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Effective Rates of Protection in a World With Non-Tariff Measures and Supply Chains: Evidence from ASEAN

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Abstract: *The concept of effective rate of protection expresses protection on a sector's final output relative to protection affecting its inputs. As such, it is well adapted to analysing the effects of trade policy from a supply chain standpoint. This paper makes two contributions to the literature on effective rates of protection. First, it draws on the literature on trade in value added to highlight an alternative to the traditional measure that better accounts for supply chain trade by considering both direct and indirect input use. Second, it includes data on ad valorem equivalents of non-tariff measures, which are increasingly important as trade policy instruments. In an analysis covering 17 aggregate goods sectors, I find that average tariff only effective rates of protection in ASEAN averaged 6.9% and ranged from zero to 23.4% in 2018. By contrast, effective rates including non-tariff measures averaged 14.0% and ranged from –6.2% to 44.0%. While patterns of escalation and even effective taxation differ substantially across sectors, most countries practice a tariff and NTM trade policy that is broadly neutral between input and output sectors, but which causes low to moderate isolation from world markets. Given the complexity of tariffs and NTMs from a supply chain perspective, there would likely be reductions in economic waste accompanying substantial simplification.*

Keywords: International trade policy; non-tariff measures; trade in value added; effective rate of protection; Southeast Asia

JEL Classification: F13; F14; O24

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1. Introduction

In a world of supply chains, it is more important than ever for policymakers to be aware of the economic impacts of trade policy changes as they feed through complex input–output systems. With this in mind, it is puzzling that the concept of the effective rate of protection, which summarises trade policy insulation from world markets taking account of input usage, has largely fallen out of use in the recent literature.

Another feature of current trade policy is the relative shift in most countries from tariffs to non-tariff measures in terms of the policies that effectively insulate domestic producers and consumers from world markets. As tariff rates have fallen around the world, the use of regulatory measures broadly considered to be non-tariff measures (NTMs) has greatly increased. In this context, the standard definition of an NTM is a regulatory measure that affects quantities trade, the price of trade goods, or both. A key category of NTMs in most markets is product standards, understood in the World Trade Organization (WTO) context as technical barriers to trade (TBTs) and sanitary and phyto-sanitary measures (SPS). For an overview of the pattern of prevalence of NTMs in the Association of Southeast Asian Nations (ASEAN) using the latest available data, see Ha and Rosenow (2019).

I bring these two developments together by extending the traditional ERP concept to include multiple stages of processing in a supply chain. I then apply it not only to tariffs, but also to newly estimated ad valorem equivalents (AVEs) of NTMs, taking 2015 and 2018 as base years, using newly collected data. While there is an existing literature that extends the ERP to the supply chain context, it has not previously been applied to NTMs in addition to tariffs. I present complete results for six of the 10 ASEAN Member States; the remaining countries do not have data for both relevant years.

Against this background, the paper proceeds as follows. Section 2 discusses the traditional ERP measure, and my literature-based extension of it to multiple stages of processing in a supply chain context. The following section then discusses my

approach to estimating AVEs of NTMs. Section 4 presents results and provides some discussion for both phases of the work. Finally, section 5 concludes by discussing policy implications.

2. Effective Rate of Protection: Theory

Standard trade policy data, such as applied tariffs, summarise what can be termed the nominal rate of protection. In other words, a tariff of 5% in a given sector is assumed to have the effect of insulating local producers and consumers from world markets by reducing the quantity that is imported and increasing the output price on the domestic market.

However, Corden (1966) showed that in an economy with input–output relationships across sectors, the nominal rate of protection does not necessarily provide a complete summary of the degree to which each sector is insulated from international markets. For instance, if a given sector has a tariff on its output of 5% but it uses a single input to the extent of 50% of its output value and that input is subject to a 10% tariff, then the net effect of the two tariffs cancels out: the input tariff raises production costs and undoes the producer effect of the price increase associated with output tariffs. However, if another sector has a tariff on its output of 5% but uses a single input to the extent of 50% of its output value, but that input is subject to a 1% tariff, then that sector is in fact protected to the extent of 9%, which is greater than what is suggested by the nominal rate.

Motivated by cases like this one, Corden (1966) developed the effective rate of protection (ERP). In its most common application, it represents the increase in value added per unit of an economic activity made possible by the tariff structure relative to the situation in the absence of tariffs but with the same exchange rate. The ERP is typically calculated as the nominal rate of tariff protection for a sector less the input weighted average of tariffs on inputs. An ERP greater than zero indicates that the total tariff structure tends to protect a sector on net, whereas a negative rate indicates that the total tariff structure tends to tax a sector on net. More formally:

$$ERP_j = \frac{t_j - \sum_{i=1}^{N} a_{ij} t_i}{1 - \sum_{i=1}^{N} a_{ij}}$$

where ERPj is the effective rate of protection for sector j; t is the nominal tariff by sector; and aij is a technical coefficient from a Leontief production model summarising the extent to which sector j draws on inputs from sector i in producing its output. The ERP therefore adjusts the nominal rate of protection by subtracting an input weighted sum of tariffs across all sectors (including the output sector, if it consumes its own production as one of its inputs).

The ERP concept described above is based on direct input use. But production of a unit of output in one sector requires inputs from other sectors, which themselves draw inputs from a range of sectors, and so on. These subsequent rounds of input use can be referred to as indirect input use. Diakantoni and Escaith (2012) extended the ERP concept to include both direct and indirect input use by fully specifying a Leontief production model. The starting point is a simple input– output relationship with fixed technology, such that:

$$X = AX + Y$$

where: X is a vector of output by sector; Y is a vector of final demand by sector; and A is, as above, the matrix of technical coefficients summarising input use by input and output sector. The elements of A give direct input use. To obtain indirect input use, it is straightforward to use an infinite series as follows:

$$\sum_{n=0}^{\infty} A^n$$

From basic matrix algebra, the following identity holds:

$$(I - A)^{-1} = \sum_{n=0}^{\infty} A^n$$

Then from the Leontief model, it is clear that:

$$X = (I - A)^{-1} Y$$

where $B = (I - A)^{-1}$ is the Leontief inverse. Each element of B gives the total direct and indirect input requirement to produce an additional unit of a given sector's output.

Diakantoni and Escaith (2012) built on this approach to reformulate the ERP expression as follows:

$$ERP'_j = \frac{t_j - \sum_{i=1}^{N} b'_{ij} t_i}{1 - \sum_{i=1}^{N} b'_{ij}}$$

where b'_{ij} is an element of the modified Leontief inverse:

$$B' = (I - A)^{-1} - I$$

The modified Leontief inverse fully captures direct and indirect usage, but subtracts unity from each sector's own use of its own output as an intermediate to account for the fact that diagonal elements of the Leontief inverse are greater than unity. The modified ERP is therefore the output tariff less an input weighted average of input tariffs, as in the original, but the weights are given by direct and indirect input use, instead of direct use only.

In this paper, I compare the standard and modified ERP calculations using data for ASEAN countries. In addition, I go beyond the standard model to analyse non-tariff measures (NTMs) in addition to tariffs. A literature search does not disclose

any examples of previous work that includes NTMs in the ERP framework. From a theoretical standpoint, the change is straightforward: after expressing NTMs in ad valorem equivalent (AVE) terms, they can simple be incorporated in the formula along with tariffs; no further changes are required. The conversion to AVE terms is of course not straightforward, and is an issue I return to below.

Having stated the matter so simply, it is important to be clear about terminology, however. For tariffs only, which are always protectionist measures in both intent and effect, the ERP terminology makes intuitive sense. For NTMs, the case is not so clear cut. NTMs are typically not protectionist in intent. Rather, they are aimed at achieving social goals. However, in promoting those goals, they have trade effects that amount to a de facto insulation of local producers and consumers from world markets in a similar way as occurs with a tariff. This similarity is indeed the basis of the AVE concept. But it is important to be clear that by including NTMs in the ERP framework, I am in no way suggesting that they are necessarily protectionist. Indeed, the 'P' in ERP stands for 'protection', not 'protectionism', so there is a clear focus on outcomes rather than intent. While there is an argument for changing terminology in the NTM concept, such a change would ultimately be confusing for readers who are familiar with the ERP concept. I therefore retain the ERP terminology in this paper, subject to this important point of clarification.

To compute the coefficients of the A and B' matrices, I use the multi-region input–output table underlying the OECD–WTO Trade in Value Added (TiVA) Database. Data are available for eight of the 10 ASEAN Member States; only Lao PDR and Myanmar are not covered. I retain 19 goods sectors, and aggregate the remainder of the economy into an 'Other' sector. Since no policy data are available for the aggregate, which consists of services and miscellaneous items, I simply drop it from the analysis. To construct the A and B' matrices, I work directly with the input–output matrix in TiVA, and simply aggregate sectors and countries to produce the required data points.

3. Ad Valorem Equivalents of NTMs

Before moving to incorporate NTMs into ERP measurements, it is necessary to produce AVE estimates. NTM data are sourced from UNCTAD's TRAINS database. TRAINS reports NTMs by HS 6 digit product, country, and partner. Multiple measures can be recorded at the product-country-partner level, or there can be no measures. But the database records the existence of a measure and its categorisation, not its economic impact. Converting these regulatory measures to AVEs produces estimates that are fully comparable to tariff rates, in the sense that they are expressed ad valorem. However, the assumption in making such a transformation is that the market insulating effects of NTMs can be interpreted in the same way as a tariff, which affects marginal but not fixed costs. I exclude from consideration the possibility that NTMs can also create fixed costs of market access because such costs cannot easily be translated into AVE terms.

There is an extensive previous literature providing different AVE estimates of NTMs. Numerous methods are available, but the most straightforward is to include some measure of NTM restrictiveness in a gravity model of trade, and then to apply some simple theory to derive an estimate of the AVE associated with a given level of restrictiveness.

In the current international trade literature, the standard gravity model takes the following form, considering a single year cross-section only:

$$(1)\ X_{ij} = F_i F_j t_{ij}^{-\theta} e_{ij}$$

where: Xij is exports from country i to country j; the F terms are exporter and importer fixed effects; t is bilateral trade costs; θ is a parameter capturing the sensitivity of demand to cost; and e is an error term satisfying standard assumptions. Numerous theoretical setups are consistent with this framework, such as the Armington-type model of Anderson and Van Wincoop (2003), the Ricardian model of Eaton and Kortum (2002), and the heterogeneous firms model of Chaney (2008).

