



Global Trade Analysis Project

Quantifying Non-Tariff Measures of ASEAN Countries Using GTAP CGE Model: Updated Analysis with Proposed U.S. Tariff Rates

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Introduction

- Quantitatively estimate non-tariff measures (NTMs) using panel data at the HS-6 level, bilateral imports, and MAST+3 classifications (e.g., A851), applying a PPML gravity model (Puangchit P., Corong E., 2024)
- Model is estimated separately at the GTAP sector level, using corresponding HS-6 products within each sector
 - Increase degrees of freedom within sector-level estimation
 - Improve estimation robustness and stability
 - Alignment with GTAP CGE sector

Literature

- How to quantitatively convert coefficients to ad-valorem equivalent of NTMs?

Method	Description	Key Literature	Challenge for CGE Implementation
1. Tariff-based conversion	Uses the ratio of NTM and tariff coefficients from the same gravity model, anchored by the observed tariff rate.	Disdier et al. (2008); Kee et al. (2009)	Requires a reliable and significant tariff coefficient. Sensitive to model specification and multicollinearity. May not align with structural CGE assumptions.
2. Trade-cost equivalent	Directly interprets the estimated NTM coefficient as an ad-valorem trade cost.	Cadot et al. (2014); Beverelli et al. (2015)	May conflate price effects, quantity restrictions, and extensive margin adjustments. Lacks structural identification.
3. Structural iceberg cost	Integrates NTM effects as iceberg costs or technical inefficiencies, applied within the CGE model structure.	Yue et al. (2006); Fell et al. (2013); Webb (2020)	Requires careful aggregation to match GTAP sectors. Uniform application risks misrepresenting regional or product-specific effects.

Ad-valorem equivalents of non-tariff measures (NTMs)

Puangchit P., Corong E. (2024)

- Bilateral import quantity collected at the HS-6 product level from 2012-2021
- NTMs sourced from UNCTAD and converted into time-series dummy variables at the MAST+3 level
- Estimated using a PPML gravity model at the GTAP sector level (46 sectors in total)
- NTM estimates converted to ad valorem equivalents (AVEs) using GTAP Armington elasticities of demand

$$AVE_{k,s} = \left(\exp \left(\frac{\beta_{k,s}}{\eta_s} \right) - 1 \right) \times 100$$

Where:

- $\beta_{k,s}$: estimated coefficient of NTM chapter k for GTAP sector s
- η_s : Armington elasticity of demand for GTAP sector s (from `esbd`)

Ad-valorem equivalents of non-tariff measures (NTMs)

Puangchit P., Corong E. (2024)

- AVE estimates further disaggregated to the country-pair level and aggregated to 36 GTAP sectors in line with this study, using import shares as weights

For each country-pair (i,j) and sector (s):

$$AVE_{ijs} = \sum_{p \in s} \left(\frac{AvgQuant_{ijp}}{\sum_{p' \in s} AvgQuant_{ijp'}} \cdot NTMDum_{ijp}^{(k)} \cdot \hat{\beta}_{sk} \right)$$

Where:

- p : HS6 product
- s : GTAP sector (all products mapped to it)
- $\hat{\beta}_{sk}$: gravity-estimated coefficient for NTM k in sector s
- $NTMDum_{ijp}^{(k)} \in \{0, 1\}$: whether NTM k is imposed by importer i on exporter j for product p
- $AvgQuant_{ijp}$: average trade value from 2012–2021
- $\sum_{p \in s} AvgQuant_{ijp}$: sector total (denominator)

Data & Model

- **GTAPv11(c) Database Overview** (Aguiar et al., 2022)
 - Year of reference: 2017
 - Country Aggregation: 44 countries/regions (including 9-ASEAN countries)
 - Sectoral Aggregation: 36 sectors
- **GTAP Static Model version 7** (Corong et al., 2017)
- **Recalibrated Database:**
 - Tariff rate updated using CARD Trade War Data (Center for Agricultural and Rural Development, 2020)
 - Tariff rates with the latest U.S. reciprocal tariff measures.

U.S. Reciprocal Tariff Rates



■ 25% ■ 55%

Source: Author's Calculation as of 9 June 2025

Scenarios

Recalibrated Baseline

- The US implements a 25 percentage points (pp) increase in tariffs on imports of all goods from all countries including ASEAN countries, and 55pp on China's imports. (Shock "*tms*").
- Incorporate NTM effects using AlterTax and shocking "*tms*".

Simulations

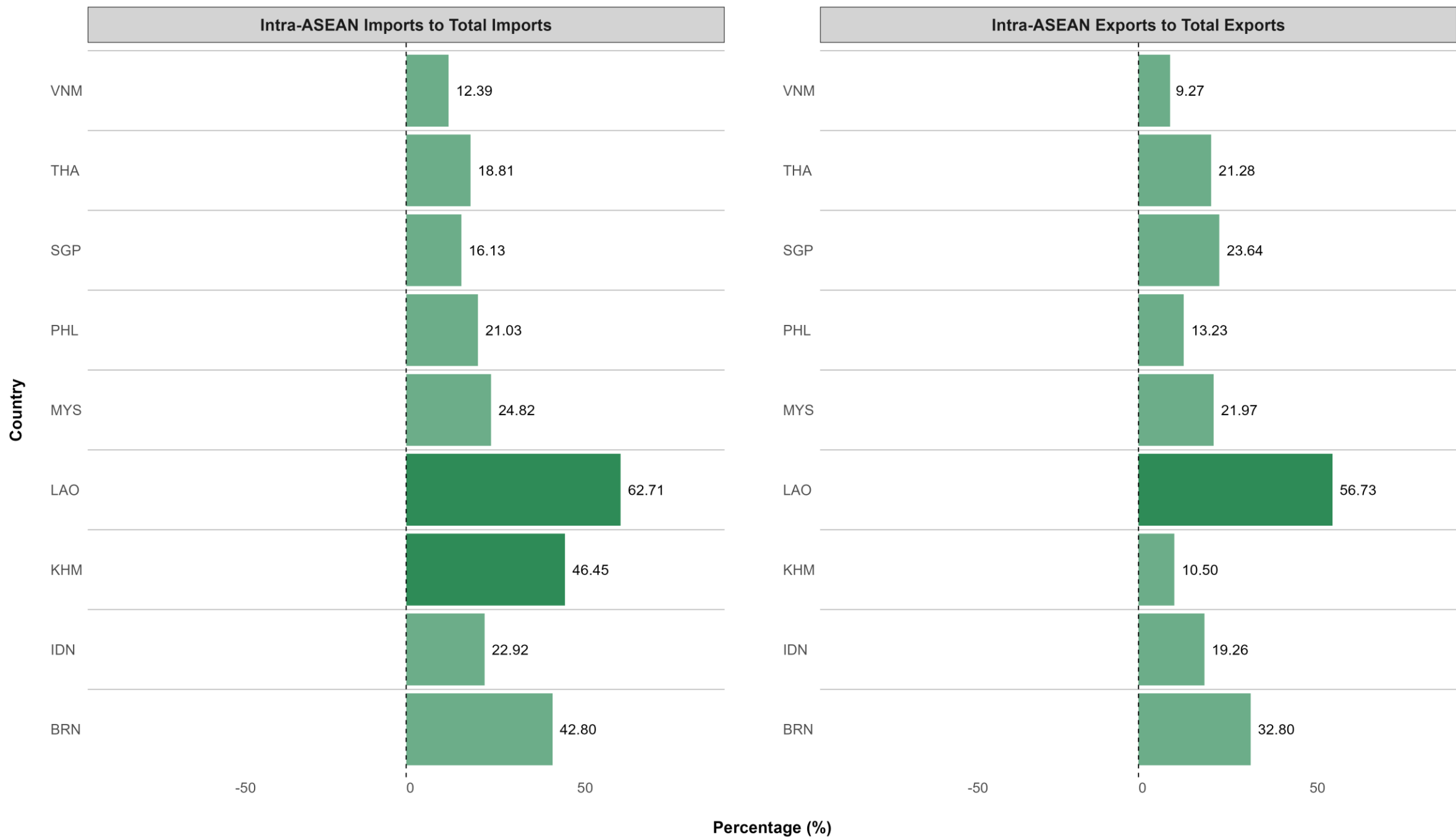
- 9-ASEAN countries reduce non-tariff measures to increase trade efficiency among the ASEAN Economic Community (AEC).
- Since there is no clear regulation on harmonization, we simulate reductions in NTM effects based on their AVEs, ranging from 10% to 100% in 10% increments.



