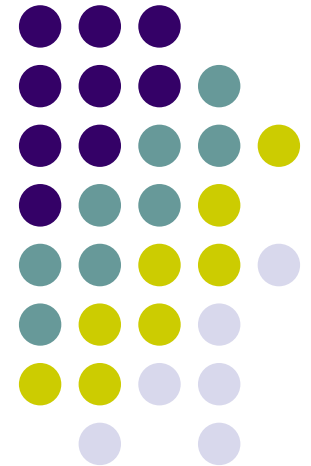


Global CGE model

Junichi Fujino

APEIS Training Workshop

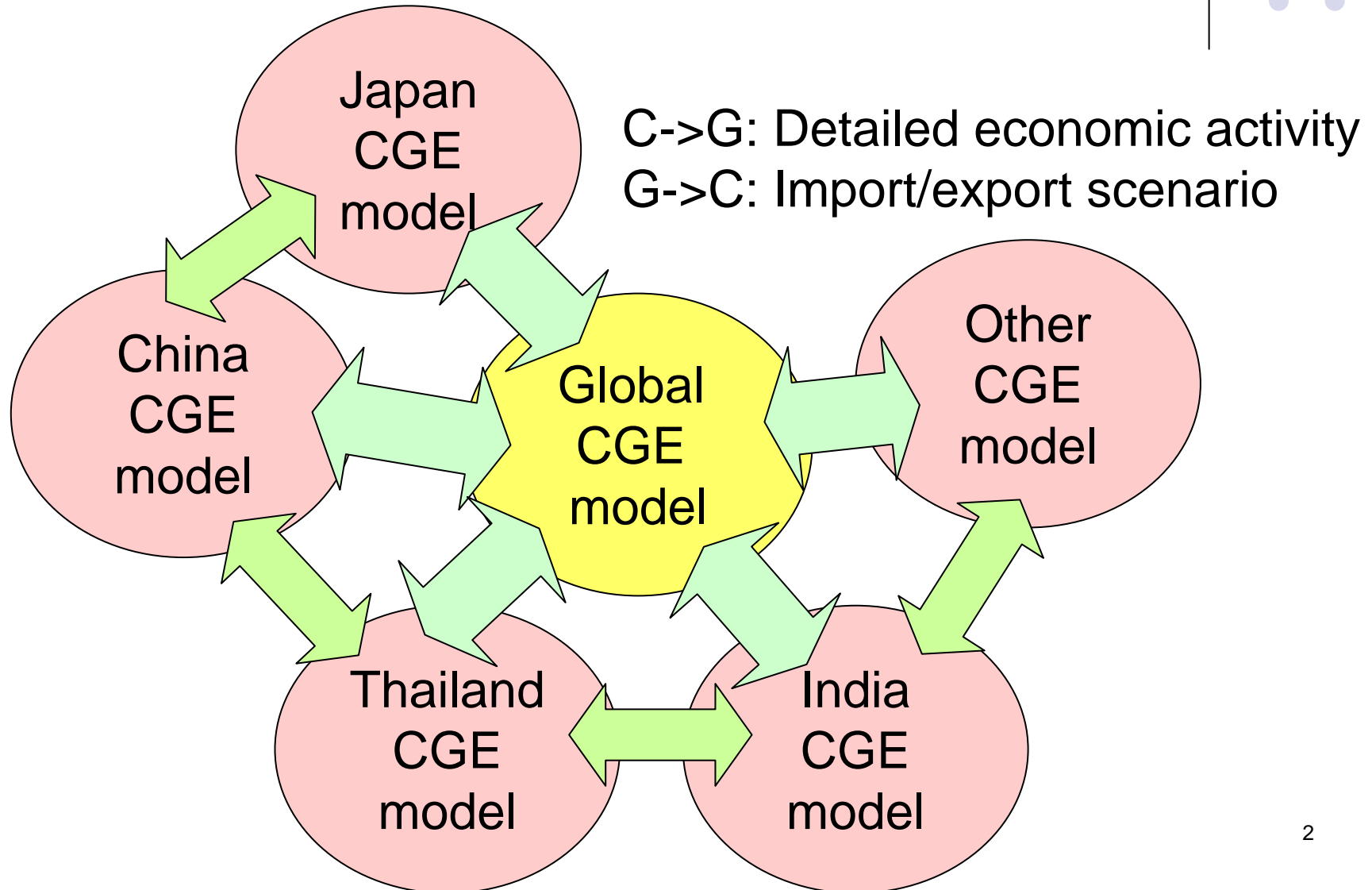
Nov. 25 to Dec. 8, 2004, National Institute of
Environment Studies, Tsukuba

