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Chapter 22

An Economic and Environmental Assessment of FTA in East Asian Region by CGE Approach



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§ 1. Introduction



§ 2. The GTAP-E model



§ 3. Simulation database and scenario



§ 4. Economic impact of FTA



§ 5. Environmental impact of FTA



§ 6. Concluding remarks



§ 1. Introduction

- An increase in the International argument for “trade and environment”
 - 1992, Earth Summit
 - Environmental impact assessments of FTA and formulation of guidelines by US, Canada, EU and international agency like OECD
 - FTA schemes including East Asia
 - Trans-Pacific Strategic Economic Partnership Agreement (TPP)
 - Regional Comprehensive Economic Partnership (RCEP)
 - Japan-Republic of Korea FTA, China-Japan-South Korea FTA etc.
 - Strategic Environmental Assessment
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Effects of FTA on environment (CO₂)

1. Output Effects

2. Changes in Industrial Structure

3. Changes in Input Structure

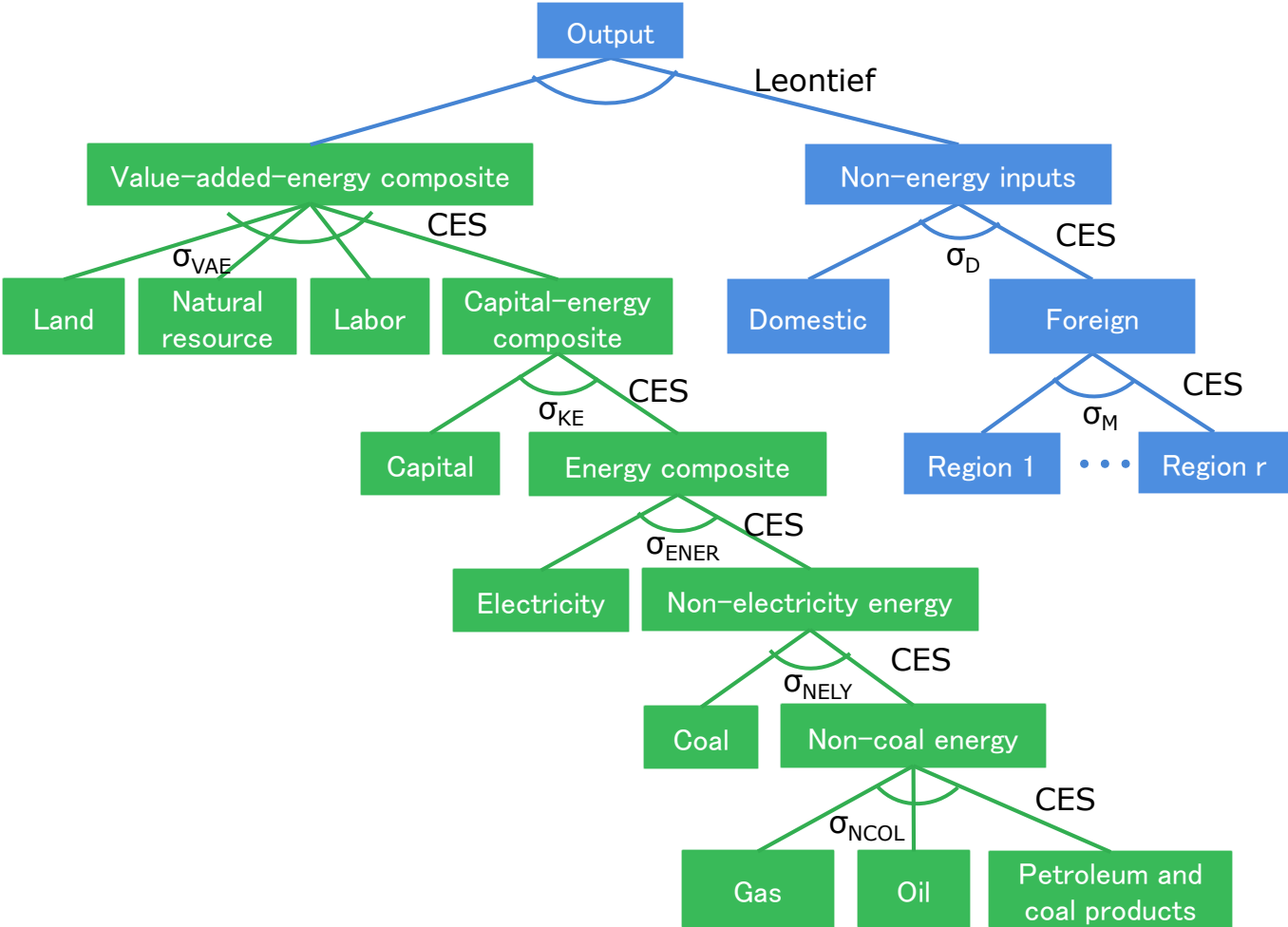
4. Spill Over Effects



§ 2. The GTAP-E model

- The GTAP-E model (version 6-pre2b)
 - Energy-environmental version of the GTAP model which is a computable general equilibrium (CGE) model
 - Market equilibrium conditions for factors and goods, optimal behavior, zero-profit conditions and an investment rule
 - Two distinct global sector
 - A global banking sector
 - A global transportation sector
 - Energy substitution, which plays an important role in linking economic activity with energy and environment.

Production structure in GTAP-E



Elasticity of substitution

	Coal	Oil	Gas	P_C	Ely	Others
σ_{VAE}	Value-added-energy composite					
	Differ among industries and regions, ex. Japan, 0.00(gas)~4.00(coal)					
σ_{KE}	Capital-energy composite					
	0	0	0	0	0.50	0.50
σ_{ENER}	Energy composite					
	0	0	0	0	0	1.00
σ_{NELY}	Non-electricity composite					
	0	0	0	0	0.50	0.50
σ_{NCOL}	Non-coal composite					
	0	0	0	0	1.00	1.00

Note: At the symposium in June, σ_{ENER} for electricity sector = 1.00.
Here, σ_{ENER} for electricity = 0.00.