Arkolakis et al. (2012) and Costinot and Rodriguez-Clare (2014) showed that a wide class of quantitative trade models, including the canonical ones just cited, have the same macro-level implications for the relationship between trade flows and trade costs even though their micro-level predictions are quite different.

Trade costs t are specified in the usual iceberg form, so that an AVE can be obtained by simply subtracting unity. T itself is unobserved, but can be specified in terms of observable proxies. Limiting consideration to NTMs for ease of exposition, a simple trade cost function would be:

$$(2)\ -\theta log t_{ij} = \beta NTM_j$$

The AVE of this measure of NTMs would therefore be:

$$(3)\ t_{ij} - 1 = \exp\left(\frac{-\beta NTM_{ij}}{\theta}\right) - 1$$

Previous work has adopted this general approach, but has departed from the standard gravity model when it comes to estimation. Ing and Cadot (2017) is an example. The authors use a model that is reminiscent of standard gravity, in the sense that trade flows respond to exporter- and importer-specific factors (the fixed effects above), as well as bilateral trade costs, including a measure of NTM prevalence. However, the standard gravity model in (1), which can be derived from quite general microeconomic assumptions, has the value of bilateral trade as the dependent variable, i.e. the aggregate of transaction level quantities multiplied by transaction level prices. Ing and Cadot (2017), on the other hand, used bilateral trade in price terms only, derived as value divided by quantity. The rationale, presumably, is that NTMs can have complex and perhaps inverse effects on quantities and prices, so the specification is an effort to disentangle these two impacts. However, rewriting (1) to have price as the dependent variable makes clear that this approach is problematic from an estimation point of view:

$$(4)\ \frac{X_{ij}}{Q_{ij}} \equiv p_{ij} = F_i F_j \frac{t_{ij}^{-\theta}}{Q_{ij}} e_{ij}$$

Equation (4) makes clear that quantity in this setup varies in the same dimension as trade costs, and so is not absorbed by the fixed effects. As a result, a gravity specification in terms of unit price needs to have quantity as an independent variable in order to be consistent with basic gravity theory. Quantity is an omitted variable in the Ing and Cadot (2017) specification, and to the extent that it is correlated with trade costs, it could be expected to introduce bias in the resulting estimates. To be more precise, trade costs are negatively correlated with price in the above formulation, so if NTMs negatively affect traded quantities – a plausible assumption – then the bias on the NTM coefficient will be positive: in other words, this approach will result in an impact estimate of NTMs that is too low in absolute value, with AVEs correspondingly too small.

A subsidiary issue is that while trade values are typically well measured in customs data – because tariffs are typically applied ad valorem – the same is not true of quantity, which means that the derived measure of unit price is likely to be much noisier than observed trade values. It is plausible that this noise varies systematically across products and countries due to unobserved factors, which is an additional source of bias in the resulting estimates. Approaches that use quantities directly, such as Ghodsi et al. (2016) and UNCTAD and World Bank (2018) are subject to similar concerns.

An additional concern with previous efforts to estimate AVEs of NTMs is that they do not always take account of current best practice in gravity modeling. First, theory has strong implications for the configuration of fixed effects used to account for unobservables. In a single year cross section with multiple products, fixed effects should be in the exporter-sector and importer-sector dimensions. For multiple years, the fixed effects should be exporter-sector-year and importer-sector-year at a minimum. Equation 1 and the literature it is based on, cited above, makes these points clear. But none of the AVE papers considered satisfies this criterion.

Second, Santos Silva, and Tenreyro (2006) showed that OLS estimates of a log linearised version of (1) will be biased in the presence of a multiplicative heteroskedastic error term in the untransformed model. They propose a pseudo-maximum likelihood solution to the problem using Poisson. PPML is consistent and unbiased provided that the conditional mean is correctly specified, although efficiency can potentially be improved with alternative variance assumptions. In addition, Fally (2015) showed that a unique property of PPML in the GLM class of estimators means that fixed effects from a model estimated by PPML correspond exactly to the theory-consistent terms in the Anderson and Van Wincoop (2003) model. PPML has therefore become the standard for gravity modeling, but only Ghodsi et al. (2016) amongst the AVE papers cited above apply it.

A final concern is that basic theory makes clear that gravity models should include all observations for Xij, including intra-national trade (j=i). The highly disaggregated approach taken by the other AVE papers does not allow for inclusion of intra-national trade data, because they are not available at that level of detail. However, exclusion of these terms means that compromises have to be made in terms of the rigor of the fixed effects specification in order for the NTM variable to be separately identified.

I deal with all of the above issues by using a gravity model exactly as given by (1), but with a sectoral dimension that necessitates greater granularity in the fixed effects in order to be consistent with theory:

$$(5)\ X_{ijs} = F_{is}F_{js}t_{ijs}^{-\theta}e_{ijs}$$

With all terms defined as above, but with s indexing sectors. I then specify the following trade costs function:[1]

[1] In panel data settings, it is now common to use country-pair fixed effects in place of many trade cost observables that do not vary through time. However, estimation in this paper is via a pure cross-section, so there is too little variation to allow for meaningful parameter identification if symmetric country pair fixed effects are used, and a model with asymmetric country pair fixed effects is not identified at all.

$$(6)\quad -\theta log t_{ijs} = \beta_1 NTM_{ijs} + \beta_2 RTA_{ij} + \beta_3 EU_{ij} + \beta_4 \log\left(distance_{ij}\right) + \beta_5 contiguous_{ij} + \beta_6 colony_{ij} + \beta_7 common\ language_{ij} + \beta_8 intl_{ij} + \beta_9 \log\left(1 + tariff_{ij}\right) + \beta_{10} common\ colonizer_{ij} + \beta_{11} same\ country_{ij}$$

where the variables other than NTM are standard gravity model controls sourced from Mario Larch's RTA database and the CEPII distance dataset, as well as effectively applied tariffs from UNCTAD's TRAINS database. I estimate the model by PPML, using a Stata package for high dimensional data developed by Correia et al. (Forthcoming). Trade data in gross value terms are sourced from OECD–WTO TiVA dataset, which allows me to include intra- as well as international trade, which is required for theoretically consistent estimates of gravity model parameters (Heid et al., 2017). I retain 19 goods sectors. I merge UNCTAD's TRAINS data from the HS6 digit level to the TiVA sector level using a concordance produced by OECD. I limit consideration to NTMs in chapters A and B of the MAST classification, namely SPS measures and technical barriers to trade, in WTO terminology. The result is a panel covering 59 exporters and importers and 19 sectors, for a total of 66,139 observations.

The main data issue relates to definition of the NTM variable. At a disaggregated level, a straightforward approach using dummies to distinguish product lines with NTMs from those without can produce meaningful results. At the much more aggregate level of TiVA sectors, such an approach is not feasible. Instead, I define the NTM variable as the NTM frequency ratio for each sector, which is the percentage of HS 6 digit lines in that sector that have at least one NTM in place. This measure varies by country pair, as well as across sectors. It is bounded between zero and unity.

Table 1 lists variables and definitions, while Table 2 provides summary statistics.

Table 1: Variables, Definitions, and Sources.

Variable	Definition	Source
Colony	Dummy variable equal to one if one country in a pair was in a colonial relationship with the other.	CEPII.
Common coloniser	Dummy variable equal to one if the two countries were colonised by the same power.	CEPII
Common language	Dummy variable equal to one if both countries in a pair have a language in common, spoken by at least 9% of the population.	CEPII.
Contiguous	Dummy variable equal to one if the two countries share a common land border.	CEPII.
EU	Dummy variable equal to one if country I and country j are both members of the European Union in 2015.	Author.
Exports	Gross exports from country i to country j in sector s (2015).	TiVA.
Intl	Dummy variable equal to one if country I and country j are different.	Author.
Log(Distance)	Logarithm of distance between country i and country j.	CEPII.
Log(Tariff)	Logarithm of 1 + applied tariff rate.	TRAINS
NTM	Count of the average number of NTMs per 6-digit product line in sector s applied by country j.	UNCTAD.
RTA	Dummy variable equal to one if country I and country j are part of the same trade agreement in 2015.	Mario Larch.
Same Country	Dummy variable equal to one if the two countries were ever part of the same country.	CEPII.

Source: Author's calculations.

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Colony	66139	0.028	0.164	0	1
Common coloniser	66139	0.023	0.150	0	1
Common language	66139	0.081	0.273	0	1
Contiguous	66139	0.038	0.192	0	1
EU	66139	0.217	0.412	0	1
Exports	66139	649.873	16232.940	0	1725716
Intl	66139	0.983	0.129	0	1
Log(Distance)	66139	8.390	1.136	1.900	9.894
Log(Tariff)	61174	0.809	0.981	0	5.017
NTM	66139	0.666	0.345	0	1
RTA	66139	0.500	0.500	0	1
Same Country	66139	0.013	0.113	0	1

Source: Author's calculations.

4. Results and Discussion

a. Gravity Model and Estimated AVEs

Table 3 presents estimates from the gravity model, specified and estimated as set out above. Turning first to the control variables, it is clear that they all have the expected signs and are highly statistically significant, which is in line with expectations. The only exception is the RTA dummy, but a comparison between that coefficient and the coefficient on the EU dummy suggests that the bulk of the trade promoting impact of trade agreements in the sectors considered comes from the EU.

The variable of interest, our count of NTM intensity, has a negatively signed coefficient, which means that increasing NTM frequency is associated with lower bilateral trade. The coefficient is statistically significant at the 1% level. Thus far, the finding is in line with previous work, despite the different data and estimation framework. To give an idea of the quantitative importance of this coefficient, a simple

calculation shows that increasing NTM frequency by 10% at the sample mean would be associated with a reduction in bilateral trade of just under 7% (exp[0.067*–1.052]–1). This magnitude is by no means implausible, and would be consistent with a low to moderately trade reducing impact of NTMs at the levels of frequency observed in these data. Again, to be clear, the fact that NTMs reduce trade only means that they raise costs for exporters and effectively introduce some degree of insulation from international markets. It does not mean that the measures are protectionist in intent.