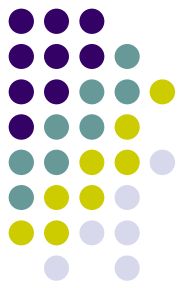


Dec.8 2004



Country CGE model and Global CGE model





GTAP and GTAP-EG

- GTAP ver 5.4 (ver 6 will be published in next March)
 - ✓ Globally economy data
 - ✓ 78 regions, 57 sectors
 - ✓ Overview of country CGE data + global trade data
- GTAP-EG
 - ✓ CGE programs including trade structure
 - ✓ Static model, MPSGE written in GAMS
 - ✓ Armington trade substitution

GTAP for Asian regions



1	AUS	Australia
2	NZL	New Zealand
3	CHN	China
4	HKG	Hong Kong
5	JPN	Japan
6	KOR	Korea
7	TWN	Taiwan
8	IDN	Indonesia
9	MYS	Malaysia
10	PHL	Philippines

3 XOC Rest of Oceania

11	SGP	Singapore
12	THA	Thailand
13	VNM	Vietnam
14	BGD	Bangladesh
15	IND	India
16	LKA	Sri Lanka
17	XSA	Rest of South Asia

17 BGD Bangladesh

GTAP-EG

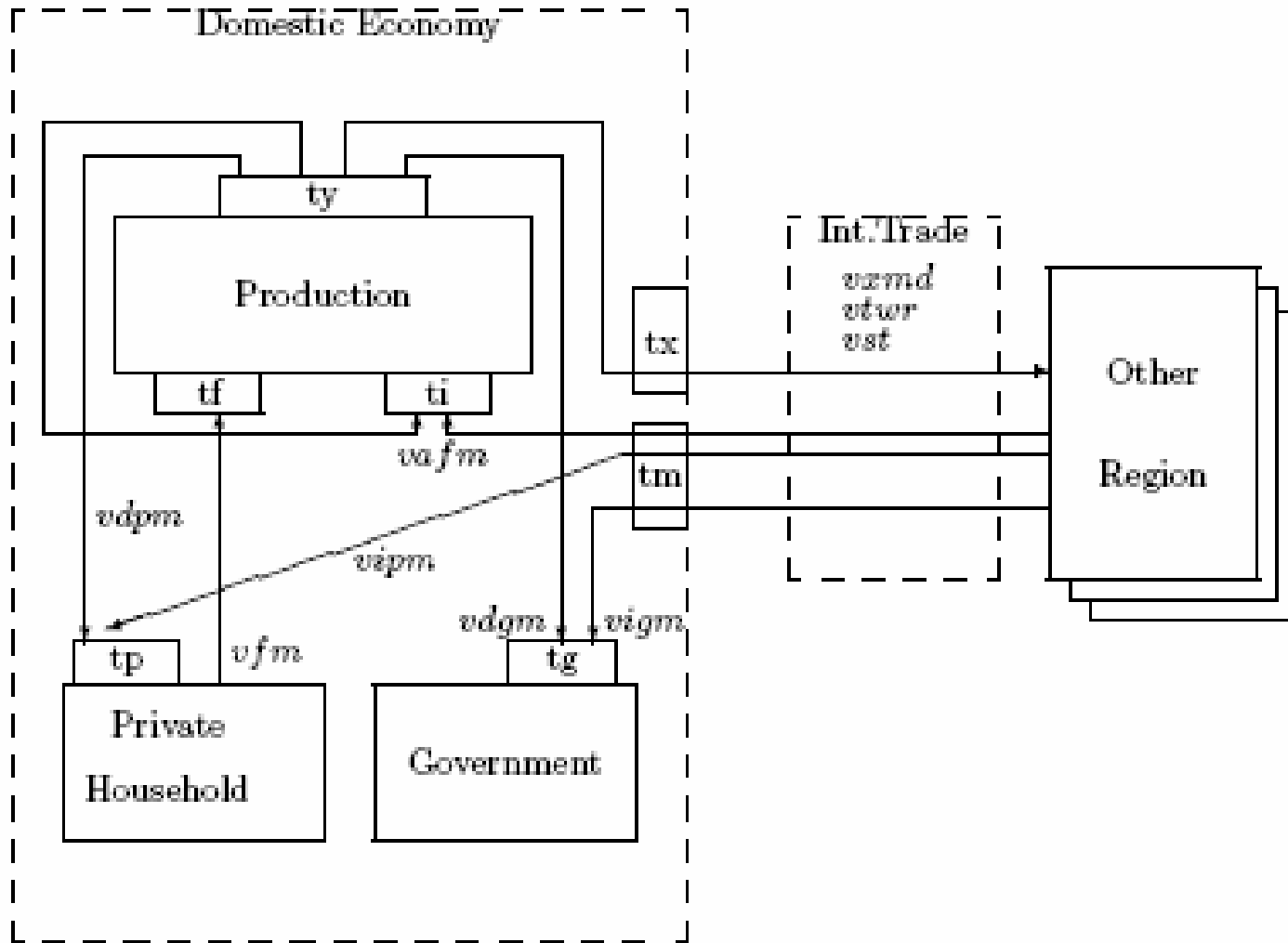
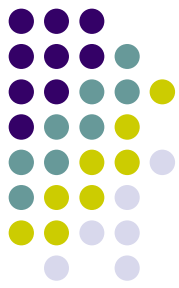