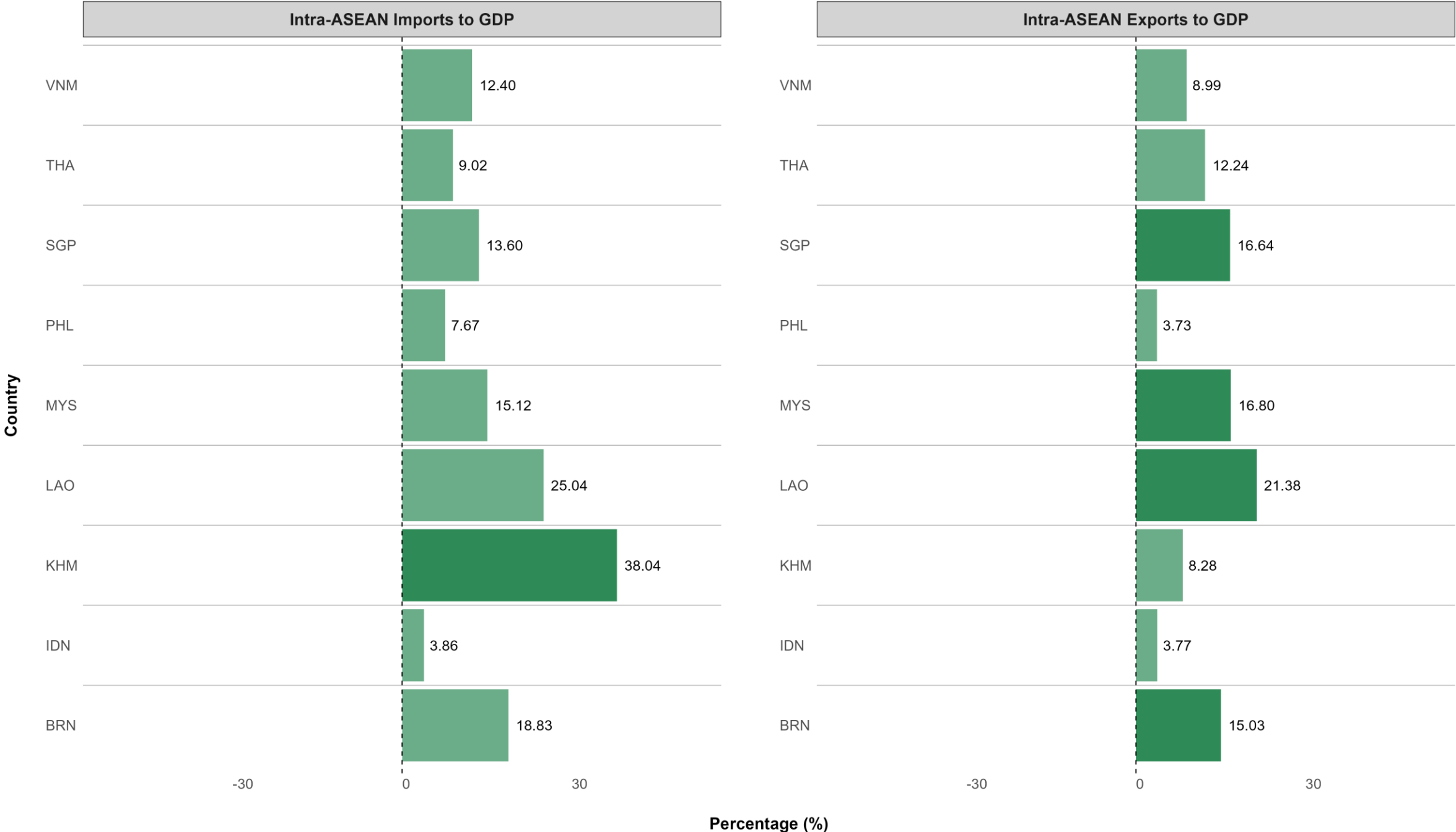
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Descriptive Data

Intra-ASEAN Trade to Total Trade, (%)



Intra-ASEAN Trade to GDP, (%)