§ 3. Simulation data and scenarios

- GTAP 8.1 Data Base
 - Global economy of 2007
 - 134 countries/regions, 57 industries
 - Regional I-O tables, macro data, bilateral trade data, and protection data
 - Energy volume data and CO₂ emission data
- Aggregation
 - 22 regions and 20 industries

Region and industry aggregation

- **22 regions** (The TPP members are underlined)
Australia, New Zealand, China, Japan, Korea, Taiwan, Rest of ASEAN, Malaysia, Singapore, Vietnam, South Asia, Canada, US, Mexico, Latin America, Chile, Peru, EU, Rest of East Europe and Russia, Middle East and North Africa, Sub-Sahara Africa, Rest of the world
 - **24 industries**
Paddy rice, Other agriculture, Livestock, Forestry, Fishing, Coal mining, Oil mining, Gas mining and products, Petro and coal products, Electricity, Other mining, Processed food, Textile and apparel, Paper products and publishing, Chemical products, Other mineral products, Ferrous metal, Motor vehicle and parts, Trans equipment, Electric equipment, Machinery and equipment, Other manufacture, Transport services, Other services
-

Simulation scenarios

The JK scenario

- Japan-Korea FTA (the complete abolition of any ad valorem import tariffs)

The CJK scenario

- China-Japan-Korea FTA

The TPP scenario

- FTA among the TPP members

The TPPJK scenario

- FTA among the TPP members and Japan-Korea FTA

The TPPCJK scenario

- FTA among the TPP members and China-Japan-Korea FTA

Initial tariff rates

- <Petroleum and coal products> remarkably high in **Vietnam** (18.5%), followed by Mexico, China, Chili, Korea (7.2% ~ 5.0%).
- <Paper product and publishing> substantially high in **Vietnam**, Peru, Malaysia, and Mexico (17.7% ~ 9.8%). In New Zealand, Japan, Korea, Singapore, Canada, and US, tariff rates are near zero.
- <Chemical products> significantly high in **Vietnam**, Mexico, Malaysia, Peru (11.6% ~ 7.9%).
- <Non-metal mineral products> relatively high in **Vietnam**, Mexico, China, Peru, Malaysia, and Korea (13.7% ~ 7.1%).
- <Ferrous metal> the highest in Malaysia (33.7%) , zero in Singapore and considerably low in Japan, Canada, and US, several percent in other FTA countries.



