

Note for the use of the database:

Ad-Valorem Equivalents of Non-Tariff Measures – GTAP Level Estimates.¹

Overview of the database

This note describes a database containing ad-valorem equivalents (AVEs) of non-tariff measures (NTMs). In using this data please cite: *Ad-valorem equivalents of non-tariff measures (2020)*. UNCTAD.

The ad-valorem equivalent of a non-tariff measure is the uniform tariff that will result in the same trade impacts on the import of a product due to the presence of the NTM. In other words, the AVEs represent the additional costs that the presence of NTMs has on imports.

This database consists of two datasets: *AVE_border_GTAP* and *AVE_technical_GTAP*. The two datasets are provided with sectors aggregated to Version 9 and 10 of the GTAP model, filenames are labelled accordingly.

The data provided in the file *AVE_border_GTAP* consists of the AVEs of border measures. These are measures implemented at the border and/or at customs. Data provided in the file *AVE_technical_GTAP*, consists of two AVEs: one for technical and one for non-technical measures. Definition of such measures follows the international classification of non-tariff measures at UNCTAD. The codes of the measures utilized are listed in *Annex I*.

Overall, the database provides three AVEs (border, technical and non-technical) for each bilateral trade flow for each of the GTAP sectors. However, because the estimation of the AVEs is performed separately and border measures overlap technical and non-technical measures, the two datasets should not be used jointly in any quantitative analysis.

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Each dataset consists of more than 200,000 observations. Data coverage includes 48 importing countries plus the European Union, and 116 exporting countries plus the European Union. The version 10 of the GTAP model comprises of 47 product groups, however AVEs for three of them are not calculated because not mapped in the HS classification (raw milk) or lack of data for estimating (electricity and gas distribution). For the version 9 of the GTAP model the datasets comprise of 41 product groups. Importer and exporter country coverage, and product groups are provided in *Annex II*.

Conversion from HS to AVE is based on the concordance table available at the [Global Trade Analysis Project \(GTAP\)](#) and at the [World Integrated Trade Solution \(WITS\)](#).

AVEs estimates are based on NTM data collected between 2014 and 2019. Trade data is averaged for the years 2016-2018. Data sources, technical details and reference for the estimation are provided in *Annex III*.

Variables description (Version 10)

The *AVE_border_GTAP10* dataset contains the following variables:

Variable	Description
cocode	importing country code
pcode	exporting country code
GTAP10_code	GTAP version 10 sector code
GTAP10_description	GTAP version 10 sector description
trade	bilateral trade (average 2016-2018)
AVE1_t	Ad-valorem equivalent of border measures [weight=bilateral imports]
AVE1_ch	Ad-valorem equivalent of border measures [weight=total imports]
AVE1_h	Ad-valorem equivalent of border measures [weight=world trade]

The three AVE1 variables provide estimates of the same measure but vary in the aggregation method from HS 6 digits to GTAP product level. Aggregation from HS to GTAP level is based on trade weights without considering elasticities. It is left to the researcher to use the weighting scheme appropriate for the analysis.

AVE1_t - Bilateral trade weighted average. Each observation is weighted proportionally to the value of bilateral trade in each product. The AVE in this case can be interpreted as the actual cost of the NTMs for a given importer-exporter pair.

AVE1_ch - Total import weighted average. Each observation is weighted proportionally to the total value of trade of the importer in each product. The AVE in this case shows the average cost of NTMs regardless of the origin of the product.

AVE1_h - World trade weighted average. Each observation is weighted proportionally to the total value of trade in each product. The AVE considers the differences in the amount of trade between HS6 categories, but not who is trading the product.

The *AVE_technical_GTAP10* dataset contains the following variables

Variable	Description
ccode	importing country code
pcode	exporting country code
GTAP10_code	GTAP version 10 sector code
GTAP10_description	GTAP version 10 sector description
trade	bilateral trade (average 2016-2018)
AVE1_t	Ad-valorem equivalent of technical measures [weight=bilateral imports]
AVE1_ch	Ad-valorem equivalent of technical measures [weight=total imports]
AVE1_h	Ad-valorem equivalent of technical measures [weight=world trade]
AVE2_t	Ad-valorem equivalent of non-technical measures [weight=bilateral imports]
AVE2_ch	Ad-valorem equivalent of non-technical measures [weight=total imports]
AVE2_h	Ad-valorem equivalent of non-technical measures [weight=world trade]

Weighting is as above.