Fig. 1. GTAP flows explicitly represented in the dataset.

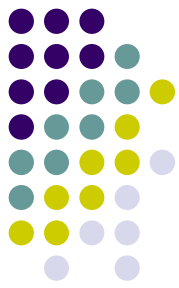
Main issues with global CGE model



World: Long-term Emissions
Scenarios including non-CO2 gases

Japan and World: FTA
bilateral/multi-lateral trade

Japan: carbon tax
Japanese scenarios
and world

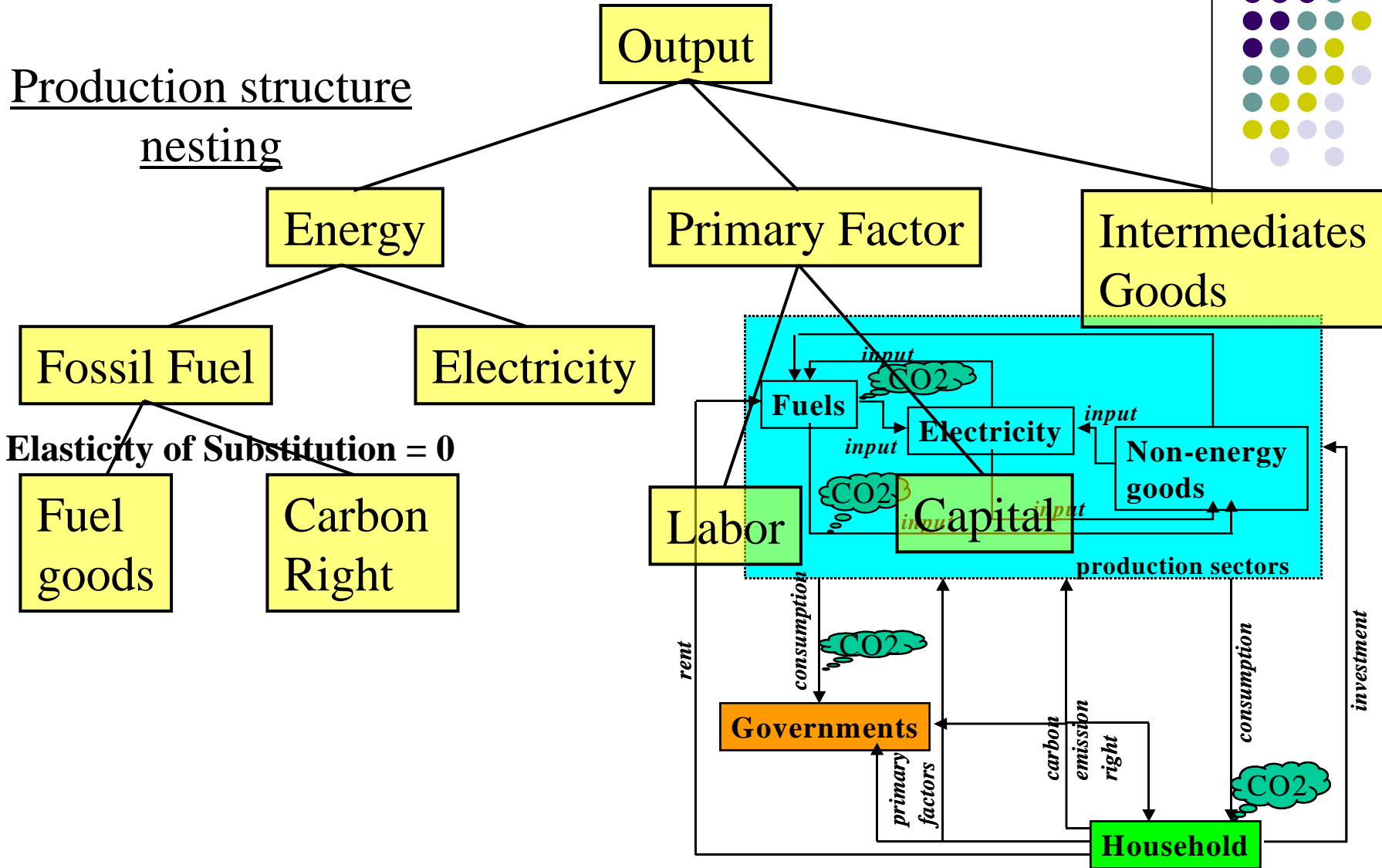


AIM/Top-down model

- **Overview of AIM/Top-down model**
 - **Data from GTAP (ver.3) and energy balance table (IEA)**
 - **Computable general equilibrium model with recursive dynamics**
 - **CO2 emissions from fossil fuels**
 - **Time period: 1992-2010**
 - **Region: 21**
 - **Sector: 8**

Production structure

nesting

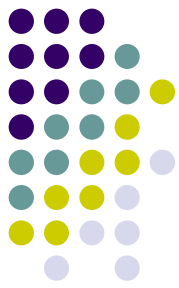


Outline of AIM/CGE



Classification of sector

Y	Agricultures, other manufactures and services
COL	Coal
CRU	Crude CRU
GAS	Natural gas
EGW	Electricity
OIL	Petroleum and coal products (refined)
EIS	Energy intensive products
TRN	Transport industries
CGD	Savings good



Definition of region

JPN	Japan	CHN	China
AUS	Australia	IDI	India
NZL	New Zealand	IDN	Indonesia
USA	United States of America	MYS	Malaysia
CAN	Canada	PHL	Philippines
EUR	Western Europe	THA	Thailand
TWN	Taiwan	LAM	Latin America
KOR	Republic of Korea	MEA	Middle East and North Africa
HKG	Hong Kong	SSA	Sub Saharan Africa
SGP	Singapore	ROW	Rest of World
EEU+ CIS	Eastern Europe + Commonwealth of Independent States		