Table 3: Gravity Model Estimation Results

	(1)
NTM Frequency	–1.052 ***
	(0.232)
Log(Tariff)	–0.294 ***
	(0.059)
RTA	–0.079
	(0.122)
EU	0.413 ***
	(0.098)
Log(Distance)	–0.632 ***
	(0.061)
Contiguous	0.265
	(0.175)
Colony	0.180
	(0.172)
Common Coloniser	0.291 *
	(0.160)
Common Language	0.397 ***
	(0.147)
Same Country	–0.101
	(0.192)
Intl	–3.056 ***
	(0.253)

Constant	16.959 ***
	(0.481)
Observations	61,085
R2	0.979
Exporter-Sector Fixed Effects	Yes
Importer-Sector Fixed Effects	Yes

Note: Dependent variable is X. Estimation is by PPML. Robust standard errors corrected for clustering by country pair appear in parentheses below the parameter estimates. Statistical significance is indicated as follows: * (10%), ** (5%), and *** (1%).
Source: Author's calculations.

As discussed above, the parameter estimate from Table 3 can easily be manipulated to produce AVEs. I assume that the trade elasticity theta is 8.25, based on the average in Caliendo and Parro (2015). Table 4 presents summary statistics by sector for the AVEs calculated in this way, limiting consideration to ASEAN Member States. The overall sample mean AVE for 2015 is 7.4%, with a range from 2.9% to 10.9%. For 2018, the figures are very similar: a mean of 7.7% and a range from 3.2% to 11.1%. The table shows that relatively high AVEs are concentrated in agriculture and food and beverages, as well as motor vehicles and transport equipment, as well as coke and petroleum. I note in passing that a concentration of regulatory measures in some of these sectors would be consistent with public health and safety motivations, which again highlights that the measures considered here are not necessarily protectionist in intent. Outside these sectors, the level of market insulation introduced by NTMs is generally low, which is in line with the back of the envelope trade impact discussed above.

It is useful to compare these results with the summary statistics of Ing and Cadot (2017). For agriculture and food, their mean AVE estimate is 6.7%, so a comparison with Table 4 shows that my estimates are a little higher. A possible reason for the difference is that Ing and Cadot (2017) only considered SPS measures in these sectors, rather than SPS measures and technical barriers to trade, as is the case here. This difference in NTM data combined with the different approach would be consistent with the higher results reported here. Similarly, the fact that my estimated AVEs are typically larger than those reported by Ing and Cadot (2017) is consistent with the analysis of the likely omitted variable bias in their model (see above), based

on which I concluded that their estimates were likely too low.

Ing and Cadot (2017) also reported an average AVE for manufacturing sectors, which is 5.0% for ASEAN. A rough comparison with Table 4 suggests that my estimates are again slightly higher. Given the uncertainty surrounding estimation methodology, as discussed above, the AVEs produced by my approach do not seem out all out of line with previous work on ASEAN, even though they are generally slightly higher. This general picture is reinforced by Table 5, which shows results by country (taking the average across all sectors).

Table 4: Estimated AVEs of NTMs by sector, ASEAN Member States

	2015	**2018**
Agriculture	8.603	8.098
Basic Metals	6.014	7.316
Chemicals & Pharma.	2.868	3.196
Coke & Petroleum	8.507	9.339
Computers & Electronics	7.966	6.901
Electrical Equip.	8.537	8.988
Fabricated Metal Prods.	4.591	5.884
Food & Beverage	8.890	8.323
Motor Vehicles	10.873	11.067
Other Machinery & Equip.	7.511	7.603
Other Manufacturing	6.082	6.134
Other Non-Metallic Minerals	6.681	6.747
Other Transport Equip.	8.722	8.808
Paper & Printing	6.222	7.489
Rubber & Plastic	7.599	7.738
Textiles & Apparel	5.808	6.491

Source: Author’s calculations.

Table 5: Estimated Average AVEs of NTMs by Country, ASEAN Member States

	2015	2018
BRN	3.783	4.085
IDN	5.508	6.291
KHM	11.176	12.157
LAO	4.916	4.905
MMR	13.600	13.600
MYS	4.855	4.936
PHL	9.168	9.664
SGP	6.051	6.052
THA	2.259	2.298
VNM	12.814	12.818

Source: Author's calculations.

b. Effective Rates of Protection

The next step of the analysis is to compute ERP and ERP' based first on tariffs only, then on tariffs and NTMs (converted to AVE terms). Not all countries reported tariff data for both 2015 and 2018. If only one year is available, I use it for both years. Similarly, TiVA input–output tables are not yet available for 2018, so I assume the relevant matrices are time invariant, in the absence of better data. In what follows, I leave raw data fields blank when the relevant information is missing, but the results of data manipulation (ERP and ERP') are presented based on filled in data when necessary.

Table 6 shows results for tariffs. Within each year, the first column gives the nominal rate of tariff protection, and the last two columns show ERP and ERP'. Nominal rates and standard ERPs are quite similar, except in food and beverage and other manufacturing, where the ERP is much higher. Differences with ERP' are much starker. The modified measure is in most but not all cases lower than the nominal rate,

and in a substantial number of cases, it is negative. A negative ERP means that the overall tariff structure effectively taxes rather than protects the sector, due to the pattern of protection affecting the sectors it uses as intermediate inputs. A key point of comparison here is between ERP (only direct input use) and ERP' (direct and indirect input use): effective rates calculated using the Leontief matrix weights are substantially different from those calculated using technical coefficient weights in most cases. There is no single direction of change: in some cases, the movement is from positive to negative, in other cases a sign is accentuated but maintained. Notwithstanding these substantial differences within each year, changes from 2015 to 2018 are relatively small for each measure, with some limited evidence of liberalisation, although the direction of change varies across sectors.

The example of fabricated metal products can be explored in more detail to highlight the differences between the two ERP calculations. Both the technical coefficients matrix and the Leontief inverse show that the sector primarily sources its inputs from itself and from the basic metals sector, as would be expected. However, the weights are noticeably higher in the Leontief inverse than in the technical coefficients matrix, which means that indirect demand flows through to these same sectors through others that incorporate their inputs. In most countries, basic metals have much lower tariffs than fabricated metal products, so ERPs tend to be well in excess of the nominal rate, an effect that is accentuated by ERP', which uses the higher input weights from the Leontief inverse. This example shows the types of effects that are in evidence, to a greater or lesser extent, in other sectors.

Comparing the nominal tariff with ERP' also provides some general information on the tariff structure affecting different sectors. Where ERP' is greater than the nominal tariff, as is the case in six sectors, this shows that protection of final goods is substantially greater than protection of input sectors; in other words, the sector in question displays tariff escalation. It is common practice in manufacturing economies like those in ASEAN to practice tariff escalation, so this pattern of results is not surprising. However, there are 11 sectors in which ERP' is less than the nominal rate, which means that protection of input sectors reduces the

competitiveness of output sectors by raising firms' costs; in some cases, where ERP' is negative, this phenomenon acts like a tax on the output sector. The relative frequency of this result is surprising for economies like those in ASEAN, and may indicate that policymakers have set tariffs without sufficient regard to patterns of input use in production, and so could potentially boost competitiveness by further liberalising tariffs in key sectors.

Table 6: ERPs for Tariffs Only, Average by Sector for ASEAN Member States

	2015			2018		
	Tariff	**ERP (T)**	**ERP' (T)**	**Tariff**	**ERP (T)**	**ERP' (T)**
Agriculture	4.927	4.532	–1.048	2.800	4.454	–1.570
Basic Metals	1.257	1.358	–0.062	1.430	1.316	–0.082
Chemicals & Pharma.	1.210	0.867	–8.909	1.191	0.880	–7.593
Coke & Petroleum	1.083	1.047	–34.885	0.669	0.632	–59.850
Computers & Electronics	1.999	–5.071	1.086	1.703	–5.060	0.791
Electrical Equip.	4.508	4.556	5.102	3.083	4.406	5.136
Fabricated Metal Prods.	5.567	5.990	142.917	3.942	5.792	129.411
Food & Beverage	8.151	14.676	1.182	5.880	14.056	1.152
Motor Vehicles	11.598	0.471	16.565	6.918	0.095	15.999
Other Machinery & Equip.	1.106	0.270	4.863	1.153	0.190	4.809
Other Manufacturing	5.303	24.054	2.405	4.141	23.756	2.640
Other Non-Metallic Minerals	4.956	4.381	7.180	3.409	4.111	6.444
Other Transport Equip.	4.477	3.730	4.446	3.493	4.044	5.029
Paper & Printing	3.292	2.607	5.995	2.436	2.566	5.022
Rubber & Plastic	5.236	6.236	2.679	4.128	6.054	3.230
Textiles & Apparel	5.532	4.833	3.458	4.806	4.880	3.691
Wood	3.241	2.588	3.204	2.784	3.083	3.064

Note: Calculations include Brunei Darussalam, Indonesia, Philippines, Singapore, Thailand, and Viet Nam only, due to lack of data on remaining countries.
Source: Author's calculations.

Table 7 presents the data in a different way, namely by taking averages across sectors within countries. Differences are less pronounced in this case, which indicates that patterns of protection differ at the sectoral level in similar ways across countries. This result is in line with the view that comparative advantage is distributed similarly in the major ASEAN economies. At a country level, there is one case (Singapore; a free trader) where the nominal rate and ERP' are exactly equal, but only two cases where ERP' is less than the nominal rate (Thailand and Indonesia). The remaining countries have more expected tariff profiles, with ERP' in excess of the nominal rate – a pattern which is consistent with generalised tariff escalation, albeit at low rates in the case of Brunei Darussalam. Generally speaking, ERP' is relatively low in all ASEAN countries, given patterns of tariff protection in other developing regions around the world, with the exception of Viet Nam.