AVEs are expressed in percentage points (for example, AVE = 1 is equivalent to a tariff of 1 percentage point). Zero values indicate no significant effects, while missing values indicate that the AVE could not be reliably estimated.

AVEs are to be interpreted as the cost equivalent of a measure applied (border, technical or non-technical), the counterfactual being the absence of that type of measures. For example, the interpretation of this database's AVEs is the cost equivalent of the importation of a product subject to border against the counterfactual of the importation of the same product not subject to border measure (e.g. because of a custom union or a trade facilitation agreement).

Variables description (Version 9)

The *AVE_border_GTAP9* dataset contains the following variables:

Variable	Description
ccode	importing country code
pcode	exporting country code
gtap	GTAP 9 product code
trade	bilateral trade
AVE1_t	Ad-valorem equivalent of border measures [weight=bilateral imports]
AVE1_ch	Ad-valorem equivalent of border measures [weight=total imports]
AVE1_h	Ad-valorem equivalent of border measures [weight=world trade]

The *AVE_technical_GTAP9* dataset contains the following variables:

Variable	Description
ccode	importing country code
pcode	exporting country code
gtap	GTAP 9 product code
trade	bilateral trade
AVE1_t	Ad-valorem equivalent of technical measures [weight=bilateral imports]
AVE1_ch	Ad-valorem equivalent of technical measures [weight=total imports]
AVE1_h	Ad-valorem equivalent of technical measures [weight=world trade]
AVE2_t	Ad-valorem equivalent of non-technical measures [weight=bilateral imports]
AVE2_ch	Ad-valorem equivalent of non-technical measures [weight=total imports]
AVE2_h	Ad-valorem equivalent of non-technical measures [weight=world trade]

Weighting and details are as in version 10.

Annex I: International classification of non-tariff measures. Measures covered.

AVEs contained in the *AVE_border_GTAP10* dataset capture the effects of border measures defined as “Customs Measures” in *Ederington and Ruta (2016)*. The border measures are categorized under the following codes of the international classification of non-tariff measures (UNCTAD, 2019).

Border measures include many categories under different chapters of the classification. In detail, they include the codes: A14, A140, A15, A150, A81, A810, A84, A840, A85, A850, A851, A852, A853, A859, A86, A860, A89, A890, B14, B140, B15, B150, B81, B810, B84, B840, B85, B850, B851, B852, B853, B859, B89, B890, C00, C000, C10, C100, C20, C200, C30, C300, C40, C400, C90, C900, E10, E100, E11, E110, E111, E112, E113, E119, E12, E120, E121, E122, E129, F40, F400, F60, F600, F61, F610, F62, F620, F63, F630, F64, F640, F65, F650, F67, F670, F80, and F800.

AVEs contained in the *AVE_technical_GTAP10* dataset capture the effects of technical and non-technical measures detailed in the international classification of non-tariff measures (UNCTAD, 2019). Technical measures are those detailed under Chapter A and B of the international classification of non-tariff measures. Non-technical measures are those listed under Chapters D, E and F of the international classification of non-tariff measures.

Annex II: Importer, Exporter and Product coverage

Importer Coverage:

ccode	Country	ccode	Country
ARE	United Arab Emirates	JPN	Japan
ARG	Argentina	KAZ	Kazakhstan
AUS	Australia	KOR	Korea, Republic of
BGD	Bangladesh	LKA	Sri Lanka
BOL	Bolivia	MAR	Morocco
BRA	Brazil	MEX	Mexico
CAN	Canada	MYS	Malaysia
CHE	Switzerland	NGA	Nigeria
CHL	Chile	NZL	New Zealand
CHN	China	PAK	Pakistan
CIV	Cote d'Ivoire	PER	Peru
CMR	Cameroon	PHL	Philippines
COL	Colombia	PRY	Paraguay
CRI	Costa Rica	RUS	Russian Federation
CUB	Cuba	SAU	Saudi Arabia
DZA	Algeria	SEN	Senegal
ECU	Ecuador	SGP	Singapore
ETH	Ethiopia	THA	Thailand
EUN	European Union	TUN	Tunisia
GHA	Ghana	TUR	Turkey
GTM	Guatemala	URY	Uruguay
HKG	Hong Kong, SAR	USA	United States
HND	Honduras	VEN	Venezuela
IDN	Indonesia	VNM	Vietnam
IND	India		