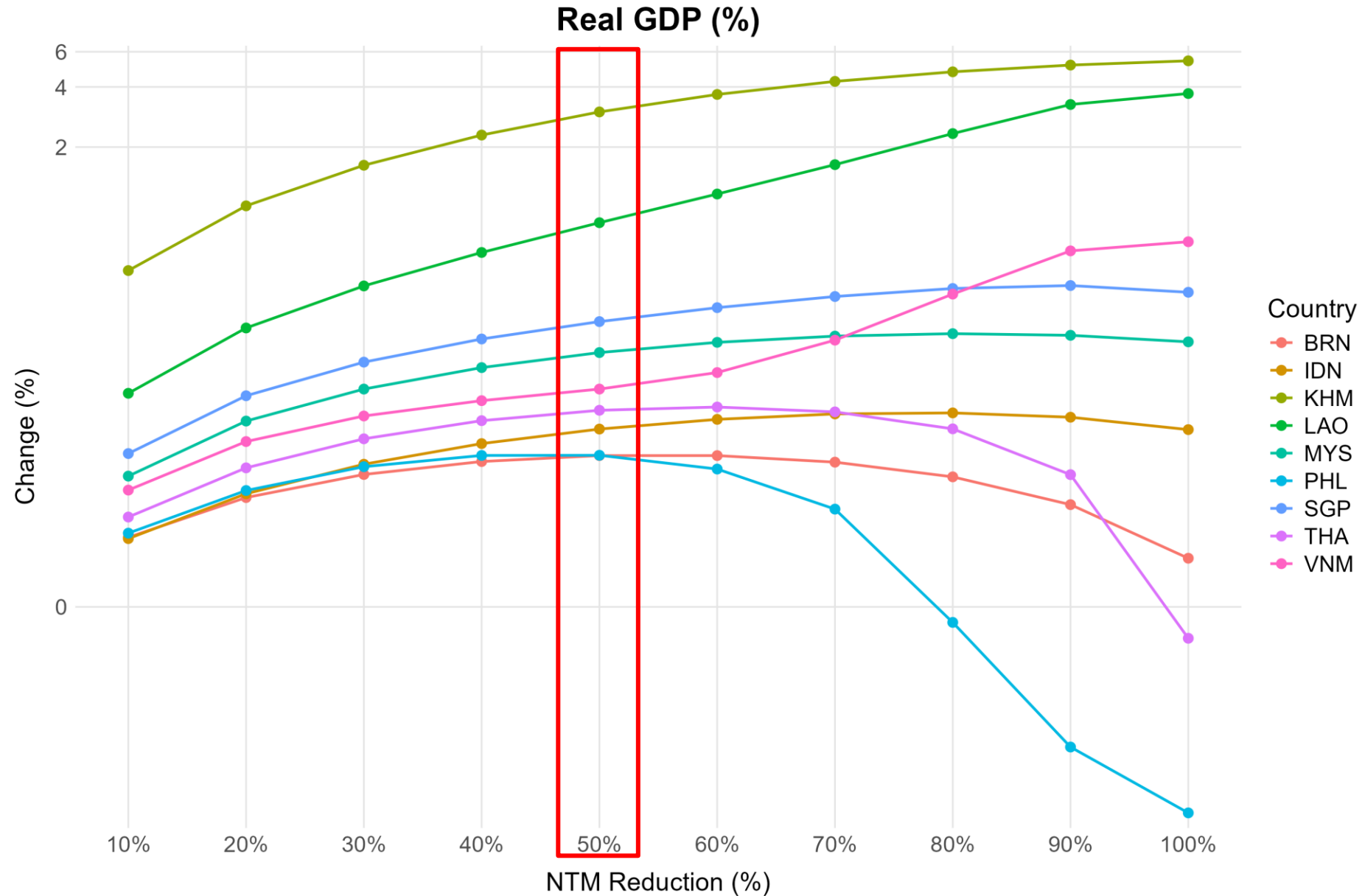




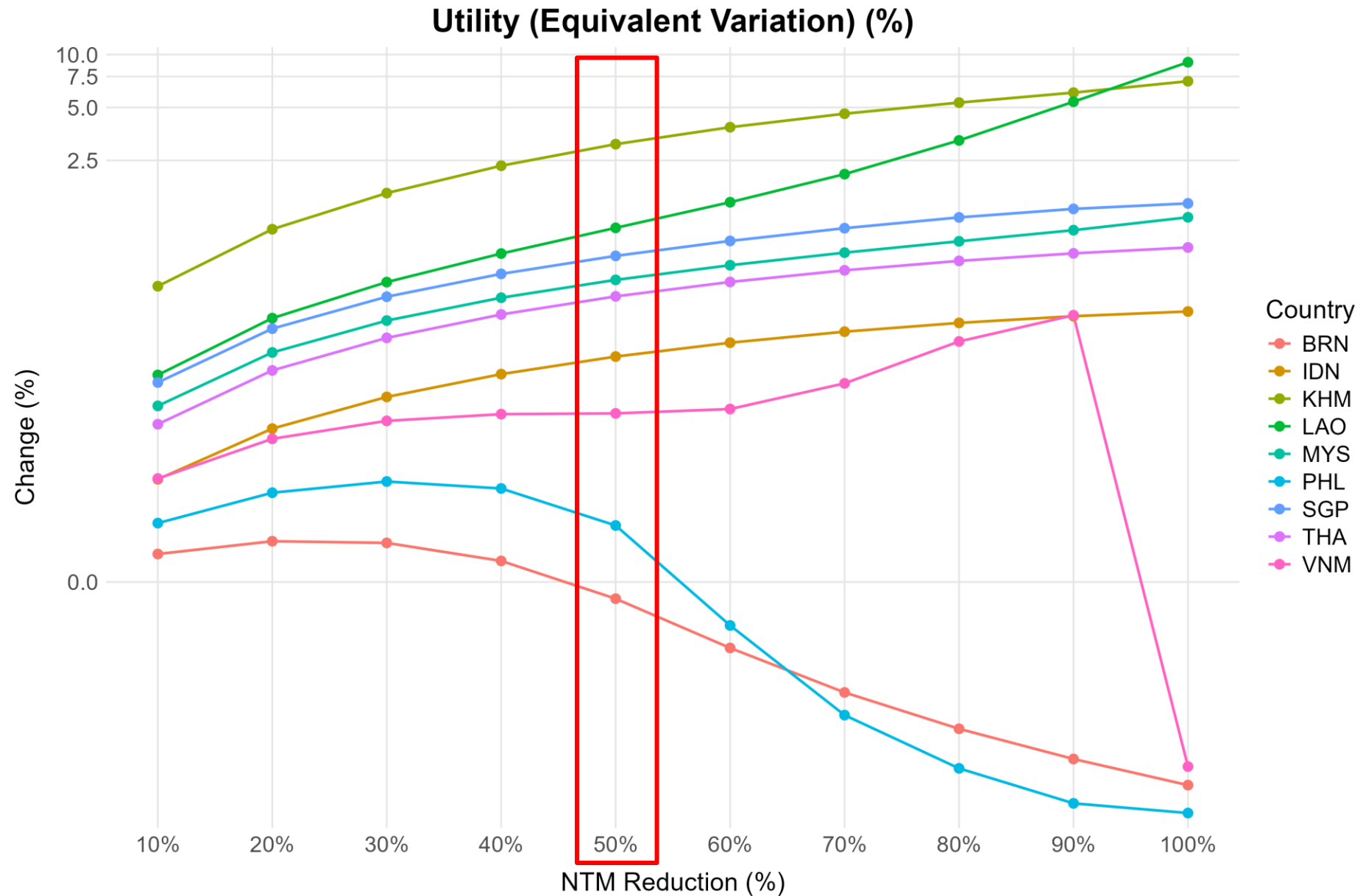
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NTM Reduction ASEAN Macroeconomics