§ 4. Economic impact of FTA

GDP growth rate for each scenario (%)

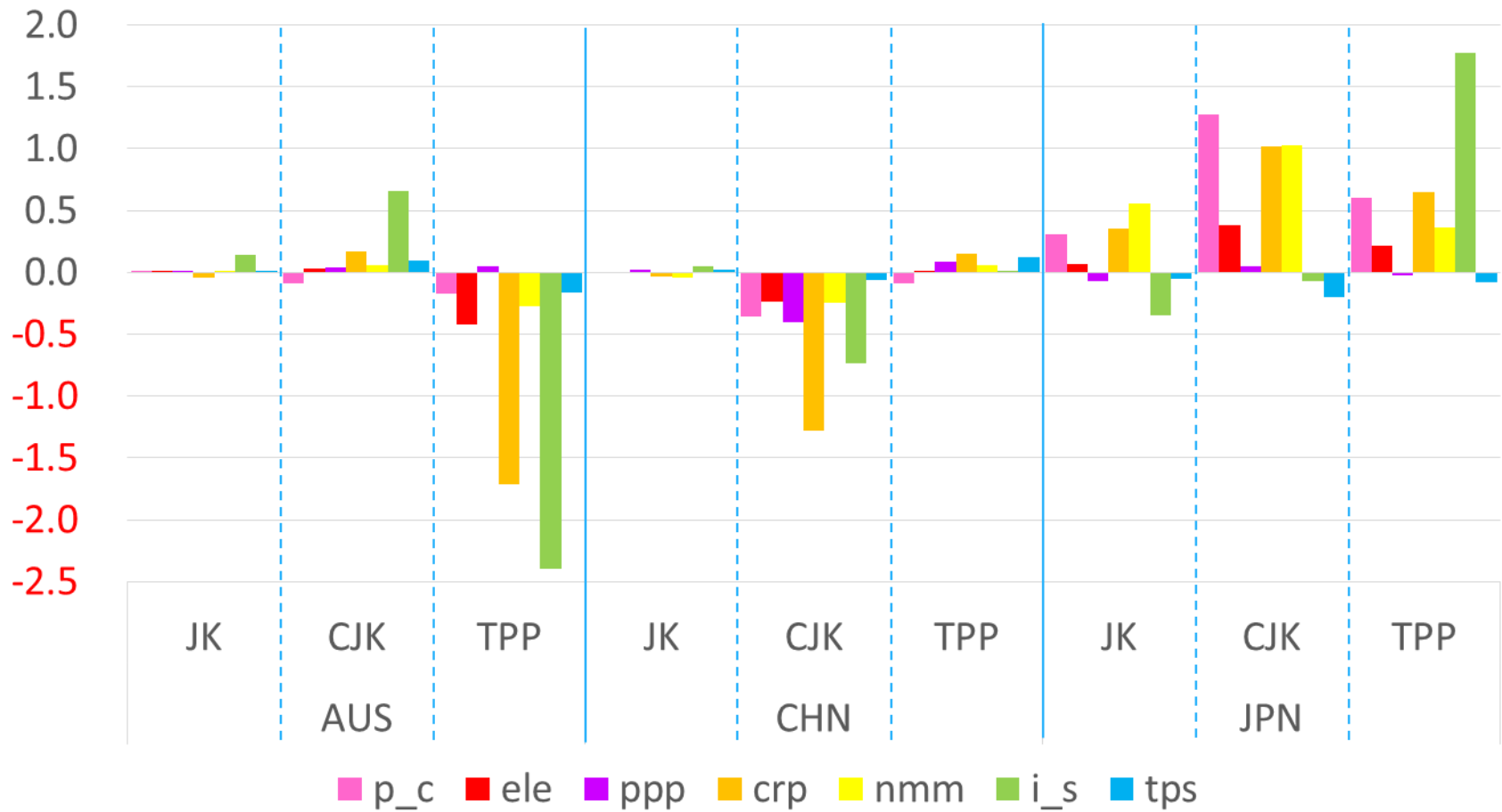
	JK	CJK	TPP	TPPJK	TPPCJK
AUS	-0.00	-0.01	0.01	0.01	0.01
NZL	-0.00	-0.01	0.06	0.06	0.05
CHN	-0.00	0.01	-0.03	-0.03	-0.00
JPN	0.02	0.11	0.08	0.10	0.17
KOR	0.03	0.20	-0.03	-0.00	0.17
TWN	-0.00	-0.04	-0.01	-0.02	-0.05
ROA	-0.00	-0.02	-0.02	-0.03	-0.04
MYS	-0.01	-0.03	0.17	0.17	0.15
SGN	-0.00	-0.01	0.01	0.01	0.01
VNM	-0.01	-0.11	1.18	1.18	1.08
SA	-0.00	-0.01	-0.02	-0.02	-0.03
CAN	-0.00	-0.00	0.06	0.06	0.06
US	-0.00	-0.00	0.00	-0.00	-0.00
MEX	-0.00	-0.01	0.05	0.05	0.04
CHL	-0.00	-0.01	0.02	0.01	0.01
PER	-0.00	-0.00	0.00	0.00	0.00