Exporter Coverage:

pcode	Country	pcode	Country	pcode	Country
AFG	Afghanistan	GTM	Guatemala	NOR	Norway
AGO	Angola	GUY	Guyana	NPL	Nepal
ALB	Albania	HKG	Hong Kong, SAR	NZL	New Zealand
ARE	United Arab Emirates	HND	Honduras	OMN	Oman
ARG	Argentina	HTI	Haiti	PAK	Pakistan
ARM	Armenia	IDN	Indonesia	PAN	Panama
AUS	Australia	IND	India	PER	Peru
AZE	Azerbaijan	IRN	Iran (Islamic Republic of)	PHL	Philippines
BEN	Benin	IRQ	Iraq	PNG	Papua New Guinea
BGD	Bangladesh	ISL	Iceland	PRY	Paraguay
BHR	Bahrain	ISR	Israel	QAT	Qatar
BHS	Bahamas	JAM	Jamaica	RUS	Russian Federation
BIH	Bosnia and Herzegovina	JOR	Jordan	SAU	Saudi Arabia
BLR	Belarus	JPN	Japan	SDN	Sudan
BOL	Bolivia	KAZ	Kazakhstan	SEN	Senegal
BRA	Brazil	KEN	Kenya	SGP	Singapore
BRN	Brunei Darussalam	KGZ	Kyrgyz Republic	SLV	El Salvador
BWA	Botswana	KHM	Cambodia	SUR	Suriname
CAN	Canada	KOR	Korea, Republic of	TCD	Chad
CHE	Switzerland	KWT	Kuwait	TGO	Togo
CHL	Chile	LAO	Lao PDR	THA	Thailand
CHN	China	LBN	Lebanon	TJK	Tajikistan
CIV	Cote d'Ivoire	LBR	Liberia	TKM	Turkmenistan
CMR	Cameroon	LKA	Sri Lanka	TTO	Trinidad & Tobago
COD	Congo DRC	MAR	Morocco	TUN	Tunisia
COG	Congo, Rep.	MDA	Moldova, Republic Of	TUR	Turkey
COL	Colombia	MDG	Madagascar	TWN	Taiwan Province of China
CRI	Costa Rica	MEX	Mexico	TZA	Tanzania, United Republic of
CUB	Cuba	MKD	Macedonia, FYR	UGA	Uganda
DOM	Dominican Republic	MMR	Myanmar	UKR	Ukraine
DZA	Algeria	MNG	Mongolia	URY	Uruguay
ECU	Ecuador	MOZ	Mozambique	USA	United States
EGY	Egypt, Arab Rep.	MRT	Mauritania	UZB	Uzbekistan
ETH	Ethiopia	MUS	Mauritius	VEN	Venezuela
EUN	European Union	MWI	Malawi	VNM	Vietnam
GAB	Gabon	MYS	Malaysia	YEM	Yemen
GEO	Georgia	NAM	Namibia	ZAF	South Africa
GHA	Ghana	NGA	Nigeria	ZMB	Zambia
GIN	Guinea	NIC	Nicaragua	ZWE	Zimbabwe

Product Group Coverage (GTAP Version 10):

GTAP10_code	GTAP10_description	GTAP10_code	GTAP10_description
BPH	Basic pharmaceutical products	OCR	Crops nec
B_T	Beverages and tobacco products	OFD	Food products nec
CHM	Chemical products	OIL	Oil
CMT	Bovine meat products	OME	Machinery and equipment nec
COA	Coal	OMF	Manufactures nec
CTL	Bovine cattle, sheep and goats, horses	OMT	Meat products nec
C_B	Sugar cane, sugar beet	OSD	Oil seeds
EEQ	Electrical equipment	OTN	Transport equipment nec
ELE	Computer, electronic and optical products	OXT	Other Extraction (formerly ONM)
FMP	Metal products	PCR	Processed rice
FRS	Forestry	PDR	Paddy rice
FSH	Fishing	PFB	Plant-based fibers
GAS	Gas	PPP	Paper products, publishing
GDT	Gas manufacture, distribution	P_C	Petroleum, coal products
GRO	Cereal grains nec	RPP	Rubber and plastic products
I_S	Ferrous metals	SGR	Sugar
LEA	Leather products	TEX	Textiles
LUM	Wood products	VOL	Vegetable oils and fats
MIL	Dairy products	V_F	Vegetables, fruit, nuts
MVH	Motor vehicles and parts	WAP	Wearing apparel
NFM	Metals nec	WHT	Wheat
NMM	Mineral products nec	WOL	Wool, silk-worm cocoons
OAP	Animal products nec		