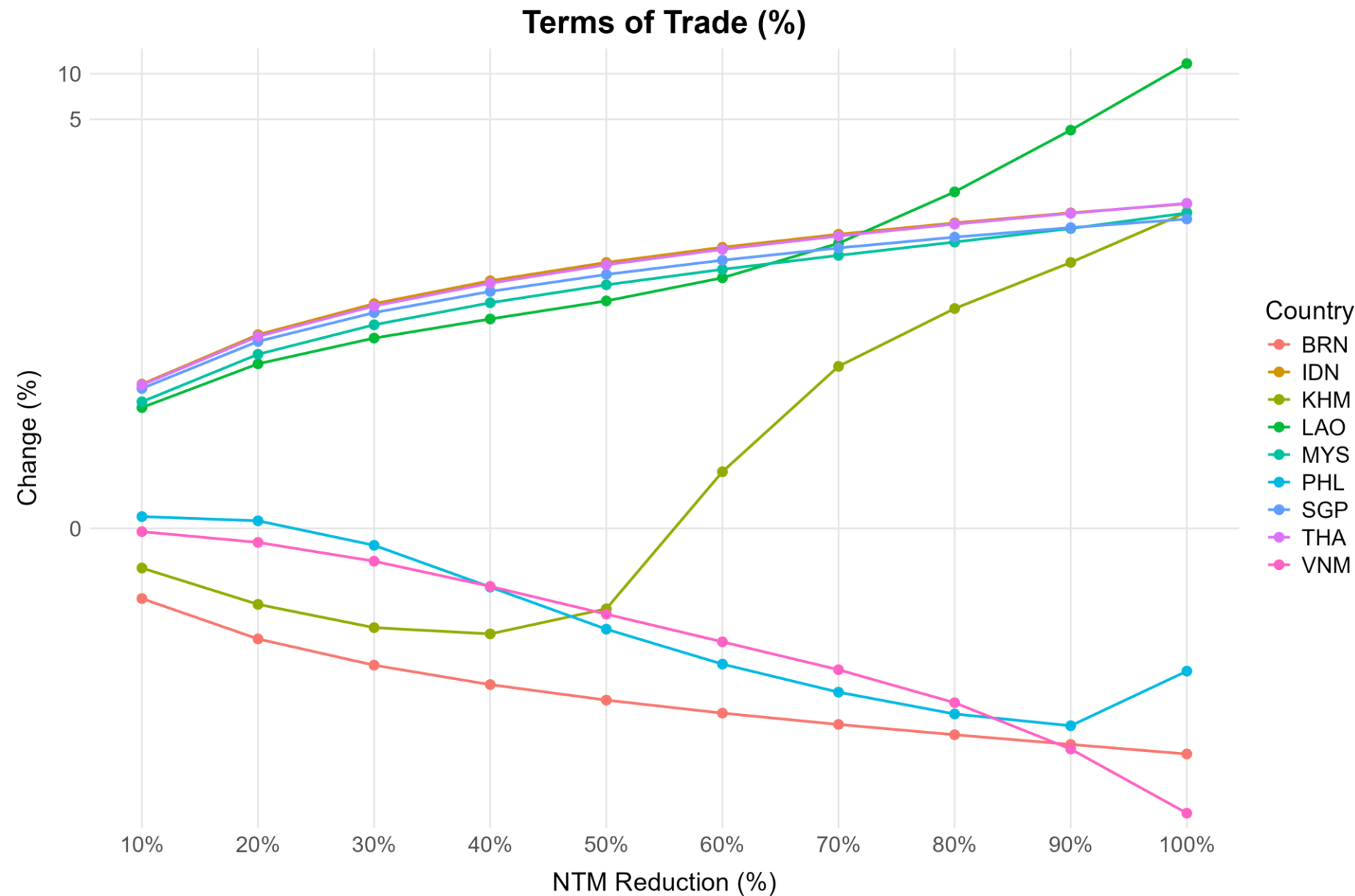
NTM Reduction – Real GDP (%)



NTM Reduction – Utility (%)



NTM Reduction – Terms of Trade (%)



