10 to 20 percent.

We then simulate the impact of a modest regulatory reform. The reform scenario maintains the same number of NTMs in each country. Cost-reductions are obtained only through the realignment of existing measures. This approach recognises that countries at different levels of development may need different levels of technical regulation. Table 1 shows an example of such a reform scenario with two countries, four NTM types for a specific product. Exporter Z undertakes a small shift (Z*) in regulations (from measure type B14 to B83). Trade costs due to NTMs would reduce from 13.4 to 10.8 percent.[7] While the example is highly stylized for a single product and four measures, regulatory patterns across 5,000 products and 58 types of technical measures provide greater insight.[8]

Table 1: Example of NTM data mapping with respect to 'regulatory overlap'

NTM types and codes **for a specific product at HS-6 level: e.g. toys**	**Importer Y**	**Exporter Z**	**Exporter Z* after reform**
B21: Maximum residue limit	1 ⟵	**1**	**1**
B41: Production process requirements	1 ⟵̸	0	**0**
B83: TBT certificate	1 ⟵̸ ⟵	0	**1**
B14: Special authorisation	0	**1** ⇢	0
Total number of NTMs	**3**	**2**	**2**
Number of overlapping NTMs	**1**		1+1=**2**

Source: Authors' illustration.

Shocks are calculated across every product and country pair in CPTPP. Across many sectors, a cut of 15 to 25 percent of current impacts of NTMs could be achieved. We then aggregate the simulated shocks from the HS 6-digit to GTAP sectors.

[7] In the original scenario between Importer X and Exporter Y, trade prices for this manufactured products are estimated to increase as follows: 3 measures applied by the importer * 3.4% + 2 measures applied by the exporter * 2.9% + 1 pair of overlapping measures * -2.6% = 13.4%. In the reform scenario, the number of overlapping measures increases from 1 to 2. This means that the calculation then runs as follows: 3 measures applied by the importer * 3.4% + 2 measures applied by the exporter * 2.9% + 2 pairs of overlapping measures * -2.6% = 10.8%.

[8] There are 34 different types of SPS measures and 24 types of TBT that are considered in this study.

3. Non-tariff measures in the CPTPP region

We use these newly constructed bilateral estimates to model harmonization of NTMs in goods trade between CPTPP countries.[9] This type of relatively modest harmonization would leave the total number of NTMs applied by each country unchanged, allowing countries to continue to achieve their policy objectives, while reducing the costs of trade between countries. The TPP agreement includes several chapters focusing on goods NTMs, including Chapter 7 on sanitary and phyto-sanitary (SPS) and Chapter 8 on technical barriers to trade (TBT). These chapters emphasize encouraging greater regulatory cooperation, enhancing transparency, and eliminating unnecessary obstacles to trade thus potentially could accommodate the type of harmonization we model.

To estimate the impacts of harmonization, we implement these measures in a dynamic version of the Global Trade Analysis Project (GTAP) model. Table 2 shows the average reductions in import costs by country and aggregate sector, with the NTM harmonization modelled. Changes in the trade costs for the goods NTMs we model tend to be highest in the processed food sector, but are also relatively high in the agricultural sector. Table 3 summarizes the average cost reductions from the perspective of exporters for each region. The aggregate reductions in import and export costs are the same when considering the whole CPTPP region. However, these will differ depending on the underlying export and import flows, combined with detailed product NTM harmonization estimates. Overall, we find that for Australia, Brunei, Chile, Peru and Singapore, there is a greater impact on imports while for the other countries there is a larger impact on exports.

The values presented in Table 2 and Table 3 present an overview of the average reductions by broad aggregate sector. However, in our modelling these are implemented a more detailed sectoral level (see Appendix Table A). When we drill into these more detailed estimates, we find there is significant variation by sector modelled, ranging from 7.8 percent for imports of beef and sheep meat products to Brunei to zero for mineral products and metal products to some markets.[10]

[9] Data are not currently available for Australia, therefore, for Australia we assume the same bilateral NTMs as New Zealand has with CPTPP member countries.

[10] We note that these are average price changes; however, in our modelling, these are implemented bilaterally.