Product Group Coverage (GTAP version 9):

GTAP 9 code	GTAP 9 description	GTAP 9 code	GTAP 9 description
1	PDR - Paddy rice	23	PCR - Processed rice
2	WHT - Wheat	24	SGR - Sugar
3	GRO - Cereal grains n.e.c.	25	OFD - Food products n.e.c.
4	V_F - Vegetables, fruit, nuts	26	B_T - Beverages and tobacco products
5	OSD - Oil seeds	27	TEX - Textiles
6	C_B - Sugar cane, sugar beet	28	WAP - Wearing apparel
7	PFB - Plant-based fibers	29	LEA - Leather products
8	OCR - Crops n.e.c.	30	LUM - Wood products
9	CTL - Bovine cattle, sheep and goats, horses	31	PPP - Paper products, publishing
10	OAP - Animal products n.e.c.	32	P_C - Petroleum, coal products
12	WOL - Wool, silk-worm cocoons	33	CRP - Chemical, rubber, plastic products
13	FRS - Forestry	34	NMM - Mineral products n.e.c.
14	FSH - Fishing	35	I_S - Ferrous metals
15	COA - Coal	36	NFM - Metals n.e.c.
16	OIL - Oil	37	FMP - Metal products
17	GAS - Gas	38	MVH - Motor vehicles and parts
18	OMN - Minerals n.e.c.	39	OTN - Transport equipment n.e.c.
19	CMT - Bovine meat prods	40	ELE - Electronic equipment
20	OMT - Meat products n.e.c.	41	OME - Machinery and equipment n.e.c.
21	VOL - Vegetable oils and fats	42	OMF - Manufactures n.e.c.
22	MIL - Dairy products		

Annex III- Technical note

Data sources

The trade data originates from the UN COMTRADE database. The data used for the estimation of AVE is at the 6-digits level of the HS classification revision 4. The computation of AVE relies both on quantity and value trade data. Trade data is averaged for three years (2018, 2017, 2016) to smooth out potential outliers and volatility of observations over time. In cases for which trade data is missing, mirror data is used to fill in the observations. Quantity is assigned value zero if the value is less than 10 thousand US\$. Quantity data is generally not satisfactory, therefore it is corrected by eliminating outliers identified by unreasonable unit values (values/quantity). Observations are dropped when unit values are outside one standard deviation away from the median, or 50 times bigger/smaller than the median. Observations where reported quantity unit is not provided, or quantity unit is different from the general unit for that product are also dropped.

NTM data is from the UNCTAD NTM database and follows the [International Classification of Non-Tariff Measures](#). For this analysis, NTM data is aggregated into three groups according to border measures, technical and non-technical measures as described above. Non-tariff measure data also follows the 6-digit level of the HS classification revision 4.

The tariff data originates from UNCTAD TRAINS and ITC MACMap. Tariff data utilized in the analysis is “applied” and allows for trade agreements and preferential access. Tariff data also follows the 6-digit level of the HS classification revision 4.