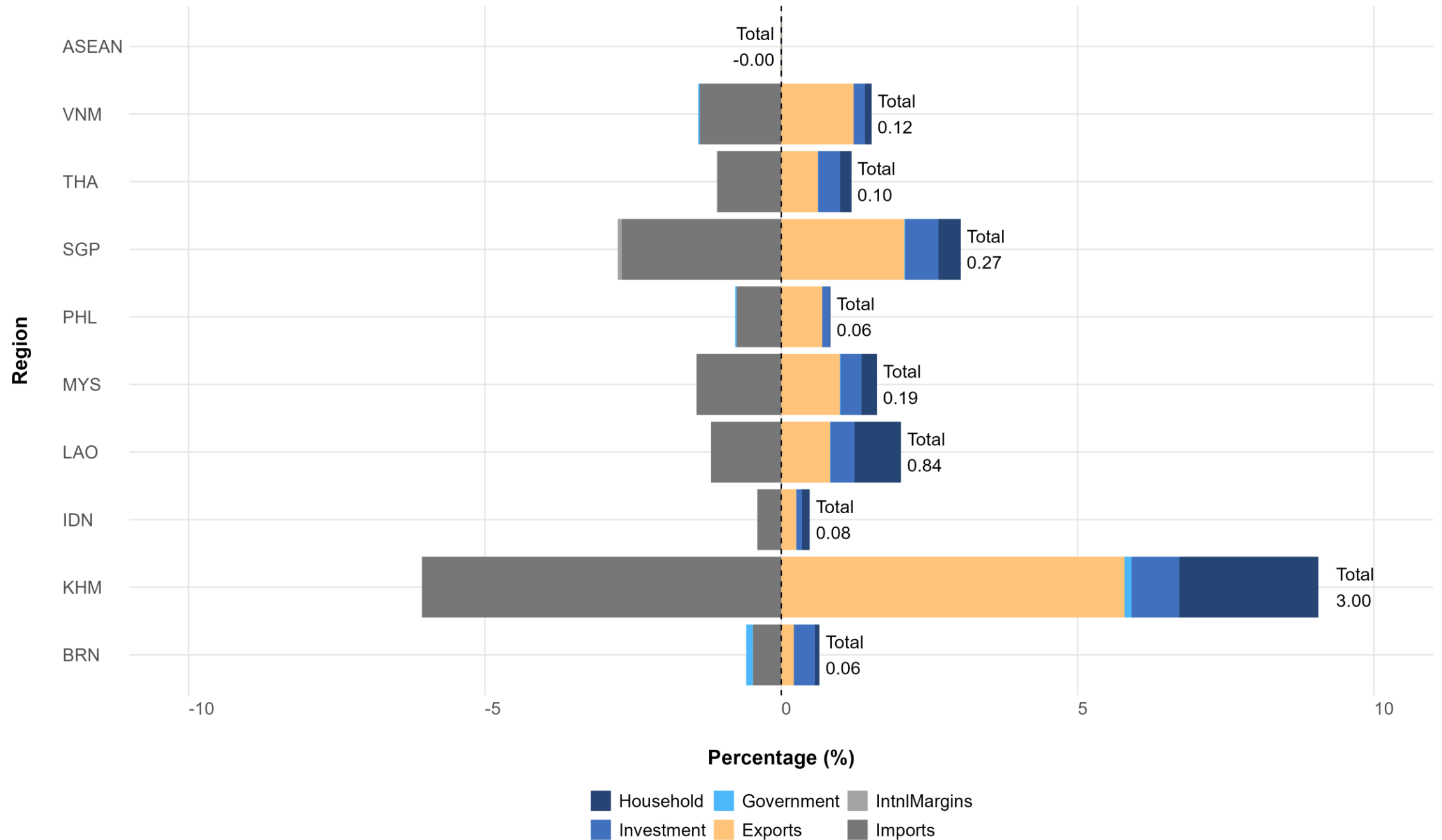


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NTM Reduction 50%

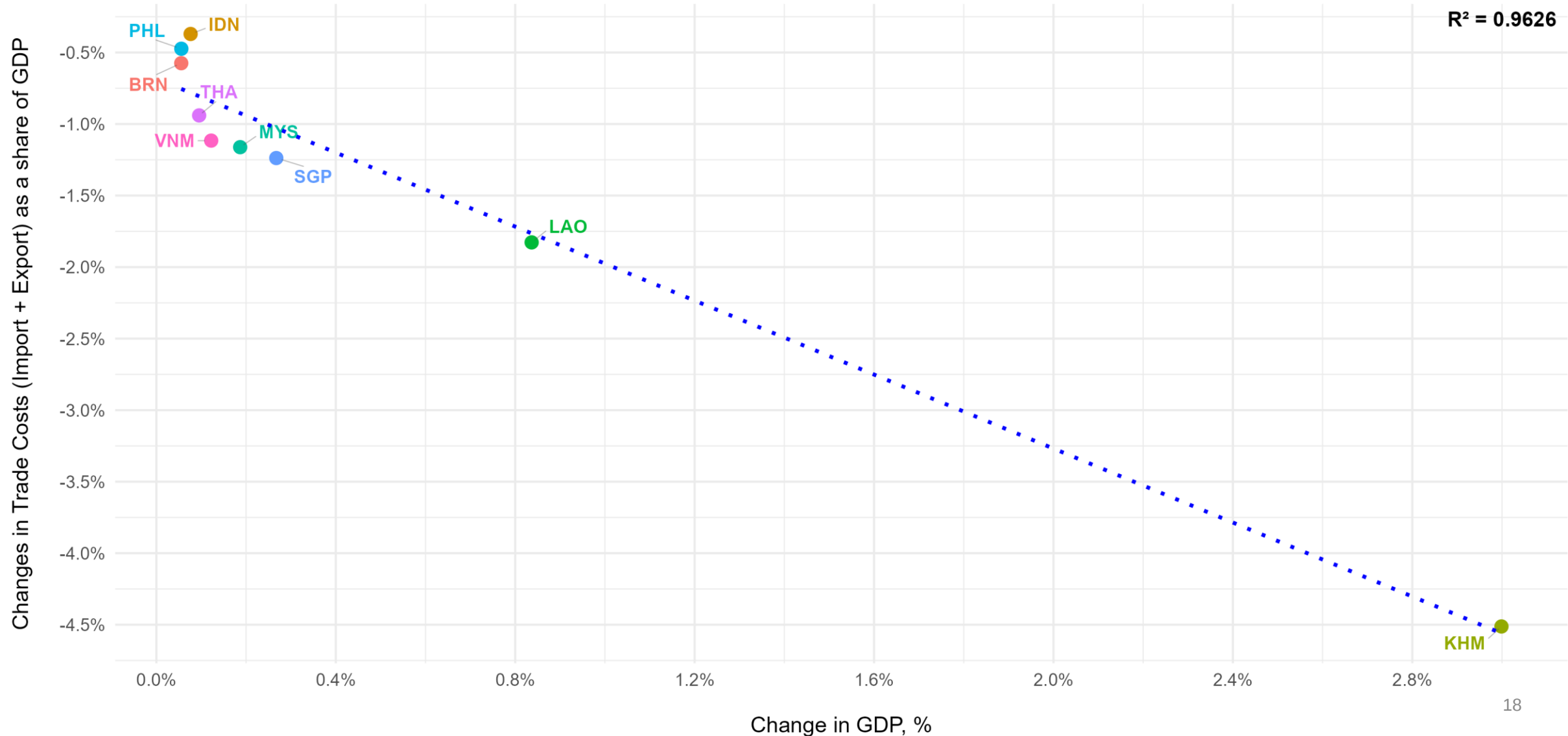


Contribution to Changes in Real GDP by Components (%)