Table 7: ERPs for Tariffs Only, Average by ASEAN Member State Across All Sectors

	2015			2018		
	Tariff	**ERP (T)**	**ERP' (T)**	**Tariff**	**ERP (T)**	**ERP' (T)**
BRN		0.100	0.118	0.103	0.100	0.118
IDN		5.721	4.226	4.897	5.721	4.226
PHL	3.706	6.191	7.527	3.886	6.482	7.325
SGP	0.000	0.000	0.000	0.000	0.000	0.000
THA	6.397	3.674	6.338		3.674	6.338
VNM	7.177	11.534	36.912	6.986	10.585	23.401

Note: Remaining countries excluded due to lack of data.
Source: Author's calculations.

Table 8 presents results for tariffs plus AVEs of NTMs. The first point to note is that nominal rates are higher than for tariffs only, which is in line with the results presented above on AVEs of NTMs. It is also consistent with the prevalent view that the main measures inhibiting market access in most countries are in fact now NTMs rather than tariffs. Second, ERP is positive in all cases, while ERP' is positive in all but two cases. Once NTMs are accounted for, there are only very limited examples of

sectors where the net effect of market insulation measures is a tax rather than a subsidy. There are again substantial differences between ERP and ERP', most commonly with ERP' greater than ERP, but not in all cases. Changes from 2015 to 2018 are relatively small in most cases.

Comparing ERP' with nominal rates shows that for nine sectors in 2018, ERP' is greater. In other words, nine sectors exhibit substantial evidence of tariff escalation. For the remaining cases, ERP' is slightly lower than the nominal rate, but given the relatively small differences that are typically in evidence, it would be appropriate to characterise the structure of trade costs as approximately neutral between input and output sectors rather than de-escalating.

In terms of the level of market insulation captured by these figures, a few sectors stand out. Domestic markets in agriculture, food and beverages, fabricated metals, motor vehicles, and wood are relatively isolated from global markets due to a combination of tariffs and NTMs. Again, it is important to stress that NTMs are not necessarily protectionist in intent, but their effect in this case is to increase trade costs substantially. These sectors stand out as ones where a relatively high level of insulation in input sectors has been compensated, or so it appears, by a high level of insulation in output sectors. There may be other explanations for this pattern of market insulation, but it is significant that other sectors where consumer protection is an issue – like computers and electronics, or chemicals and pharmaceuticals – are much less insulated from world markets.

Table 8: ERPs for Tariffs and NTMs, Average by Sector for ASEAN Member States

	2015			2018		
	Tariff+ AVE	**ERP (TNTM)**	**ERP' (TNTM)**	**Tariff+ AVE**	**ERP (TNTM)**	**ERP' (TNTM)**
Agriculture	12.065	7.748	11.963	10.165	7.815	10.972
Basic Metals	8.017	8.615	7.712	8.410	8.759	7.841
Chemicals & Pharma.	2.695	1.487	–45.347	3.478	2.371	–42.649
Coke & Petroleum	8.623	9.279	10.465	9.016	9.624	–13.754
Computers & Electronics	9.360	3.439	8.239	7.050	–2.676	7.566
Electrical Equip.	12.023	12.482	13.351	10.687	12.424	13.567
Fabricated Metal Prods.	9.464	9.597	173.265	9.074	10.859	161.411
Food & Beverage	16.012	13.203	13.210	13.860	10.522	13.940
Motor Vehicles	21.825	3.207	33.513	17.469	3.170	32.948
Other Machinery & Equip.	8.585	8.995	–25.342	8.637	8.761	–25.873
Other Manufacturing	10.058	30.881	1.756	8.971	31.011	3.091
Other Non-Metallic Minerals	10.743	10.291	13.644	9.183	9.979	12.823
Other Transport Equip.	12.573	11.592	13.840	11.645	11.913	14.375
Paper & Printing	8.622	7.890	15.983	9.588	9.982	18.699
Rubber & Plastic	12.018	13.828	4.215	10.956	13.588	4.018
Textiles & Apparel	10.565	8.470	4.871	10.635	9.320	6.657
Wood	12.841	12.471	12.847	12.384	12.924	12.609

Note: Calculations include Brunei, Indonesia, Philippines, Singapore, Thailand, and Viet Nam only, due to lack of data on remaining countries.
Source: Author's calculations.

Table 9 presents similar summary figures by member state, averaging across sectors. Nominal rates are higher than in Table 7, which showed tariffs only. The pattern of ERP' results relative to nominal rates is of interest. All countries except Singapore and Indonesia exhibit economy wide escalation of insulation, as evidenced by an ERP' greater than the nominal rate in 2018. This result is wholly driven by NTMs in the case of Singapore, as that country practices free trade in relation to tariffs. Singapore's ERP' is in fact negative, which means that the pattern of NTMs results in a net tax. The case of Indonesia is much less drastic, with only a small difference between ERP' and the nominal rate. Overall, the picture that emerges is reasonably similar in qualitative terms to that for tariffs only: the structure of market insulation from tariffs and NTMs displays considerable variation at the sectoral level, but economy-wide, these effects cancel out to a substantial degree, which translates to a substantial number of cases in which ERP' is very close to the nominal rate. While the overall level of insulation is low to moderate, and likely not particularly high by global standards, there is clearly a great deal of complexity at the level of individual firms when it comes to compliance. The relative neutrality of the structure does not suggest that NTMs are concentrated in sectors where consumer life and health are major considerations, as there is evidence of substantial insulation in business-to-business input sectors as well. These data do not strongly suggest that effective NTM density is concentrated on consumer-facing sectors; the relative neutrality of the structure overall suggests that other considerations, notably economic ones, may be at play. There could potentially be gains in terms of reducing economic waste by simplifying the overall structure of tariffs and NTMs.

Table 9: ERPs for Tariffs and NTMs, Average by ASEAN Member State Across All Sectors

	2015			2018		
	Tariff+ AVE	ERP (TNTM)	ERP' (TNTM)	Tariff+ AVE	ERP (TNTM)	ERP' (TNTM)
BRN	3.783	4.116	4.026	4.188	4.411	4.398
IDN	5.508	11.876	10.103	11.189	12.475	10.931
PHL	12.874	11.858	19.849	13.550	10.500	21.571
SGP	6.051	6.316	–6.189	6.052	6.314	–6.189
THA	8.657	3.303	9.149	2.298	3.613	9.164
VNM	19.991	23.494	57.500	19.804	22.552	44.008

Note: Remaining countries excluded due to lack of data.
Source: Author's calculations.

5. Conclusion and Policy Implications

This paper has implemented an extension to the traditional ERP concept that takes account of multiple stages of processing in a supply chain context. I have shown that this modified ERP produces noticeably different results from the traditional measure at the sectoral level. In addition, I have included AVEs of NTMs in the standard and modified ERP, and have shown that the degree of insulation from world markets increases substantially. These findings are very much in line with other work looking at the role of NTMs relative to tariffs in terms of increasing trade costs, but they highlight the particular implications of these measures in the context of supply chain trade.

It is important to stress that my results do not in any way imply that NTMs should be eliminated in order to reduce trade costs and thus lower the degree of insulation from world markets. That point can certainly be made for tariffs, which are protectionist by design. But NTMs may be in place in the pursuit of legitimate social objectives. What this research highlights is the need to incorporate good regulatory practice in the design and implementation of NTMs, so that they restrict trade no more than is strictly necessary to achieve a given social objective. The implication,

therefore, is that there may be a case for streamlining NTMs, but not for eliminating them.

Having said this, the pattern of market insulation revealed by the modified ERP highlights a number of concerns with existing trade policy structure. While there is evidence of some degree of insulation from world markets at the sectoral level, most countries implement an overall trade policy that essentially neutralises the effect of input measures on output sectors. It is not obvious that this approach would coincidentally emerge from a consideration of desirable social objectives and their pursuit by optimal means. It is consistent with a more strategic approach to the design of NTM structures, and is indeed reminiscent of what is seen in relation to tariffs in most countries. Again, this finding does not imply that NTMs should be removed at large scale. But it does mean that there is cause for closely examining the extent to which they rationally and efficiently pursue social objectives, and the extent to which they have the effect of privileging domestic production, whether by design or by accident.

Of particular concern for a region like ASEAN is the way in which NTMs in input markets can have major effects on the competitiveness of final producers. There is clear evidence of this in the modified ERP measures, and at the sectoral level, there are markedly different levels of success in terms of presenting firms with an overall neutral incentive structure. In some case, final producers are relatively insulated from world markets, but in others, their effective rate of protection is substantially lower than the nominal rate, which means that policies are less effective in practice than they were designed to be. Typically, it would be expected that a region like ASEAN would practice escalation, with relatively free input markets but protected outputs. That pattern is in evidence in some sectors, but it is far from universal. It is therefore possible that the current pattern of trade policy in member states is not always consistent with their development policy.

One point that emerges clearly from the data is that although most member states seem to have attempted to maintain a relatively neutral incentive structure, they nonetheless have a relatively complex trade policy structure. It is certainly true for

NTMs, but it is also apposite for tariffs. It is therefore likely that firms have to expend substantial economic resources ensuring compliance with the various rules and taxes. Selective liberalisation (tariffs) or efficient rationalisation (NTMs) could therefore reduce the compliance burden on firms, and allow these economic resources to shift to a more productive use.

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Annex: Effective and Nominal Rates of Protection

Note: Figures show ERP' in blue, ERP in red, and nominal rates in green. Each figure has an individual scale, so caution is necessary in comparing results visually. Results with an absolute value greater than 100% are not included, so as to retain readability.