Estimation of Ad-Valorem equivalents

The ad-valorem equivalents of NTMs provided in this database are based on the estimation method detailed in Kee and Nicita (2017), which in turn, builds on the seminal work of Kee, Nicita and Olarreaga (2009). As with most of the econometric literature estimating AVEs, the effects of NTMs on international trade are isolated using incidence measures of NTMs as explanatory variables. Following Kee and Nicita (2017), the AVEs are computed as the equivalent tariff that would be necessary to impose in order to obtain the same proportionate change in quantity imported due to the presence of NTMs. In short, the

estimation method seeks to identify the instantaneous semi-elasticity of trade with respect to differences in the observed tariffs and apply this elasticity to the estimated effects of NTMs on the quantity of trade. Bilateral variations in the AVEs estimates are calculated on the assumption that the trade costs associated with NTMs are a function of importers' and exporters' market power. The econometric model controls for issues related to the estimation of gravity type equations at the disaggregated level. The estimation is performed according to various econometric models (negative binomial, Poisson, zero inflated Poisson, zero inflated negative binomial and OLS) and estimates are based on the best model as identified by statistical tests (Pearson chi-squared, Vuong test and Akaike criterion). In particular, zero-inflated maximum likelihood estimation considers the large presence of zero in the bilateral trade statistics, while two-stage instrumental variable techniques address the endogeneity of tariffs and NTMs. In summary, the second stage quantity estimation equation takes the form:

$$\ln E(Q_{nij}|X) = \beta_n + \beta_{nij}^t \hat{t}_{nij} + \beta_{nij}^{NTM} \widehat{NTM}_{nij} + \gamma Z_{ij} + e_{nji}$$

where $\beta_{nij}^t = \beta_n^t + \beta_1^t share_{nj} + \beta_2^t share_{nij} + \beta_3^t share_{ni}$

and $\beta_{nij}^{NTM} = \beta_n^{NTM} + \beta_1^{NTM} share_{nj} + \beta_2^{NTM} share_{nij} + \beta_3^{NTM} share_{ni}$

where Q denotes quantities, t tariffs, and NTM the presence of an NTM. These explanatory variables are denoted by "hat" as they are instrumented using the average tariff or NTM of the three closest countries; and where n denotes products, i importing country and j exporting country. Bilateral variation of AVEs is provided by interaction terms (shares) and consists of three terms: absolute market power of the exporter ($export_{jK}/wld_trade_K$); relative market power of the exporter in the importer market ($import_{iJK}/export_{jK}$); and importer market power ($import_{iK}/wld_trade_K$). Z_{ij} are the standard gravity variables: the log of the gross domestic product (GDP) of the importer and the exporter, bilateral distance between the importer and the exporter, landlocked indicators for the importer and the exporter, and common border indicator.

In this setup the elasticity of trade with respect to tariff is:

$$\hat{\beta}_{nij}^t = \frac{\partial \ln(E(Q_{nij}|X))}{\partial t_{nij}},$$

and the AVE measuring the ad-valorem tariffs that induce the same proportionate change in quantity as the presence of an NTM is:

$$AVE_{nij}^{NTM} = \frac{\exp(\hat{\beta}_{nij}^{NTM}) - 1}{\exp(\hat{\beta}_{nij}^t) - 1} \cong \frac{\hat{\beta}_{nij}^{NTM}}{\hat{\beta}_{nij}^t} \quad \text{for small } \hat{\beta}_{nij}^t \text{ and } \hat{\beta}_{nij}^{NTM}.$$

In more intuitive terms, to measure the AVEs of NTMs is to construct the proportionate change in quantity imported due to the presence of NTMs, and then use the elasticity of trade with respect to a one percentage point increase in the tariff to convert the proportionate change in quantity imported due to NTMs in terms of ad valorem equivalents. A feature of this approach is that it allows the calculation of AVE when there is no bilateral trade. In this case the AVEs will be based on the coefficient on the dummy NTM variables and the average elasticity.

Although standard errors are not provided, the calculation of the AVEs considers only coefficients with a significance of 5 percent or better. Finally, this approach does not allow for negative AVEs (cost reducing or trade enhancing NTMs). While this could be the case for some technical measures, the model is not well suited to identify these effects as the identification is based on imports in the presence of the measure against the counterfactual of imports in absence of the measure.

References:

- Ederington and Ruta (2016). Non-tariff Measures and the World Trading System; chapter 13 of K. Bagwell and R. Staiger, eds., *Handbook of Commercial Policy*.
- Kee, Nicita and Olarreaga (2009). Estimating Trade Restrictiveness Indices. *Economic Journal*, Vol. 119, No. 534, pp. 172-199, January 2009.
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- UNCTAD (2019). International Classification of Non-Tariff Measures. Available at: [Classification of NTMs | UNCTAD](#)