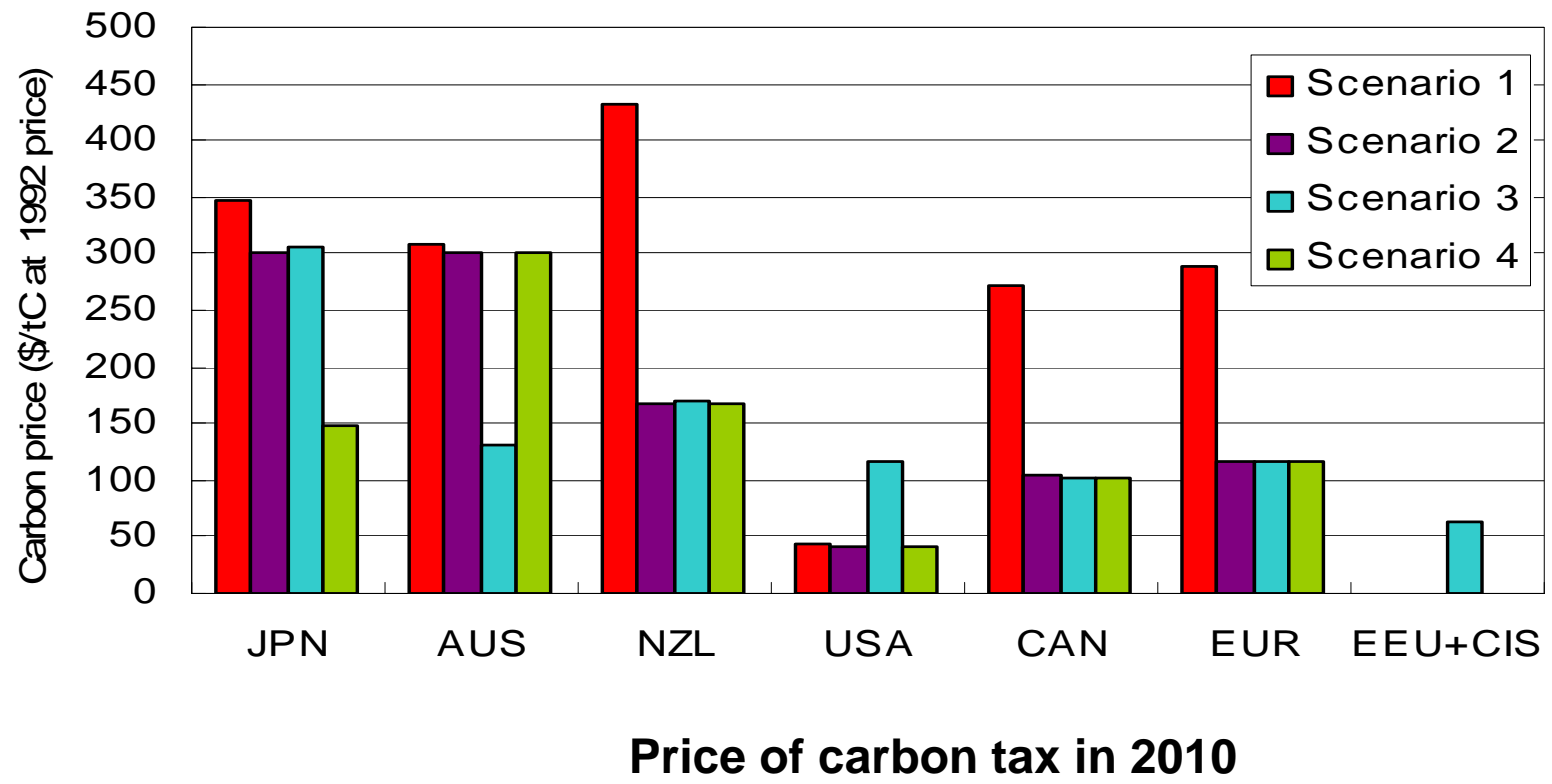


Scenarios for analysis

	Climate policy in US and Australia	Emission trade	
		Japan	Others
BaU	No CO2 reduction		
Scenarios reducing CO2 emissions			
Scenario 1	Keep original policy	No trade	
Scenario 2	Keep original policy	1.6% of emissions in 1990	Half of reduction
Scenario 3	Ratify Kyoto in 2008	1.6% of emissions in 1990	Half of reduction
Scenario 4	Keep original policy	Half of reduction	