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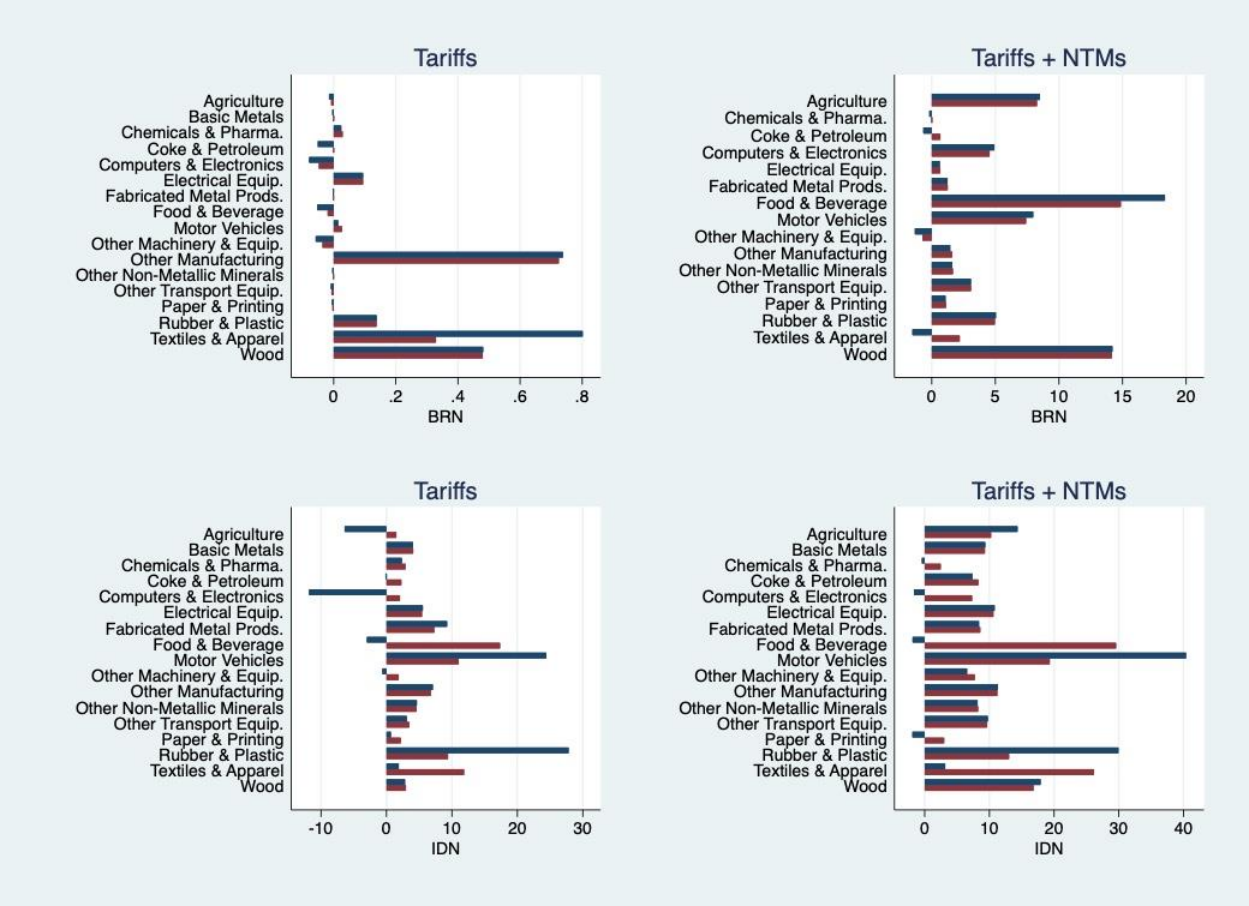