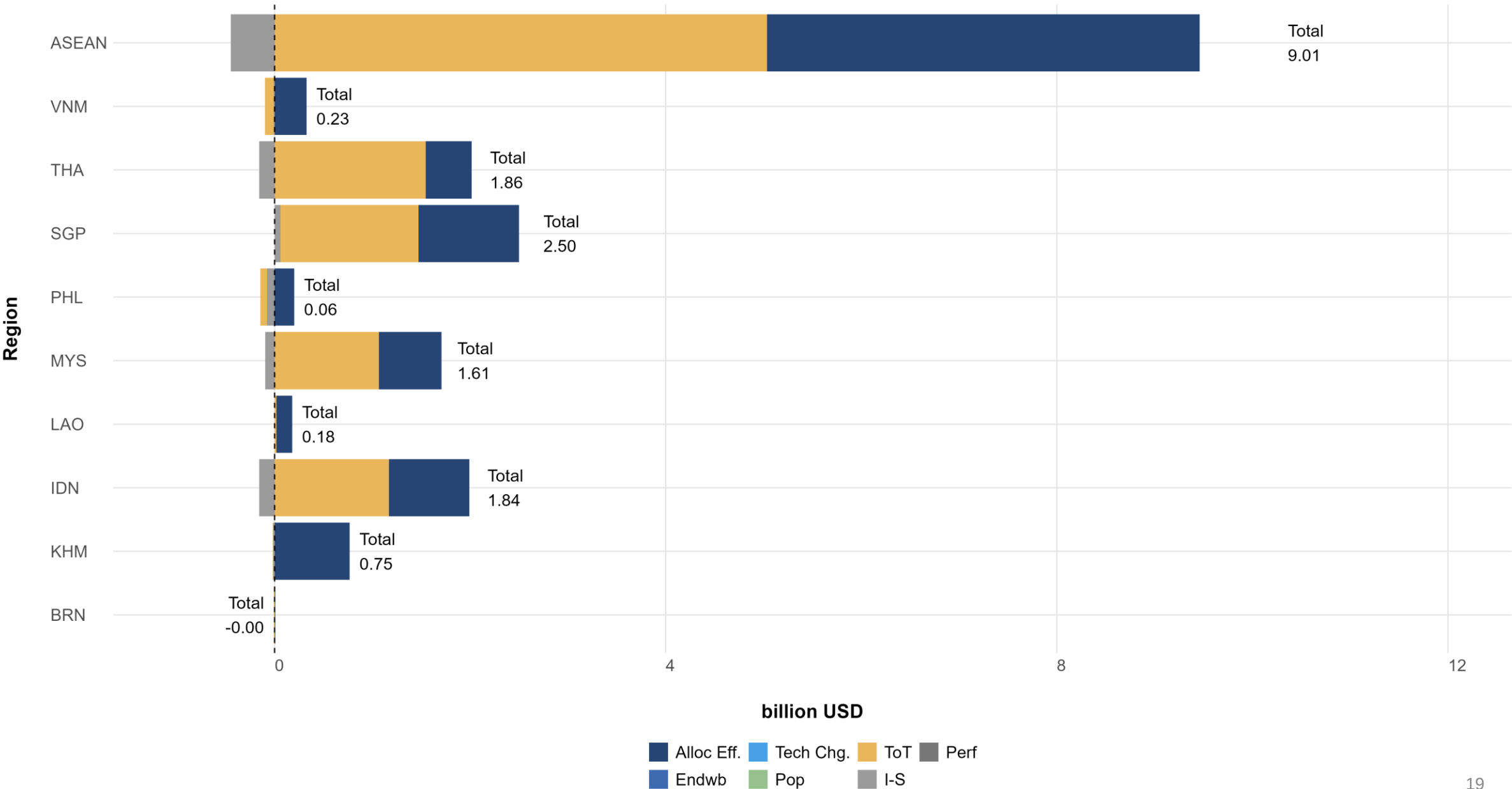


Reduction 50% – Trade Cost (%)

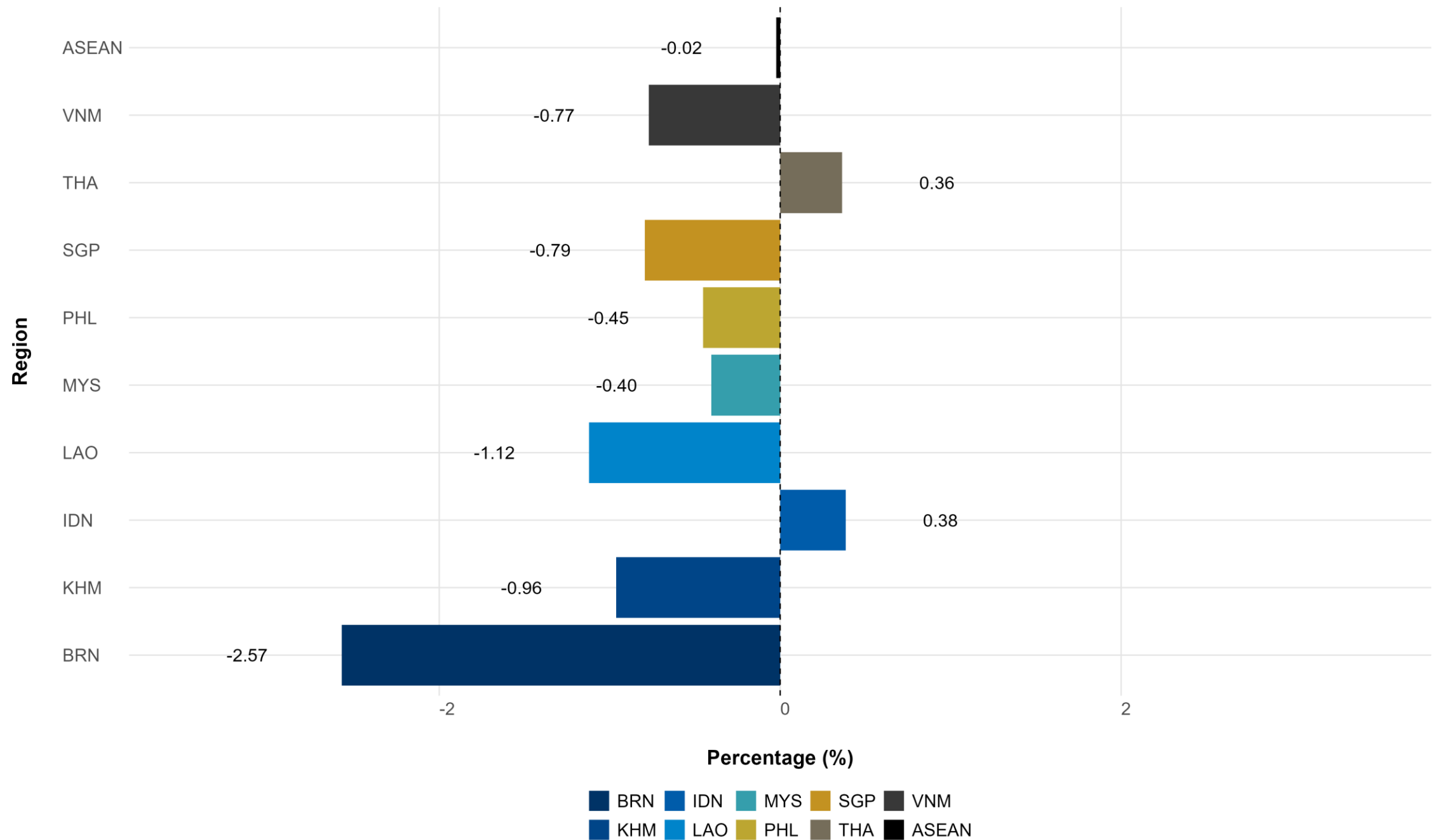
Reduct50: Total Effect of Trade Policy on GDP - ASEAN Intra-Regional Trade



Welfare Decomposition (billion USD)



CPI excl. services (%)



Summary

- NTMs significantly hinder trade efficiency and regional integration within ASEAN.
- Converting NTMs to AVEs involves aggregation risks that may distort bilateral shock application.
- Simulation results suggest 50% NTM reduction is a practical upper bound before distortions emerge.
- Excessive liberalization may trigger welfare losses due to overshooting and adverse price shifts.
- Policy should aim for gradual, sector-sensitive NTM reforms backed by better measurement and model calibration.