ROA: rest of ASEAN, SA: South Asia

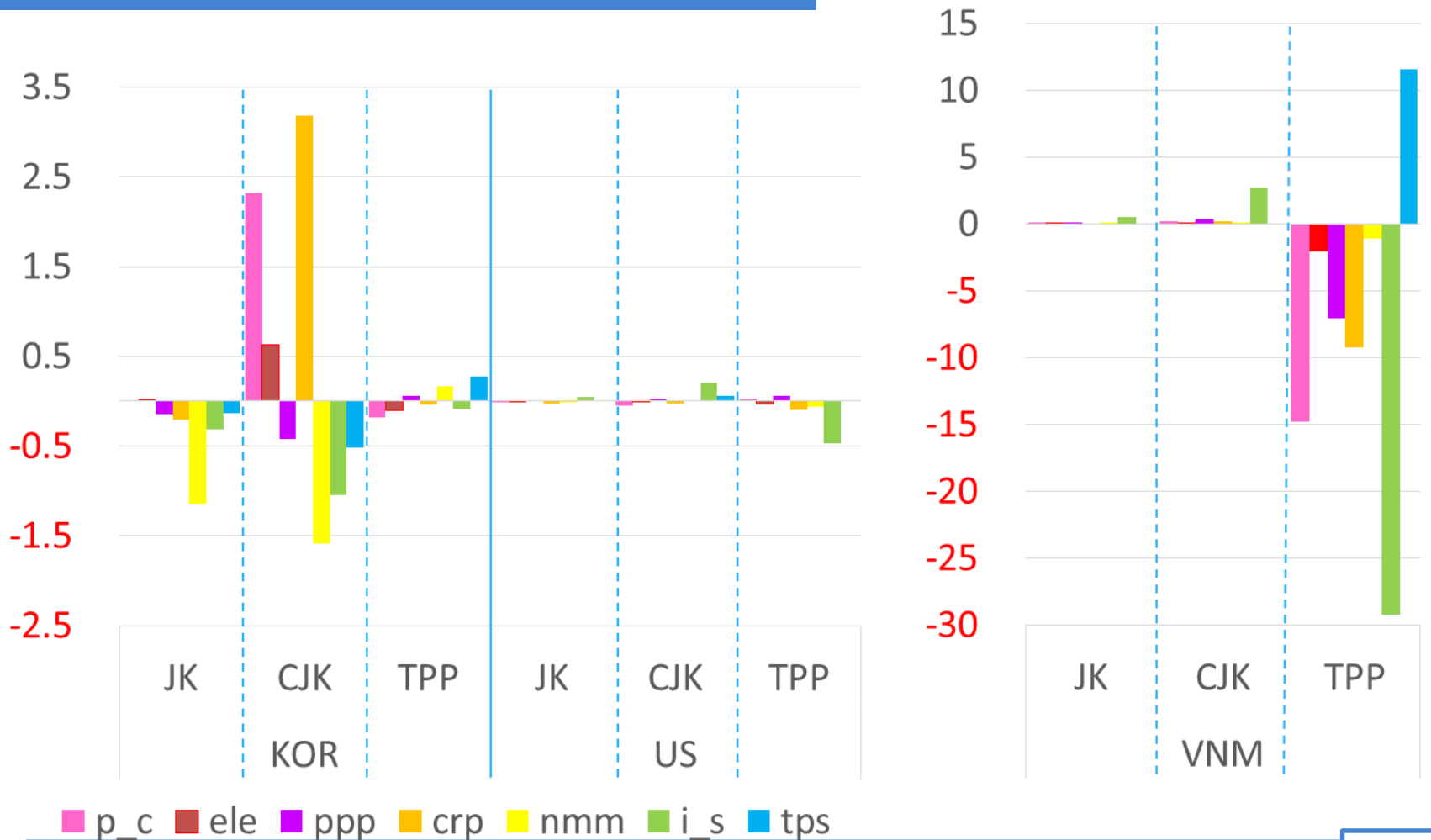
Nominal factor price change rates (%)