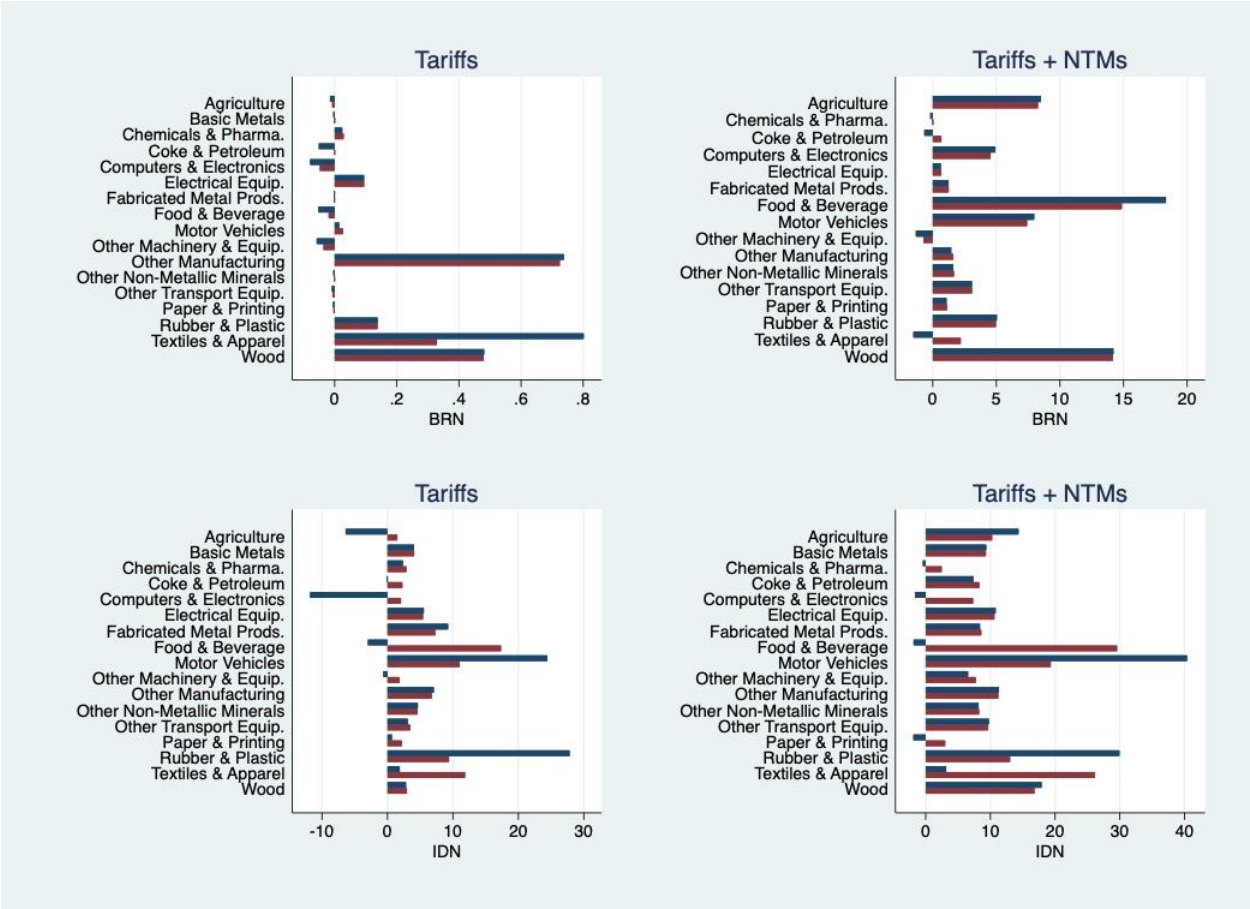
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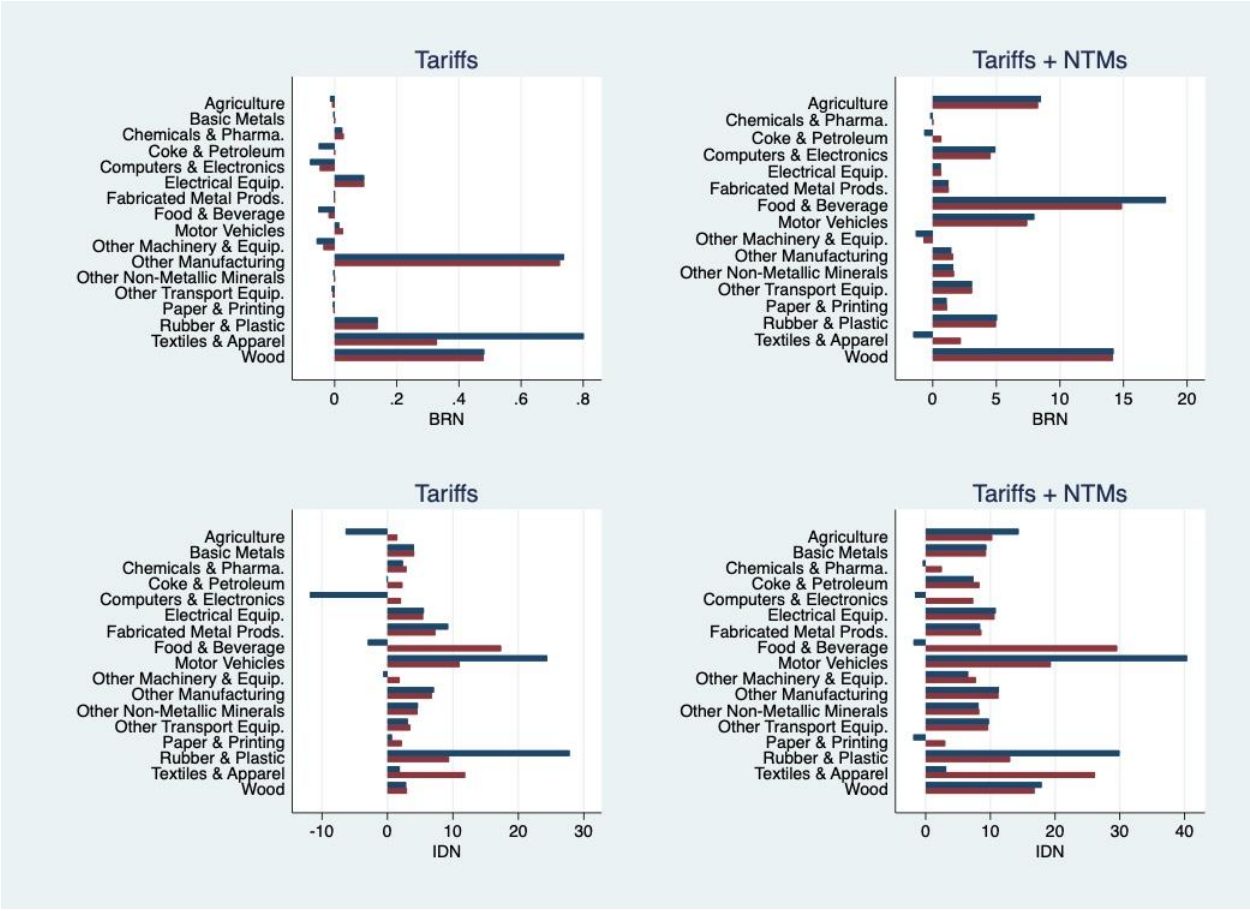
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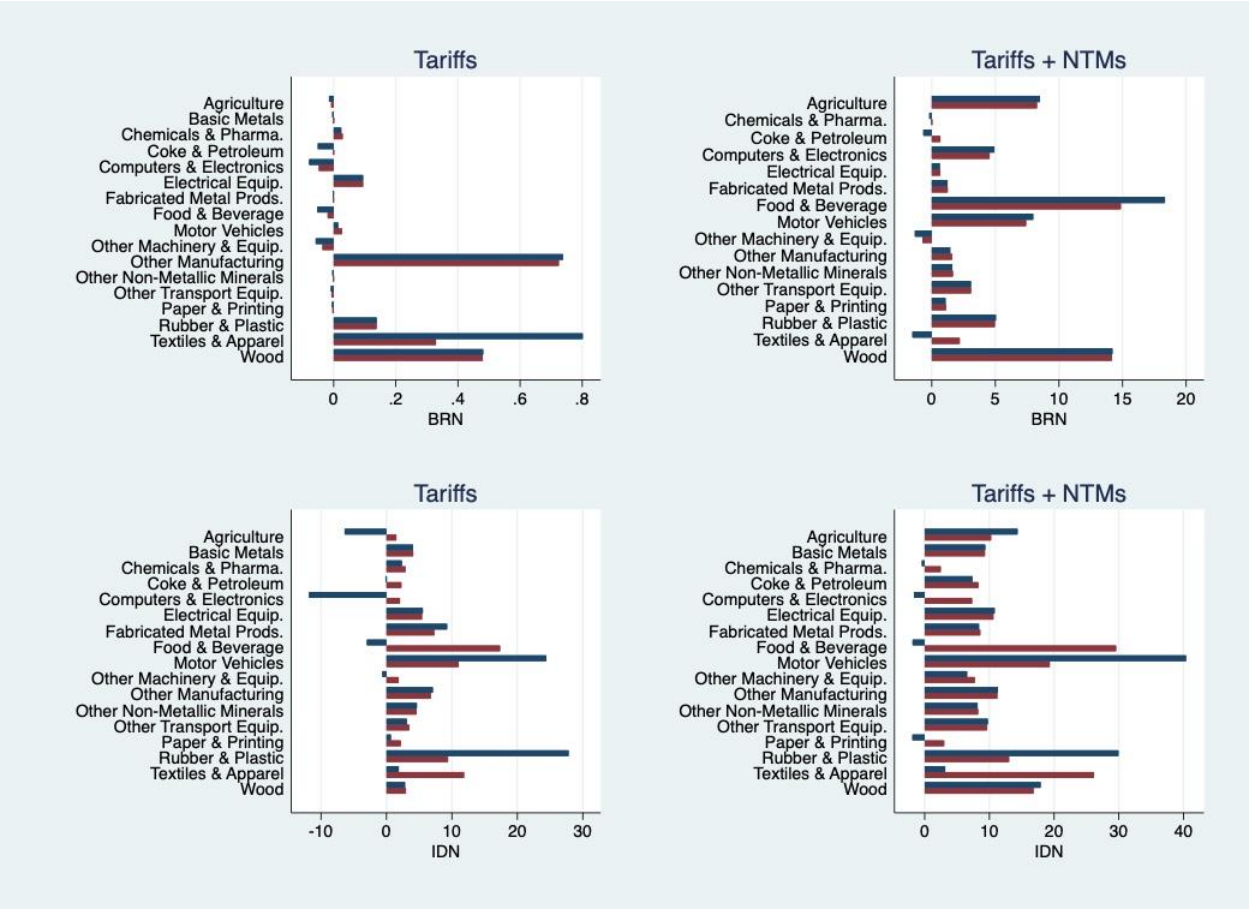
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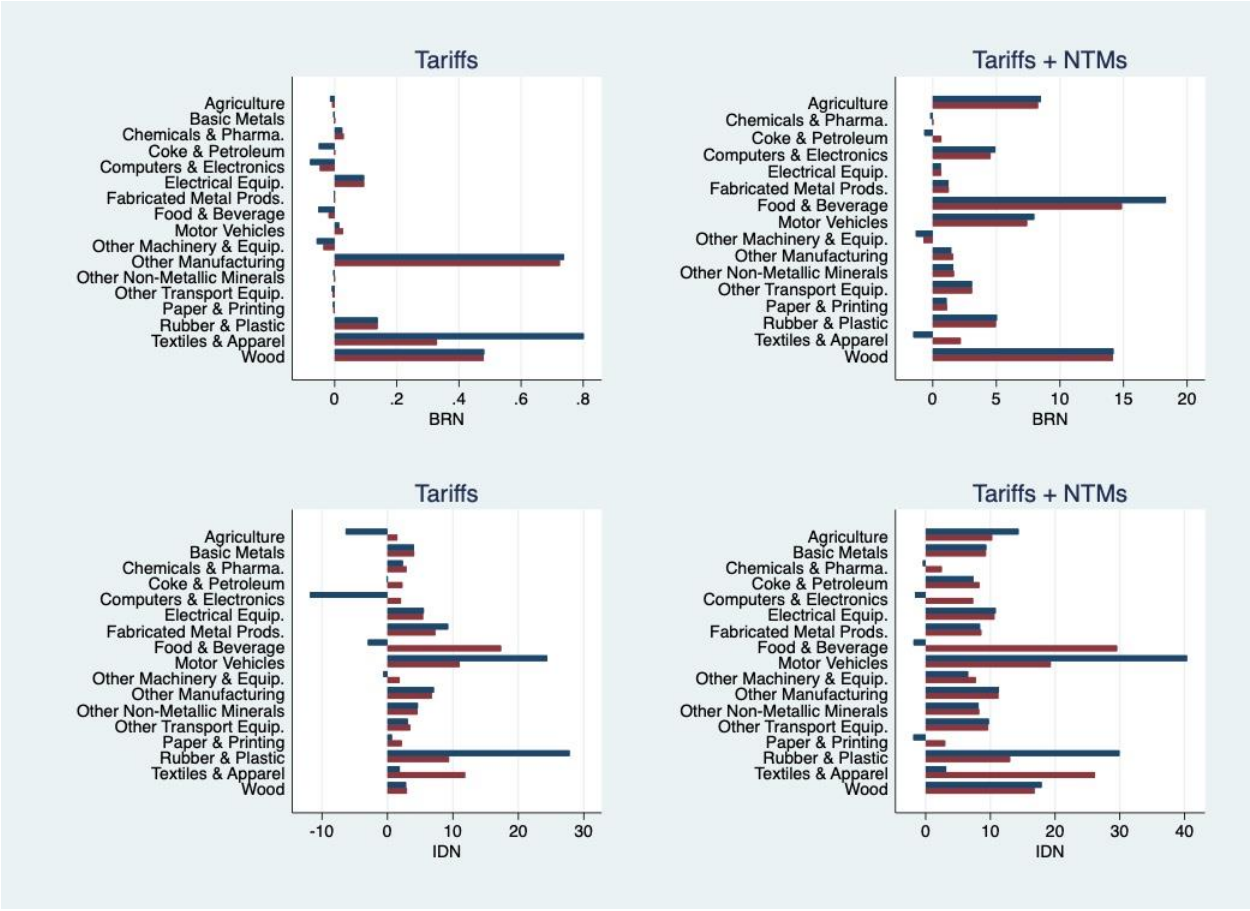
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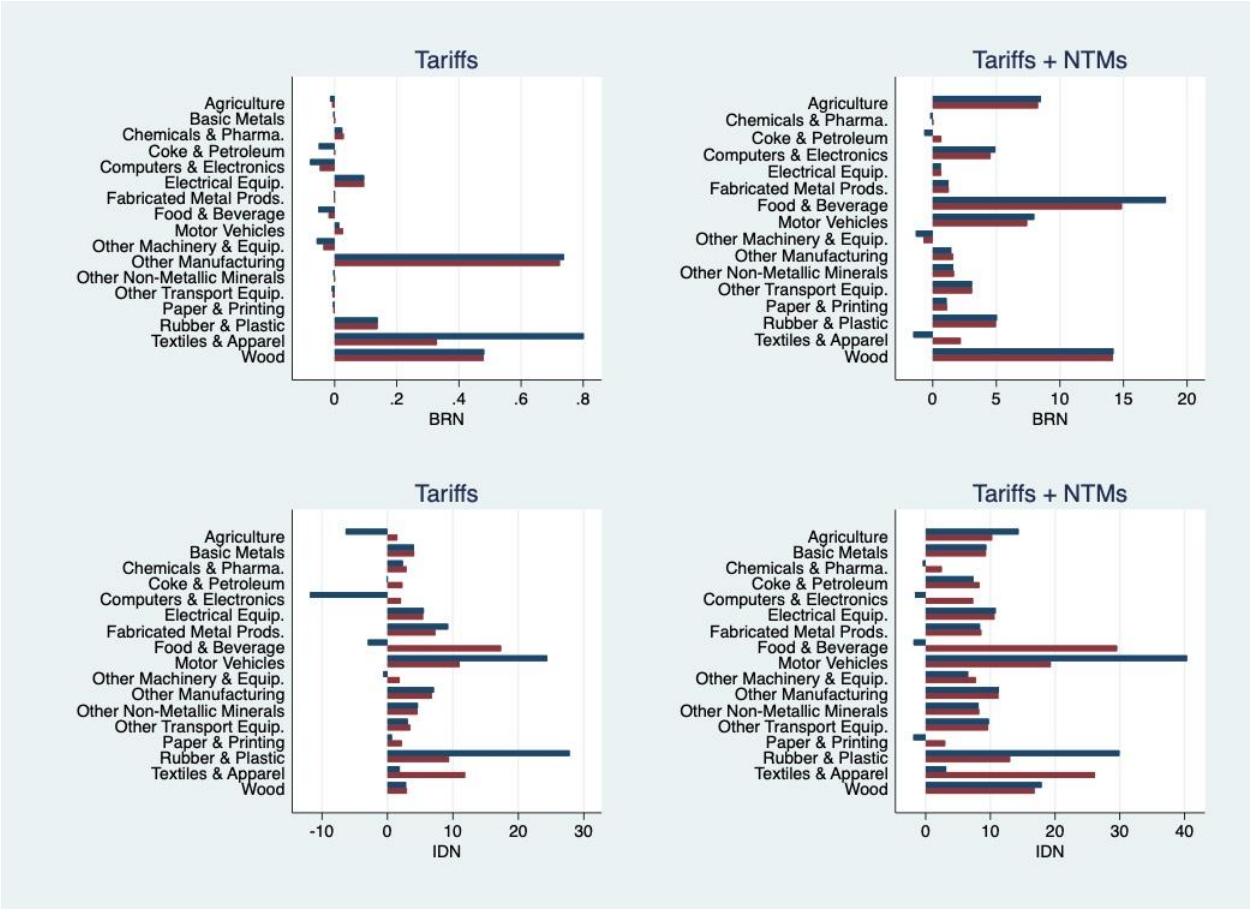
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Summary Table 2015