Country Aggregation

GTAPISO	Description	GTAPISO	Description	GTAPISO	Description
ROW	Rest of World	LKA	Sri Lanka	BRN	Brunei Darussalam
ARE	United Arab Emirates	MDG	Madagascar	KHM	Cambodia
EU27	European Union	MEX	Mexico	LAO	Lao People's Democratic Republic
BGD	Bangladesh	MOZ	Mozambique	IDN	Indonesia
CAN	Canada	MUS	Mauritius	MYS	Malaysia
CHE	Switzerland	MWI	Malawi	PHL	Philippines
CHN	China	NAM	Namibia	SGP	Singapore
CMR	Cameroon	NGA	Nigeria	THA	Thailand
DZA	Algeria	NIC	Nicaragua	VNM	Viet Nam
GBR	United Kingdom of Great Britain and Northern Ireland	NOR	Norway		
HKG	China, Hong Kong Special Administrative Region	PAK	Pakistan		
IND	India	SYR	Syrian Arab Republic		
IRQ	Iraq	TUN	Tunisia		
ISR	Israel	USA	United States of America		
JOR	Jordan	ZAF	South Africa		
JPN	Japan	ZMB	Zambia		
KAZ	Kazakhstan	ZWE	Zimbabwe		
KOR	Republic of Korea				

Note: Country labels are identified using the GTAP concordance: [GTAP Data Bases: GTAP 11 Data Base Regions](#)

Sectoral Aggregation

Agg Sec.	Description	GSEC	Agg Sec.	Description	GSEC
Grains	Combines rice and other grains for staple crop analysis	pdr, wht, gro, mil	nmm	Mineral products nec	rpp
v_f	Vegetables, fruit, nuts	v_f	i_s	Ferrous metals	nmm
osd	Oil seeds	osd	nfm	Metals nec	i_s
OthCrop	Aggregates remaining crops for diverse crop trade analysis	c_b, pfb, ocr	fmp	Metal products	nfm
Livstock	Combines all livestock for animal agriculture trade analysis	ctl, oap, rmk, wol	ele	Computer, electronic and optical products	fmp
PrimProd	Aggregates primary production sectors not elsewhere classified	frs, fsh	eeq	Electrical equipment	ele
Extract	Combines all extractive industries for natural resource analysis	coa, oil, gas	ome	Machinery and equipment nec	eeq
oxt	Other Extraction (formerly omn Minerals nec)	gdt	mvh	Motor vehicles and parts	ome
Food	Aggregates food processing industries for comprehensive analysis	oxt, cmt, omt, vol, pcr, ofd	otn	Transport equipment nec	mvh
ofd	Food products nec	sgr	omf	Manufactures nec	otn
tex	Textiles	b_t	ely	Electricity	omf
wap	Wearing apparel	tex	Utility	Groups utility services due to similar regulatory environments	ely, wtr
lea	Leather products	wap	cns	Construction	cns
lum	Wood products	lea	TransComm	Combines trade and communication for analysis of commerce facilitation	trd, otp, wtp, atp, whs, cmn
ppp	Paper products, publishing	lum	BusServ	Aggregates various business-related services	afs, rsa, obs, ros, dwe
p_c	Petroleum, coal products	ppp	FinServ	Aggregates financial services for financial sector analysis	ofi, ins
chm	Chemical products	p_c	GovServ	Combines government-related services for public sector analysis	osg, edu, hht
bph	Basic pharmaceutical products	chm			
rpp	Rubber and plastic products	bph			