Table 2: Average reductions in imported goods NTMs, CPTPP countries with harmonization (percent)*

	Agriculture	Food	Manufactures	All goods
Australia	2.8	2.1	1.1	1.2
Brunei	2.2	2.3	0.5	0.9
Canada	1.9	2.6	0.8	0.9
Chile	1.6	2.2	0.8	0.9
Japan	2.6	3.6	1.0	1.3
Malaysia	2.5	2.2	0.5	0.6
Mexico	1.7	1.8	0.8	1.0
New Zealand	2.0	1.8	0.7	0.9
Peru	2.3	2.3	0.9	1.1
Singapore	2.2	3.1	1.6	1.7
Vietnam	3.3	3.7	2.2	2.4
CPTPP Total	2.4	3.0	1.0	1.2

* Trade-weighted by 2011 base year trade flows from the GTAP sectors modelled to three aggregate sectors, as detailed in Appendix Table A. As discussed in Section 4, these are implemented through shocks to exporters and importers.

Source: Authors' estimates

Table 3: Average reductions in exported goods NTMs, CPTPP countries with harmonization (percent)*

	Agriculture	Food	Manufactures	All goods
Australia	2.8	3.9	0.6	1.0
Brunei	2.0	2.3	0.1	0.1
Canada	2.1	3.5	0.7	1.3
Chile	1.3	1.4	0.3	0.5
Japan	3.1	3.2	1.5	1.5
Malaysia	2.3	2.9	0.6	0.8
Mexico	1.7	1.6	0.9	1.0
New Zealand	2.9	2.7	0.3	1.4
Peru	2.5	2.5	0.3	0.6
Singapore	2.1	2.6	1.2	1.2
Vietnam	3.5	3.6	2.4	2.5
CPTPP Total	2.4	3.0	1.0	1.2

* Trade-weighted by 2011 base year trade flows from the GTAP sectors modelled to three aggregate sectors, as detailed in Appendix Table A. As discussed in Section 4, these are implemented through shocks to exporters and importers.

Source: Authors' estimates.

4. Modelling approach and scenarios

To model the overall impacts of goods NTM harmonization in the CPTPP region, we employ the recursive dynamic GTAP model (GDyn) (Ianchovichina and Walmsely, 2012), based on the widely used GTAP model (Hertel, 1997). GDyn provides a theoretically consistent method for projecting long-term macro- and micro economic variables, allowing for the modelling of policy impacts in the appropriate year and economic environment. We extend GDyn to allow for improved modelling of NTMs and the model is solved using GEMPACK software (Harrison et al., 2014).

The starting point for our analysis is the GTAP v9.2 2011 database (Aguiar et al., 2016). The data are aggregated into 31 commodities and 21 regions, as detailed in Appendix Table A and Appendix Table B. We establish a simple baseline scenario from 2011 to 2040, providing an extended period time for implementation of NTM harmonization in the CPTPP region. To build the baseline scenario, forecasts are obtained for key exogenous variables, including real GDP, population, labor and investment. Forecasts to 2021 for real GDP and investment are obtained for 191 countries from the IMF's (2016) World Economic Outlook database. After 2021, we generally assume that technological change, risk premiums and other relevant rates remain unchanged. Forecasts for labor to 2040 are obtained from CEPII, following the methodology documented in Fouré et al. (2012) and updated to reflect more recent forecasts in total labor growth from the ILO (2015). Population forecasts to 2040 are obtained from the ILO (2015), based on UN (2015) forecasts.

We model harmonization of current SPS and TBT measures with no reduction in the quantity of NTMs, as discussed above. The estimates of the shocks required to harmonize NTMs are aggregated to match the GTAP goods commodities modelled. For Australia, given that data are not currently available, we apply the bilateral estimates generated for New Zealand, since these two countries have relatively similar regulatory systems.[11] The reductions in costs imposed by goods NTMs are divided into two parts to impact importers and exporters through different mechanisms. The first half of the estimated price reductions are applied as iceberg productivity gains to the importing country. The second half is applied as a productivity gain to the exporting firm following Walmsley and Strutt (2018): we modify the dynamic Global Trade Analysis Project model (GDyn) to incorporate this newly developed mechanism for modelling NTMs. In each scenario, implementation is evenly split over the ten-year period commencing in 2020.