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff + NTM	ERP' Tariff	ERP' Tariff + NTM
BRN	Agriculture		8.117	–0.008	8.281	–0.015	8.504
BRN	Food & Beverage		11.962	–0.020	14.869	–0.053	18.339
BRN	Textiles & Apparel		2.262	0.329	2.204	0.802	–1.529
BRN	Wood		13.600	0.480	14.170	0.482	14.212
BRN	Paper & Printing		1.212	–0.004	1.124	–0.006	1.093
BRN	Coke & Petroleum		0.673	–0.001	0.682	–0.051	–0.669
BRN	Chemicals & Pharma.		0.146	0.029	0.011	0.025	–0.196
BRN	Rubber & Plastic		4.549	0.138	4.969	0.139	5.047
BRN	Other Non-Metallic Minerals		1.688	–0.001	1.672	–0.004	1.616
BRN	Basic Metals			0.000		–0.004	
BRN	Fabricated Metal Prods.		1.250	–0.001	1.257	–0.002	1.246
BRN	Computers & Electronics		3.439	–0.048	4.554	–0.079	4.927
BRN	Electrical Equip.		0.650	0.095	0.675	0.095	0.638
BRN	Other Machinery & Equip.		0.252	–0.036	–0.741	–0.058	–1.335
BRN	Motor Vehicles		5.737	0.027	7.423	0.015	7.982
BRN	Other Transport Equip.		3.075	–0.007	3.096	–0.009	3.089
BRN	Other Manufacturing		1.907	0.725	1.606	0.738	1.457
IDN	Agriculture		7.316	1.514	10.268	–6.402	14.365
IDN	Food & Beverage		7.639	17.366	29.596	–3.015	–1.886
IDN	Textiles & Apparel		10.674	11.871	26.137	1.886	3.170

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff + NTM	ERP' Tariff	ERP' Tariff + NTM
IDN	Wood		13.209	2.979	16.839	2.843	17.926
IDN	Paper & Printing		1.517	2.200	3.020	0.693	–1.913
IDN	Coke & Petroleum		5.516	2.284	8.311	–0.073	7.388
IDN	Chemicals & Pharma.		0.153	2.913	2.492	2.361	–0.453
IDN	Rubber & Plastic		3.010	9.416	13.051	27.840	29.955
IDN	Other Non–Metallic Minerals		3.651	4.611	8.273	4.649	8.183
IDN	Basic Metals		5.090	4.085	9.317	4.064	9.373
IDN	Fabricated Metal Prods.		2.517	7.330	8.604	9.276	8.406
IDN	Computers & Electronics		4.847	2.066	7.339	–11.844	–1.658
IDN	Electrical Equip.		5.097	5.442	10.631	5.563	10.826
IDN	Other Machinery & Equip.		5.221	1.869	7.761	–0.643	6.565
IDN	Motor Vehicles		7.222	11.043	19.339	24.428	40.407
IDN	Other Transport Equip.		5.906	3.489	9.664	3.118	9.776
IDN	Other Manufacturing		5.048	6.779	11.244	7.099	11.325
PHL	Agriculture	4.199	1.408	5.441	0.806	1.242	22.333
PHL	Food & Beverage	6.868	0.956	47.575	–7.837	1.707	12.140
PHL	Textiles & Apparel	5.669	1.370	6.104	6.621	8.251	2.817
PHL	Wood	4.215	13.600	4.271	18.413	4.406	19.310
PHL	Paper & Printing	3.057	13.600	3.044	17.029	3.029	17.457
PHL	Coke & Petroleum	0.283	13.600	–0.067	15.062	–1.369	16.212
PHL	Chemicals & Pharma.	1.567	0.734	1.303	0.374	0.733	–3.533

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff + NTM	ERP' Tariff	ERP' Tariff + NTM
PHL	Rubber & Plastic	6.089	13.600	6.457	20.973	6.729	21.730
PHL	Other Non-Metallic Minerals	3.613	13.600	3.698	17.784	3.787	18.451
PHL	Basic Metals	1.500	13.600	1.401	15.731	0.772	16.729
PHL	Fabricated Metal Prods.	5.191	0.818	5.578	4.982	5.801	4.343
PHL	Computers & Electronics	1.682	13.600	–1.101	17.737	3.459	13.452
PHL	Electrical Equip.	2.889	13.600	2.936	17.632	3.023	20.621
PHL	Other Machinery & Equip.	1.120	13.600	0.838	14.923	0.647	15.038
PHL	Motor Vehicles	8.196	13.600	10.771	25.984	78.413	135.002
PHL	Other Transport Equip.	3.214	13.600	3.255	17.455	3.290	18.039
PHL	Other Manufacturing	3.650	0.972	3.740	–2.089	4.046	–12.716
SGP	Agriculture	0.000	12.225	0.000	12.229	0.000	12.259
SGP	Food & Beverage	0.000	12.760	0.000	13.992	0.000	29.185
SGP	Textiles & Apparel	0.000	2.103	0.000	2.088	0.000	2.024
SGP	Wood	0.000	2.795	0.000	2.465	0.000	2.427
SGP	Paper & Printing	0.000	1.619	0.000	1.198	0.000	0.526
SGP	Coke & Petroleum	0.000	9.117	0.000	9.704	0.000	29.474
SGP	Chemicals & Pharma.	0.000	6.819	0.000	8.108	0.000	6.458
SGP	Rubber & Plastic	0.000	5.587	0.000	5.575	0.000	5.515
SGP	Other Non–Metallic Minerals	0.000	1.769	0.000	1.662	0.000	1.405
SGP	Basic Metals	0.000	0.880	0.000	0.759	0.000	0.509
SGP	Fabricated Metal Prods.	0.000	2.351	0.000	2.130	0.000	0.565

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff + NTM	ERP' Tariff	ERP' Tariff + NTM
SGP	Computers & Electronics	0.000	7.099	0.000	4.596	0.000	5.445
SGP	Electrical Equip.	0.000	10.453	0.000	11.121	0.000	11.887
SGP	Other Machinery & Equip.	0.000	11.523	0.000	19.466	0.000	–225.929
SGP	Motor Vehicles	0.000	8.728	0.000	8.961	0.000	9.172
SGP	Other Transport Equip.	0.000	3.404	0.000	0.012	0.000	5.365
SGP	Other Manufacturing	0.000	3.641	0.000	3.313	0.000	–1.505
THA	Agriculture	9.698	0.164	11.845	11.498	–7.280	–3.065
THA	Food & Beverage	12.516	0.248	52.626	50.836	3.446	4.667
THA	Textiles & Apparel	8.368	0.187	10.164	10.019	3.849	5.287
THA	Wood	4.609	0.797	4.567	5.333	4.530	5.225
THA	Paper & Printing	3.274	0.431	3.157	3.525	2.457	2.443
THA	Coke & Petroleum	1.052	2.736	0.973	3.940	–11.584	–3.634
THA	Chemicals & Pharma.	1.742	0.833	0.669	1.260	19.926	23.781
THA	Rubber & Plastic	6.690	0.345	10.880	10.463	0.486	2.587
THA	Other Non-Metallic Minerals	5.917	0.417	6.485	6.697	9.793	8.213
THA	Basic Metals	1.617	0.630	1.357	1.882	0.228	0.459
THA	Fabricated Metal Prods.	7.911	2.849	9.914	13.524	13.240	18.202
THA	Computers & Electronics	2.913	1.580	–33.733	–29.872	5.057	6.457
THA	Electrical Equip.	7.436	1.692	8.475	10.274	20.683	23.726
THA	Other Machinery & Equip.	1.436	0.677	–1.479	–1.589	34.824	44.046
THA	Motor Vehicles	19.614	12.474	–46.336	–83.671	3.216	3.392

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff + NTM	ERP' Tariff	ERP' Tariff + NTM
THA	Other Transport Equip.	5.707	8.989	5.879	15.861	6.107	17.744
THA	Other Manufacturing	8.255	3.361	17.006	26.168	–1.236	–4.002
VNM	Agriculture	5.809	13.600	8.398	3.404	6.170	17.383
VNM	Food & Beverage	13.222	13.600	–29.490	–22.240	5.007	16.816
VNM	Textiles & Apparel	8.093	13.600	0.527	3.750	5.962	17.454
VNM	Wood	4.139	13.600	3.231	17.602	6.966	17.986
VNM	Paper & Printing	6.838	13.600	7.245	21.446	29.796	76.292
VNM	Coke & Petroleum	2.996	13.600	3.090	17.973	–196.233	14.022
VNM	Chemicals & Pharma.	1.529	0.228	0.286	–3.325	–76.501	–298.140
VNM	Rubber & Plastic	8.166	13.600	10.526	27.940	–19.119	–39.541
VNM	Other Non–Metallic Minerals	10.293	13.600	11.491	25.659	24.858	43.998
VNM	Basic Metals	1.910	13.600	1.303	15.386	–5.433	11.490
VNM	Fabricated Metal Prods.	9.165	13.600	13.118	27.087	829.187	1006.827
VNM	Computers & Electronics	3.401	13.600	2.387	16.284	9.922	20.809
VNM	Electrical Equip.	7.706	13.600	10.386	24.559	1.246	12.408
VNM	Other Machinery & Equip.	1.868	13.600	0.428	14.150	–5.592	9.559
VNM	Motor Vehicles	18.582	13.600	27.320	41.208	–6.681	5.127
VNM	Other Transport Equip.	8.988	13.600	9.768	23.464	14.169	29.029
VNM	Other Manufacturing	9.306	13.600	116.071	145.046	3.783	15.975