	JK		CJK		TPP	
	Labor	Capital	Labor	Capital	Labor	Capital
AUS	-0.1	-0.1	-0.4	-0.4	0.9	0.9
NZL	-0.1	-0.1	-0.4	-0.4	1.9	1.8
CHN	-0.1	-0.1	0.3	0.1	-0.2	-0.2
JPN	0.4	0.4	1.5	1.6	0.7	0.7
KOR	0.3	0.3	2.1	2.3	-0.2	-0.2
TWN	-0.1	-0.1	-0.9	-0.9	-0.2	-0.2
ROA	-0.1	-0.0	-0.4	-0.4	-0.4	-0.3
MYS	-0.0	-0.0	-0.4	-0.4	1.5	1.7
SGN	-0.0	-0.0	-0.2	-0.3	0.3	0.2
VNM	-0.1	-0.1	-0.7	-0.8	11.4	13.2
SA	-0.0	-0.0	-0.2	-0.2	-0.3	-0.3
CAN	-0.0	-0.0	-0.2	-0.2	-0.2	-0.1
US	-0.0	-0.0	-0.2	-0.2	0.0	0.1
MEX	-0.0	-0.0	-0.2	-0.2	-0.0	-0.0
CHL	-0.1	-0.1	-0.4	-0.4	0.0	0.1
PER	-0.0	-0.0	-0.2	-0.2	0.4	0.6

Change rates in output (%)



Change rates in output (%)