5. Preliminary results of harmonizing NTMs in the CPTPP

In this section, we analyse some of the impacts of harmonizing NTMs in the CPTPP region. We then briefly consider how these impacts might change if the United States, an original TPP member, were to join the harmonization of NTMs between CPTPP countries.

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[11] For bilateral Australia-New Zealand NTMs, we assume the regulatory barriers are generally relatively low, with the reductions in NTM costs set to the lowest cut in the region for each product category.

Real GDP

When goods NTMs are harmonized in the CPTPP region, all member countries gain in terms of real GDP, as shown in Table 4. For the scenario we model, expansions in real GDP exceed 1 percent for Singapore and Vietnam, more than 0.4 percent for Vietnam and almost 0.3 percent for New Zealand. For other countries, the increases in real GDP relative to the 2040 baseline range between 0.04 and 0.2 percent. Overall, for the CPTPP region, the percentage expansion in real GDP is 0.2 percent in 2040. Table 4 also shows the expansions in constant 2011 dollars, relative to the 2040 baseline. The total expansion of real GDP in the CPTPP region is almost US$41b, with large economies such as Japan tending to experience particularly large gains in dollar terms.

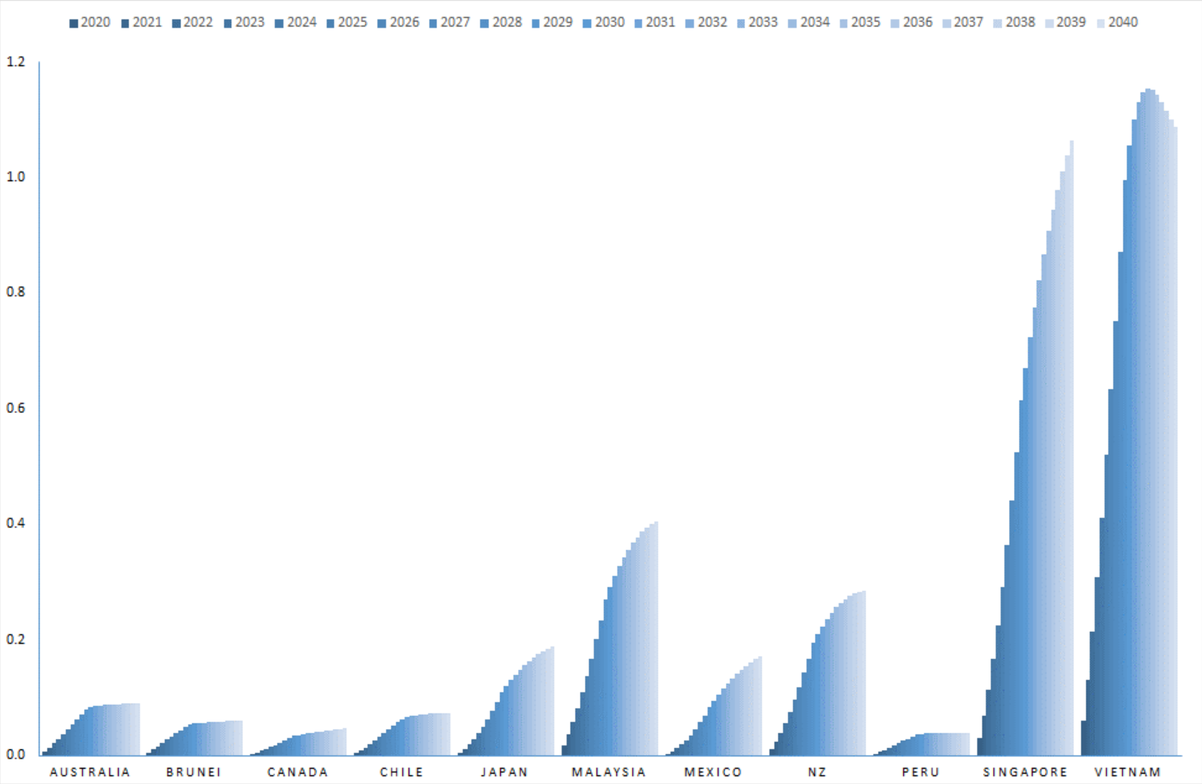
Table 4: Simulated impact of NTM harmonization on CPTPP GDP, 2040 relative to baseline (% and constant 2011 US$m)