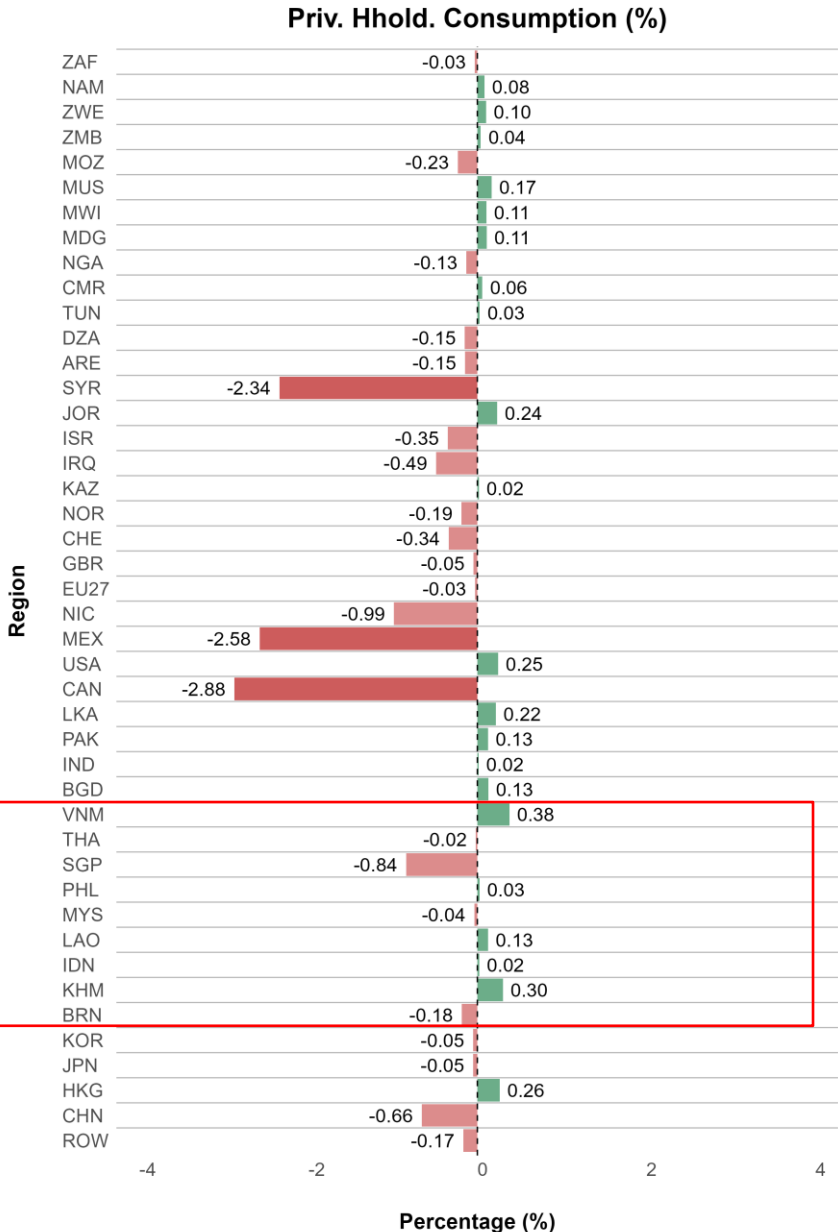
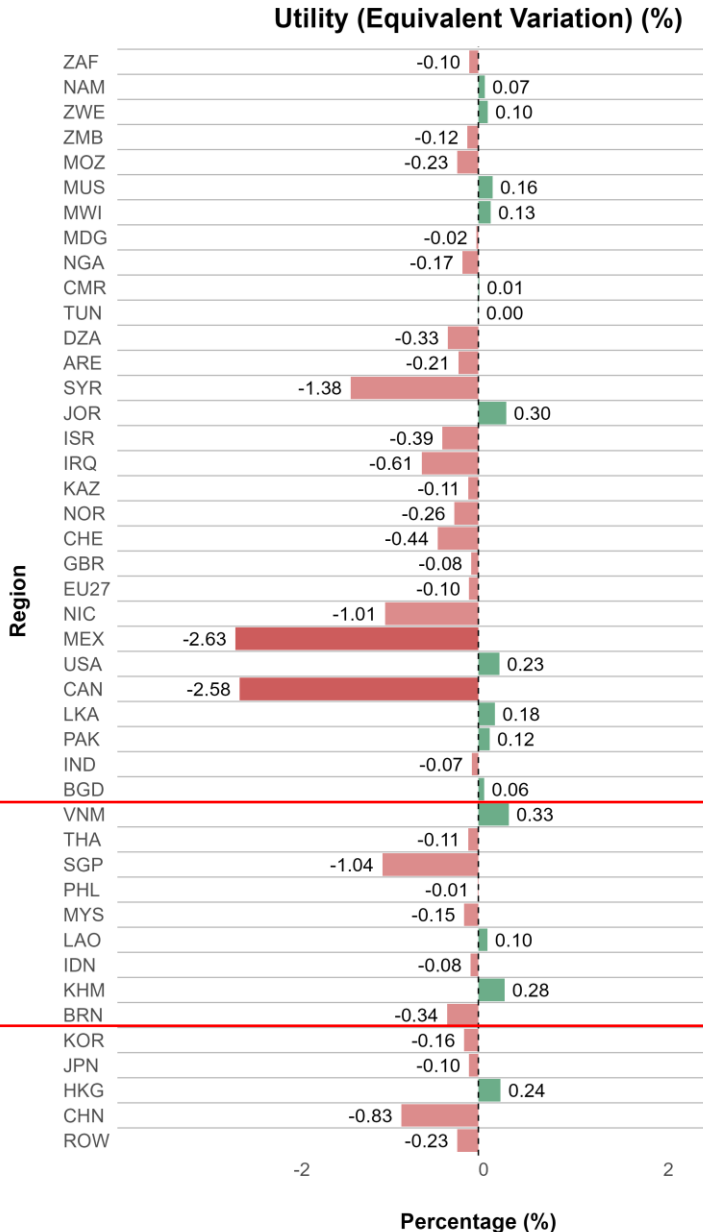
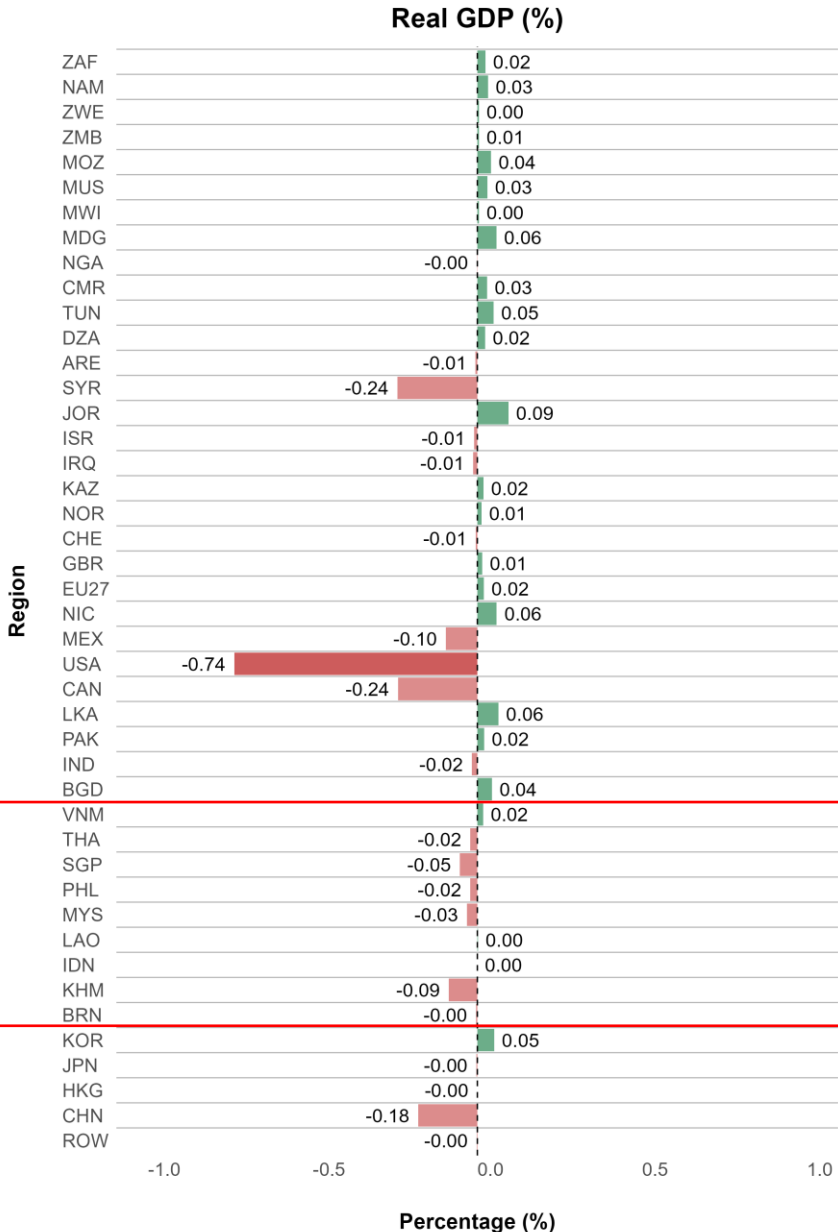
Note: Sectoral labels are identified using the GTAP concordance: [GTAP Data Bases: GTAP 11 Data Base Sectors](#)



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US Reciprocal Tariffs ASEAN Macroeconomics

U.S. Reciprocal Tariff



Intra-ASEAN Trade Flows (Pre-Simulation) (billion USD)