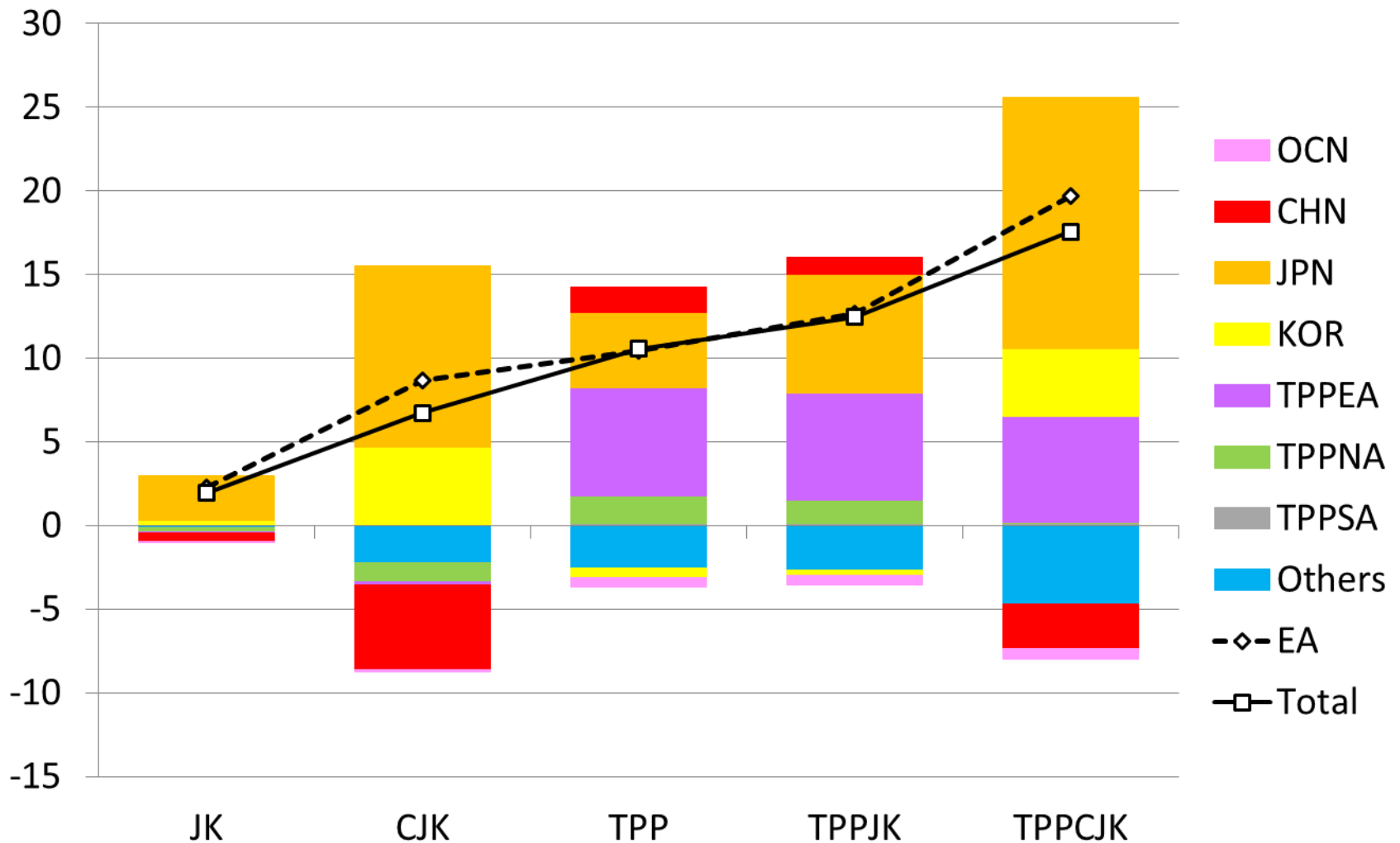


§ 5. Environmental impact of FTA

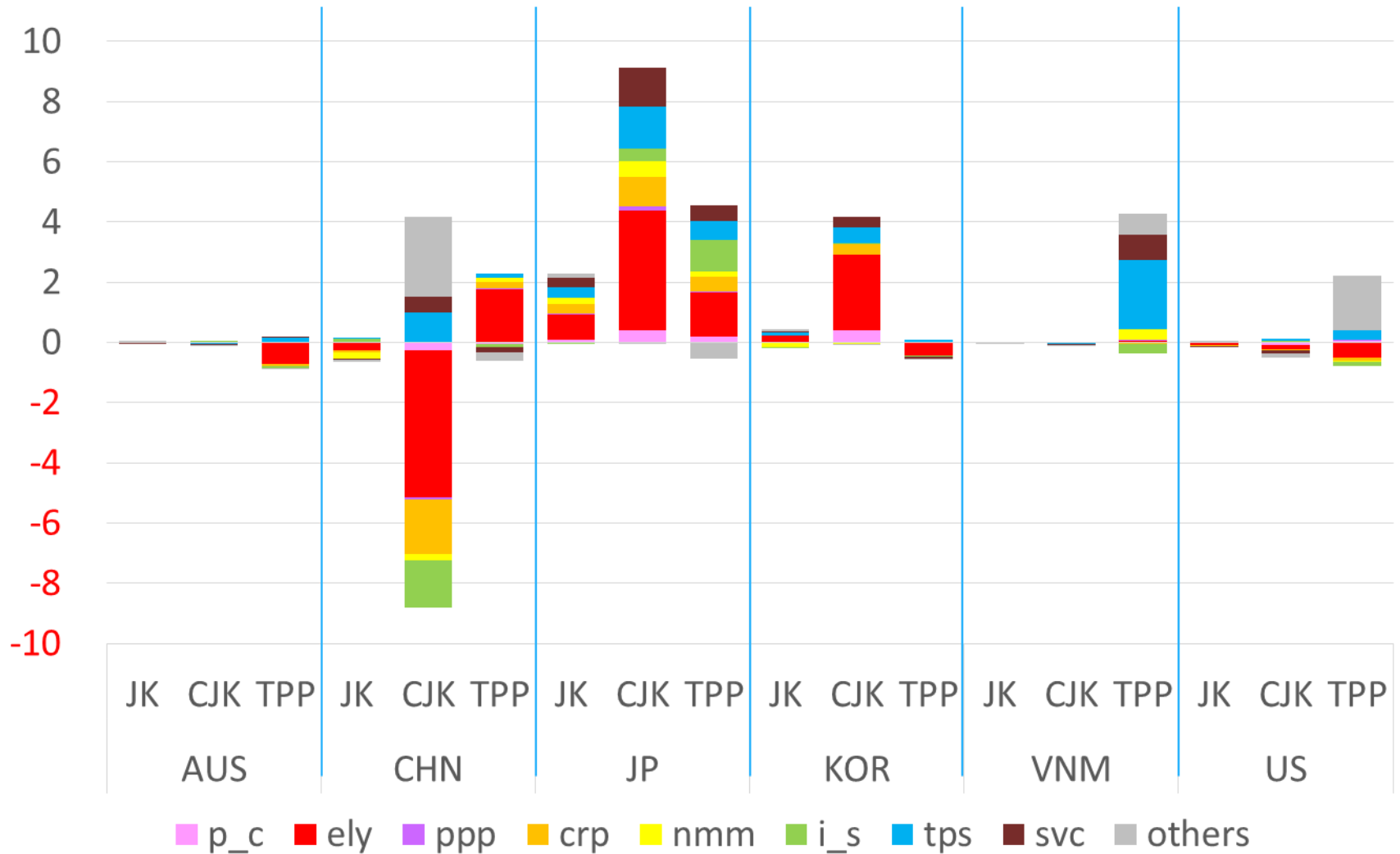
CO₂ growth rates (%)