	Percent	US$m
Australia	0.09	2,836
Brunei	0.06	35
Canada	0.05	1,596
Chile	0.07	423
Japan	0.19	14,637
Malaysia	0.41	3,697
Mexico	0.17	4,125
New Zealand	0.29	912
Peru	0.04	170
Singapore	1.07	6,775
Vietnam	1.09	5,772
CPTPP Total	0.20	40,978

Source: Authors' model results.

Figure 1 shows how the cumulative annual increments to real GDP for each CPTPP economy change over time. Real GDP generally rises incrementally during the implementation period from 2020-2030, with the expansion tending to slow down, stabilize, or even slightly reduce in the case of Vietnam, over the subsequent decade.

Figure 1: Simulated impact of NTM harmonization on CPTPP GDP relative to baseline, 2020-2040 (percent)



Source: Authors' model results.

Sectoral exports and output

Turning to sectoral impacts, Table 5 indicates the most significant changes in real sectoral exports tend to occur in the sectors for which relatively high price impacts of harmonization are estimated. Exports from the food sector tends to grow particularly strongly, with overall exports from the CPTPP growing by more than 1.5 percent in our simulation results, as shown in Table 5. In terms of more detailed sectors, we note beef and sheep meat, along with the other meat sector, tend to experience relatively strong expansion in output: relative to the 2040 baseline beef and sheep meat exports are simulated to expand by 5.2 percent while other meats expand by 7.8 percent for the CPTPP region.

Changes in real sectoral exports tend to be reflected in changes in real sectoral output, as indicated in Table 6. For example, total output of food in the CPTPP region expands by 0.15 percent while the manufactures sector expands output by 0.21 percent. In terms of more detailed sectors, it is the electronics sector that expands particularly strongly in output, with a 0.66 percent expansion. While electronics exports only expanded by 1.5 percent, we find that much of this translates into an expansion in exports, in part because there is less trade diversion from non-CPTPP regions than we find for the food sectors.

Table 5: Impact of NTM harmonization on CPTPP exports to the world (%)

	Agriculture	Food	Manufacture	All goods
Australia	0.52	5.87	0.18	0.24
Brunei	1.13	3.00	0.03	0.03
Canada	0.09	0.66	0.02	0.03
Chile	0.67	2.15	0.28	0.32
Japan	-0.46	1.44	0.63	0.57
Malaysia	0.67	0.54	0.66	0.61
Mexico	0.13	0.32	0.25	0.24
New Zealand	0.04	1.66	-0.03	0.46
Peru	0.82	2.18	0.07	0.11
Singapore	0.64	3.33	1.60	1.32
Vietnam	-0.46	2.36	1.86	1.58
CPTPP Average	0.22	1.56	0.54	0.52

Source: Authors' model results.

Table 6: Impact of NTM harmonization on CPTPP output (%)

	Agriculture	Food	Manufacture	All goods
Australia	0.27	0.25	0.00	0.01
Brunei	-0.15	-1.44	0.03	0.01
Canada	0.23	0.01	-0.01	0.00
Chile	0.12	0.20	0.03	0.02
Japan	-0.20	-0.03	0.12	0.04
Malaysia	0.03	0.26	0.39	0.22
Mexico	-0.01	0.06	0.17	0.08
New Zealand	0.47	0.99	-0.08	0.08
Peru	0.01	0.03	0.00	0.00
Singapore	0.15	1.72	1.31	0.66
Vietnam	0.19	0.93	1.06	0.61
CPTPP Average	0.08	0.15	0.21	0.08