Summary Table 2018

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff+NTM	ERP' Tariff	ERP' Tariff + NTM
BRN	Agriculture	0.000	8.117	–0.008	8.213	–0.015	8.404
BRN	Food & Beverage	0.000	11.962	–0.020	14.831	–0.053	18.177
BRN	Textiles & Apparel	0.286	2.262	0.329	2.165	0.802	–2.230
BRN	Wood	0.476	13.600	0.480	14.168	0.482	14.208
BRN	Paper & Printing	0.000	1.212	–0.004	1.121	–0.006	1.086
BRN	Coke & Petroleum	0.000	5.516	–0.001	5.699	–0.051	6.615
BRN	Chemicals & Pharma.	0.032	0.146	0.029	–0.014	0.025	–0.251
BRN	Rubber & Plastic	0.133	4.549	0.138	4.958	0.139	5.023
BRN	Other Non-Metallic Minerals	0.000	1.688	–0.001	1.668	–0.004	1.594
BRN	Basic Metals	0.000		0.000		–0.004	
BRN	Fabricated Metal Prods.	0.000	1.250	–0.001	1.255	–0.002	1.242
BRN	Computers & Electronics	0.007	3.439	–0.048	4.520	–0.079	4.836
BRN	Electrical Equip.	0.091	0.650	0.095	0.671	0.095	0.629
BRN	Other Machinery & Equip.	0.000	0.252	–0.036	–0.775	–0.058	–1.427
BRN	Motor Vehicles	0.047	5.737	0.027	7.406	0.015	7.934
BRN	Other Transport Equip.	0.000	3.075	–0.007	3.091	–0.009	3.079
BRN	Other Manufacturing	0.680	1.907	0.725	1.603	0.738	1.448

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff+NTM	ERP' Tariff	ERP' Tariff + NTM
IDN	Agriculture	2.359	7.320	1.514	10.212	–6.402	10.946
IDN	Food & Beverage	7.769	7.639	17.366	26.536	–3.015	1.690
IDN	Textiles & Apparel	9.287	10.674	11.871	25.694	1.886	4.765
IDN	Wood	3.017	13.209	2.979	16.762	2.843	17.680
IDN	Paper & Printing	2.459	12.465	2.200	15.950	0.693	20.571
IDN	Coke & Petroleum	2.303	5.516	2.284	8.315	–0.073	6.014
IDN	Chemicals & Pharma.	2.982	0.157	2.913	2.314	2.361	–1.298
IDN	Rubber & Plastic	7.051	3.316	9.416	13.037	27.840	25.800
IDN	Other Non-Metallic Minerals	4.563	3.569	4.611	8.165	4.649	7.952
IDN	Basic Metals	4.056	6.186	4.085	10.466	4.064	10.534
IDN	Fabricated Metal Prods.	6.227	4.926	7.330	11.792	9.276	12.887
IDN	Computers & Electronics	3.121	5.202	2.066	7.407	–11.844	–7.430
IDN	Electrical Equip.	5.332	5.628	5.442	11.105	5.563	11.234
IDN	Other Machinery & Equip.	3.289	5.251	1.869	6.989	–0.643	3.919
IDN	Motor Vehicles	9.317	9.162	11.043	21.763	24.428	45.955
IDN	Other Transport Equip.	3.745	6.244	3.489	9.875	3.118	9.716
IDN	Other Manufacturing	6.379	0.488	6.779	5.696	7.099	4.894
PHL	Agriculture	5.684	2.622	8.582	4.723	–1.519	20.376
PHL	Food & Beverage	7.676	1.058	48.866	–20.858	1.920	13.692

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff+NTM	ERP' Tariff	ERP' Tariff + NTM
PHL	Textiles & Apparel	6.517	6.151	7.080	12.849	9.885	12.857
PHL	Wood	4.642	13.600	4.728	18.700	4.919	19.476
PHL	Paper & Printing	3.342	13.600	3.346	17.224	3.354	17.603
PHL	Coke & Petroleum	0.214	13.600	–0.134	14.537	–1.472	15.187
PHL	Chemicals & Pharma.	1.451	5.575	1.156	5.790	0.517	3.392
PHL	Rubber & Plastic	6.041	13.600	6.408	20.603	6.675	21.233
PHL	Other Non-Metallic Minerals	3.474	13.600	3.545	17.486	3.609	18.032
PHL	Basic Metals	1.435	13.600	1.338	15.487	0.679	16.248
PHL	Fabricated Metal Prods.	5.060	5.816	5.440	10.414	5.654	10.168
PHL	Computers & Electronics	1.278	1.160	–2.105	–20.122	3.490	17.066
PHL	Electrical Equip.	2.792	13.600	2.843	17.617	2.915	21.180
PHL	Other Machinery & Equip.	0.739	13.600	0.416	14.381	0.192	14.467
PHL	Motor Vehicles	7.861	13.600	10.312	25.163	74.420	125.511
PHL	Other Transport Equip.	3.696	13.600	3.839	17.874	3.963	18.492
PHL	Other Manufacturing	4.155	5.910	4.531	6.626	5.320	1.728
SGP	Agriculture	0.000	12.225	0.000	12.229	0.000	12.259
SGP	Food & Beverage	0.000	12.760	0.000	13.992	0.000	29.181
SGP	Textiles & Apparel	0.000	2.103	0.000	2.088	0.000	2.024
SGP	Wood	0.000	2.795	0.000	2.465	0.000	2.427

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff+NTM	ERP' Tariff	ERP' Tariff + NTM
SGP	Paper & Printing	0.000	1.619	0.000	1.197	0.000	0.526
SGP	Coke & Petroleum	0.000	9.117	0.000	9.703	0.000	29.458
SGP	Chemicals & Pharma.	0.000	6.834	0.000	8.069	0.000	6.460
SGP	Rubber & Plastic	0.000	5.587	0.000	5.575	0.000	5.514
SGP	Other Non–Metallic Minerals	0.000	1.769	0.000	1.662	0.000	1.405
SGP	Basic Metals	0.000	0.880	0.000	0.759	0.000	0.508
SGP	Fabricated Metal Prods.	0.000	2.351	0.000	2.130	0.000	0.564
SGP	Computers & Electronics	0.000	7.099	0.000	4.597	0.000	5.446
SGP	Electrical Equip.	0.000	10.453	0.000	11.121	0.000	11.887
SGP	Other Machinery & Equip.	0.000	11.523	0.000	19.466	0.000	–225.902
SGP	Motor Vehicles	0.000	8.728	0.000	8.961	0.000	9.172
SGP	Other Transport Equip.	0.000	3.404	0.000	0.011	0.000	5.366
SGP	Other Manufacturing	0.000	3.641	0.000	3.313	0.000	–1.510
THA	Agriculture		0.307	11.845	11.634	–7.280	–3.171
THA	Food & Beverage		0.856	52.626	55.868	3.446	4.472
THA	Textiles & Apparel		0.187	10.164	10.016	3.849	5.303
THA	Wood		0.797	4.567	5.332	4.530	5.223
THA	Paper & Printing		0.412	3.157	3.504	2.457	2.412
THA	Coke & Petroleum		2.736	0.973	3.943	–11.584	–3.665

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff+NTM	ERP' Tariff	ERP' Tariff + NTM
THA	Chemicals & Pharma.		0.710	0.669	1.072	19.926	24.545
THA	Rubber & Plastic		0.317	10.880	10.476	0.486	2.562
THA	Other Non-Metallic Minerals		0.417	6.485	6.700	9.793	8.219
THA	Basic Metals		0.629	1.357	1.883	0.228	0.457
THA	Fabricated Metal Prods.		2.849	9.914	13.525	13.240	18.204
THA	Computers & Electronics		1.580	–33.733	–29.815	5.057	6.457
THA	Electrical Equip.		1.693	8.475	10.277	20.683	23.745
THA	Other Machinery & Equip.		0.679	–1.479	–1.585	34.824	44.022
THA	Motor Vehicles		12.474	–46.336	–83.687	3.216	3.390
THA	Other Transport Equip.		8.989	5.879	15.862	6.107	17.745
THA	Other Manufacturing		3.431	17.006	26.420	–1.236	–4.126
VNM	Agriculture	5.957	13.600	4.792	–0.123	5.798	17.020
VNM	Food & Beverage	13.957	13.600	–34.502	–27.239	4.613	16.428
VNM	Textiles & Apparel	7.938	13.600	–0.162	3.107	5.723	17.223
VNM	Wood	5.784	13.600	5.744	20.113	5.612	16.641
VNM	Paper & Printing	6.379	13.600	6.699	20.897	23.631	69.998
VNM	Coke & Petroleum	0.827	13.600	0.667	15.548	–345.920	–136.131
VNM	Chemicals & Pharma.	1.490	0.297	0.514	–3.006	–68.385	–288.744
VNM	Rubber & Plastic	7.415	13.600	9.483	26.878	–15.761	–36.024

Country	Sector	Tariff	NTM	ERP Tariff	ERP Tariff+NTM	ERP' Tariff	ERP' Tariff + NTM
VNM	Other Non-Metallic Minerals	9.010	13.600	10.027	24.193	20.616	39.739
VNM	Basic Metals	1.661	13.600	1.117	15.198	–5.457	11.458
VNM	Fabricated Metal Prods.	8.424	13.600	12.068	26.035	748.294	925.402
VNM	Computers & Electronics	4.111	13.600	3.462	17.358	8.125	19.021
VNM	Electrical Equip.	7.198	13.600	9.583	23.755	1.559	12.730
VNM	Other Machinery & Equip.	1.735	13.600	0.367	14.089	–5.462	9.683
VNM	Motor Vehicles	17.366	13.600	25.527	39.414	–6.084	5.730
VNM	Other Transport Equip.	10.021	13.600	11.067	24.763	16.997	31.853
VNM	Other Manufacturing	9.492	13.600	113.494	142.411	3.918	16.115

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