	JK	CJK	TPP	TPPJK	TPPCJK
AUS	-0.00	-0.04	-0.16	-0.16	-0.18
NZL	0.00	0.01	0.13	0.14	0.14
CHN	-0.01	-0.09	0.03	0.02	-0.05
JPN	0.25	1.01	0.42	0.66	1.40
KOR	0.07	1.11	-0.14	-0.07	0.97
TWN	-0.04	-0.59	-0.28	-0.32	-0.87
ROA	-0.00	-0.01	-0.11	-0.11	-0.12
MYS	-0.01	-0.07	0.66	0.64	0.59
SGN	0.03	0.09	0.97	0.99	1.03
VNM	-0.01	-0.12	5.06	5.04	4.94
SA	-0.00	-0.01	0.13	0.13	0.12
CAN	-0.00	-0.00	0.02	0.02	0.02
US	-0.00	-0.02	0.03	0.03	0.00
MEX	0.00	0.00	-0.05	-0.05	-0.05
CHL	-0.00	-0.01	0.28	0.27	0.26
PER	0.00	0.01	-0.29	-0.29	-0.28

CO₂ Change (million tons)



CO₂ change by sector (million tons)



Effects on CO₂ emissions per output

■ Replacement of factor with energy

Growth rates in input demand for electricity industry (%)

	AUS	CHN	JPN			KOR		VNM	SA	US
	TPP	CJK	JK	CJK	TPP	JK	CJK	TPP	TPP	TPP
labor	-0.63	-0.50	-0.15	-0.47	-0.13	-0.23	-0.70	-4.06	0.12	-0.02
capital	-0.47	-0.23	-0.02	0.06	0.12	-0.07	0.09	-3.12	0.04	-0.05
ely	-0.30	-0.13	0.18	0.84	0.38	0.12	1.25	1.39	-0.06	-0.02
vean	-0.42	-0.24	0.06	0.38	0.22	0.01	0.63	-2.10	-0.01	-0.03

ely > vean → replacement of production factor with energy

■ Energy substitution

Growth rates in total CO₂ emissions by energy (%)

	AUS	CHN	JPN			KOR		VNM	SA	US
coal	-0.35	-0.14	0.36	0.23	1.04	0.01	1.10	1.60	0.26	-0.01
oil	-0.98	-0.04	0.44	0.19	0.86	-0.09	-3.15	17.49	0.21	-0.08
gas	-0.26	-0.16	0.48	0.25	1.13	0.08	1.33	-3.08	0.09	0.00
p_c	0.22	0.08	0.43	0.26	0.96	0.11	1.04	10.70	-0.14	0.08



§ 6. Concluding remarks

- Environmental effects differ across region and the reasons are diverse and region specific.
 - Change in output and a share of energy intensive industries
 - Energy substitution
 - Trade of electricity (Vietnam and China, US and Canada)

- Political implication
 - Environmental assessment is important for FTA including East Asia which is incorporated into the global supply chain.
 - Importance of a mutually supportive relationship between the environment and trade
 - Japan's responsibility and role