Source: Authors' model results

Impact of including the US in the agreement

While the United States is no longer a member of the CPTPP, it was a member of the original 12 member TPP. Therefore in this section, we briefly consider how the effects of our simulation might change if the United States were to be included in the included in the NTM harmonization. Table 7 presents overview results showing the impact of harmonization of goods NTMs in the TPP12 region that includes the United States. We find that the gains for the CPTPP region expand from 0.2 percent of total GDP to more than 0.6 percent with the inclusion of the United States. The positive impact of the United States joining the regional harmonization is particularly strong on Mexico as well as Canada, Singapore and Vietnam. For Australia and Brunei, the impacts of the United States joining the harmonizing are slightly negative. For the United States, we find that when CPTPP countries harmonize their goods NTMs in the absence of the United States, 2040 real GDP contracts by 0.02 percent. This changes to a 0.08 percent expansion if the United States harmonizes along with CPTPP countries.

Table 7: Simulated impact of NTM harmonization on TPP12 (including the United States) GDP, 2040 relative to baseline (% and constant 2011 US$m)

	Percent	US$m
Australia	0.05	1,656
Brunei	-0.05	-31
Canada	0.85	29,076
Chile	0.21	1,177
Japan	0.28	21,665
Malaysia	0.79	7,175
Mexico	1.86	44,925
New Zealand	0.39	1,233
Peru	0.06	251
Singapore	1.91	12,165
Vietnam	1.92	10,179
United States	0.08	25,405
TPP12 Total	0.30	154,875
CPTPP Total	0.64	129,471

Source: Authors' model results.

6. Preliminary conclusions

Using a detailed new set of NTM estimates along with new econometric and CGE modelling approaches, we find that harmonizing NTMs over a 10-year period from 2020 has positive overall impacts on each country participating in the CPTPP regional integration, even without reducing the total number of measures imposed by each country. Our simulation suggests that overall CPTPP real GDP will expand by 0.2 percent relative to the 2040 value, with particularly strong expansions for Vietnam and Singapore. Exports of food are likely to expand relatively strongly and the manufactures sector is simulated to experience relatively strong real output expansion. If the United States were to harmonize NTMs along with CPTPP countries, the expansions in real GDP tend to be greater for most participating countries.

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8. Appendices

Appendix Table A: Sectoral aggregation

Sectors modelled	Description	GTAP sectors*	Aggregated sectors for reporting
Rice	Rice (paddy and processed)	PDR, PCR	Agriculture
Fruit & vegetables	Vegetables, fruit, nuts	V_F	Agriculture
Sugar	Sugar (raw and processed)	C_B, SGR	Agriculture
Other crops	Other crops: wheat, other grains, oilseeds, plant fibres etc.	WHT, GRO, OSD, PFB, OCR	Agriculture
Raw milk	Raw milk	RMK	Agriculture
Cattle & sheep	Cattle, sheep, goats, horses etc.	CTL	Agriculture
Other animals	Pigs, poultry etc.	OAP	Agriculture
Wool	Wool, silk etc.	WOL	Agriculture
Beef & sheep meat	Beef and sheep meat	CMT	Processed Food
Other meats	Other meat: pork, chicken etc.	OMT	Processed Food
Dairy	Dairy products	MIL	Processed Food
Other processed foods	Vegetable oils, other processed foods incl. fish	VOL, OFD	Processed Food
Beverages & tobacco	Beverages and tobacco products	B_T	Processed Food
Forestry, wood and paper	Forestry, wood and paper products	FRS, LUM, PPP	Manufactures
Fisheries	Fisheries (not including processed fish)	FSH	Agriculture
Extractive	Extract of coal, oil, gas & other minerals; petroleum & coke	COA, OIL, GAS, OMN, P_C	Manufactures
Textiles	Textiles	TEX	Manufactures
Apparel & leather	Wearing apparel and leather products	WAP, LEA	Manufactures
Motor vehicles	Motor vehicles & parts	MVH	Manufactures
Electronics	Electronic equipment	ELE	Manufactures
Other machinery	Other machinery and equipment	OME	Manufactures
Other manufactures	Manufactures nes: metal prods, transport equip & other	FMP, OTN, OMF	Manufactures
Chemicals, rubbers and plastics	Chemicals, rubber and plastic products	CRP	Manufactures
Mineral products	Non-metallic mineral prods: cement, plaster, concrete etc.	NMM	Manufactures
Metal products	Iron & steel and non-ferrous metals	I_S, NFM	Manufactures
Construction	Construction	CNS	Services
Business & financial services	Business, insurance and financial services	OBS, OFI, ISR	Services
Air & other transportation	Air and other transport	ATP, WTP, OTP	Services
Trade & communications	Trade and communications	TRD, CMN	Services
Public sector	Government services	OSG	Services
Other services	Other services	ELY, GDT, WTR, ROS, DWE	Services

* *See www.gtap.agecon.purdue.edu/databases/contribute/detailedsector.asp for details of the 57 GTAP sectors.*

Appendix Table B: Regional aggregation

Country/region modelled	Original GTAP regions*	Aggregated regions for reporting
New Zealand	NZL	CPTPP
Australia	AUS	CPTPP
Brunei	BRN	CPTPP
Canada	CAN	CPTPP
Chile	CHL	CPTPP
Japan	JPN	CPTPP
Malaysia	MSY	CPTPP
Mexico	MEX	CPTPP
Peru	PER	CPTPP
Singapore	SGP	CPTPP
Vietnam	VNM	CPTPP
United States	USA	United States
Other ASEAN countries	KHM, IDN, LAO, PHL, THA, XSE**	Rest of the world
China	CHN	Rest of the world
Hong Kong	HKG	Rest of the world
Taiwan	TWN	Rest of the world
South Korea	KOR	Rest of the world
South Asia	IND, BGD, NPL, PAK, LKA, XSA,	Rest of the world
Western Europe: EU28 and EFTA	AUT, BEL, CYP, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, IRL, ITA, LVA, LTU, LUX, MLT, NLD, POL, PRT, SVK, SVN, ESP, SWE, GBR, CHE, NOR, XEF, BGR, ROU	Rest of the world
Rest of Central & Latin America	BRA, ARG, XNA, BOL, COL, ECU, PRY, URY, VEN, XSM, CRI, GTM, HND, NIC, PAN, SLV, XCA, XCB	Rest of the world
Rest of the World	XOC, MNG, XEA, ALB, BLR, RUS, UKR, XEE, XER, HRV, KAZ, KGZ, XSU, ARM, AZE, GEO, TUR, BHR, IRN, ISR, 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	Rest of the world

* *See http://www.gtap.agecon.purdue.edu/databases/regions.asp?Version=9.211 for details of the GTAP countries and regions*

*** This region comprises Myanmar and Timor-Leste: while Timor-Leste is not currently an ASEAN member country, Myanmar is a much larger economy and dominates this composite region.*

Appendix Table C: Underlying regression results for the calculation of shocks

	(1)	(2)
Dependent variable: log (c.i.f. trade unit value)	*only Agriculture*	*only Industry*
Importer's *total number* of technical NTMs	0.012***	0.034***
	(0.00)	(0.00)
Exporter's/domestic *total number* of technical NTMs	0.0093***	0.029***
	(0.00)	(0.00)
Pairs of *overlapping* NTMs in exporter & importer	-0.0086***	-0.026***
	(0.00)	(0.00)
Importer quantitative restrictions dummy	0.021	0.029***
	(0.02)	(0.01)
log (Importer GDP per capita)	0.25***	0.19***
	(0.01)	(0.00)
log (Exporter GDP per capita)	0.18***	0.21***
	(0.01)	(0.00)
log (distance)	0.074***	0.20***
	(0.00)	(0.01)
1 for common border	-0.22***	-0.031***
	(0.02)	(0.01)
1 if importer is landlocked	0.19***	0.11***
	(0.02)	(0.01)
1 if exporter is landlocked	0.089**	0.22***
	(0.04)	(0.02)
Observations	43'662	369'249
Adjusted R^2	0.616	0.697

Clustered standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01.
Fixed effects regressions with product-specific (HS-6 digit) fixed effects.

Source: Knebel and Peters (2018)