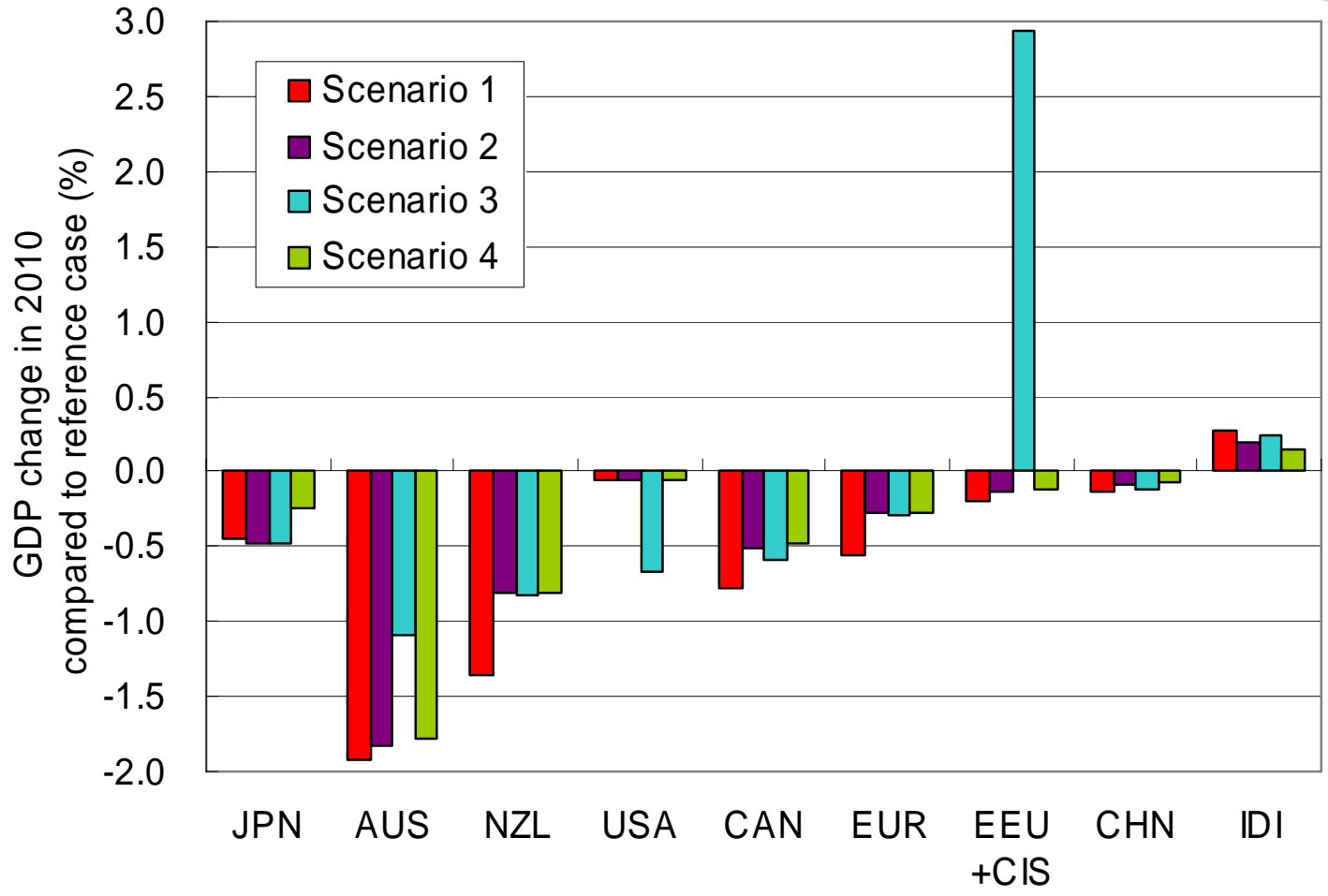


Carbon Price





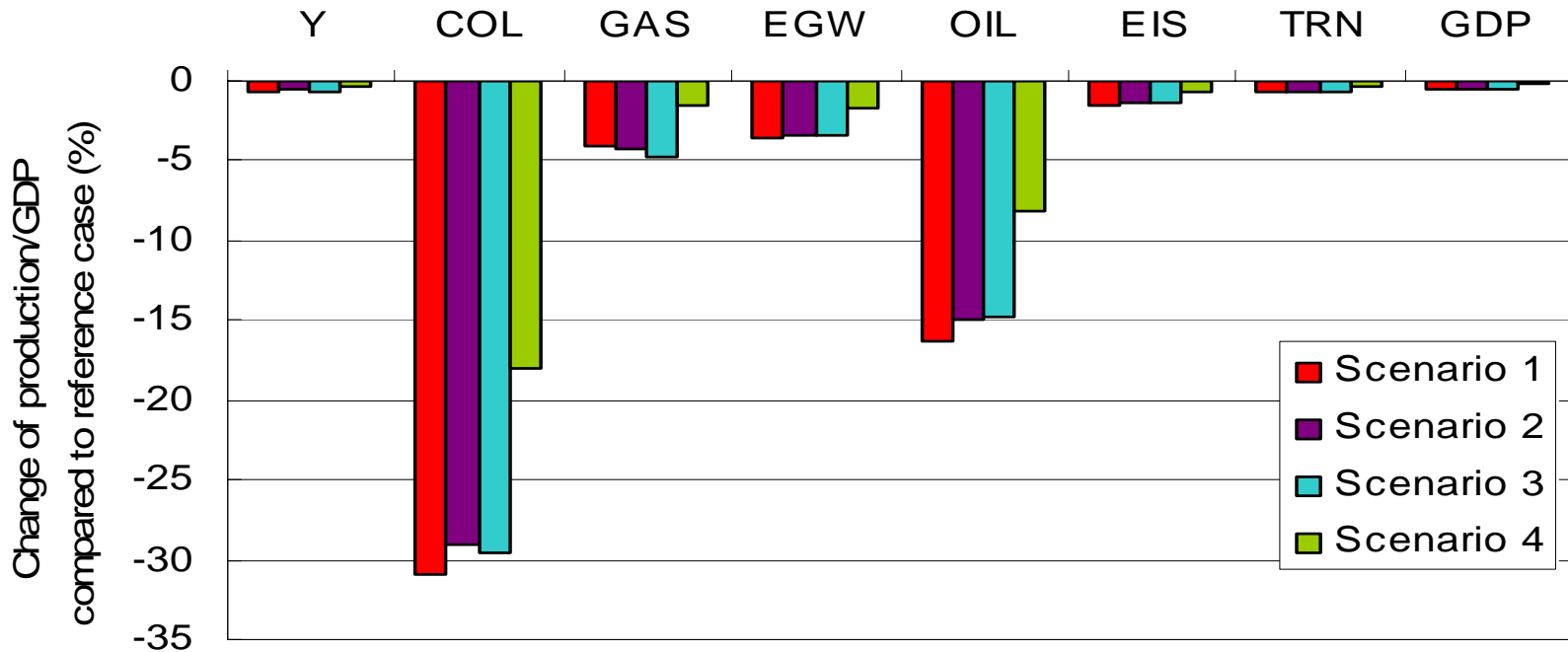
GDP change



GDP change in 2010 compared to BaU



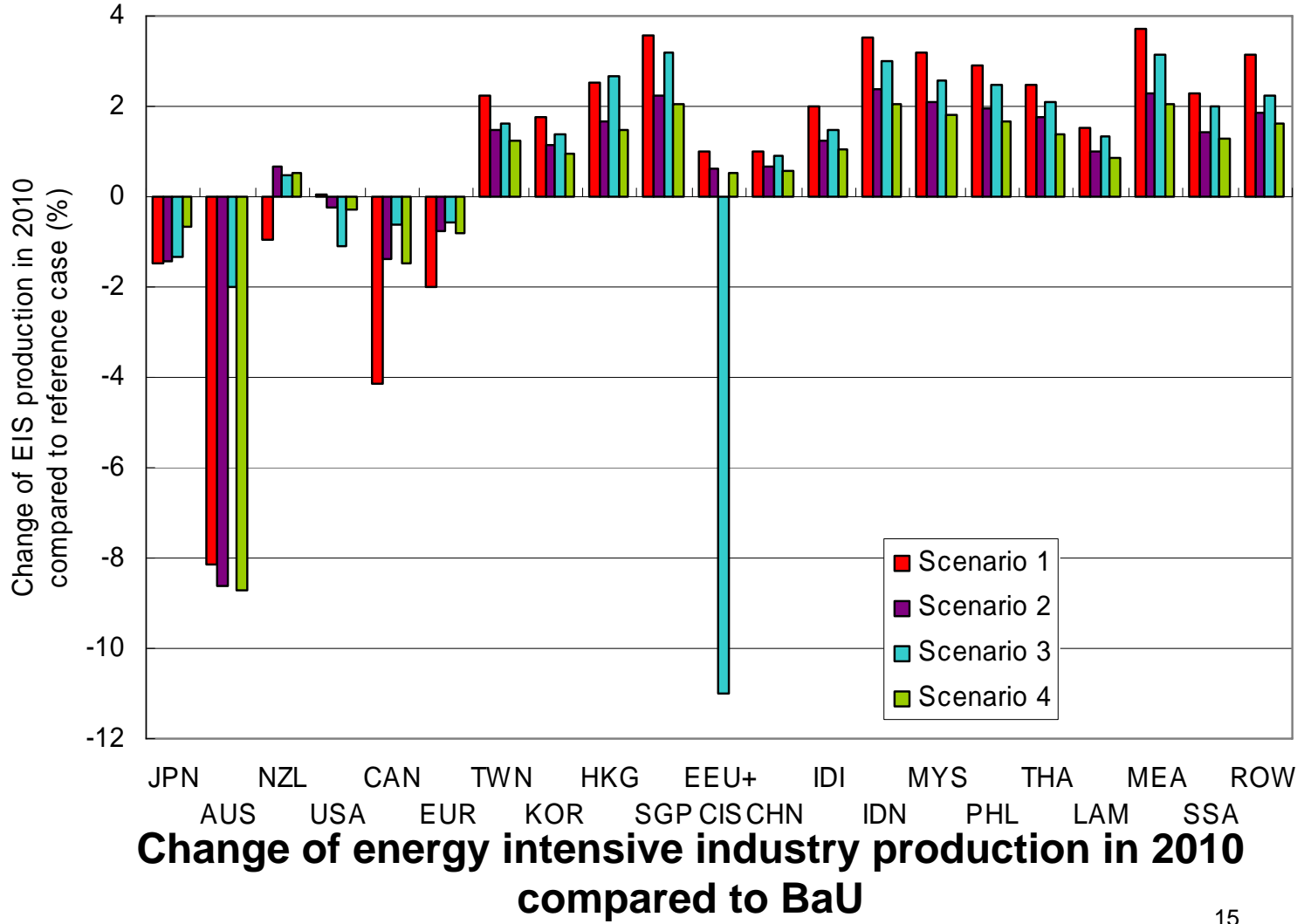
Production change in Japan



Change of production in each sector and GDP in Japan (2010)



EII production change

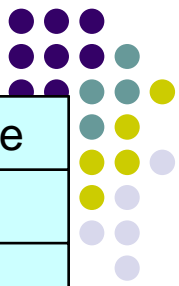




Basic framework of AIM/CGE(Asia)

- Type: Top-down, CGE, recursive dynamics
- Program : GTAP-EG/GAMS/MPSGE
- Database : GTAP ver.5(1997), IEA
- Target Year: 2100
- Target Region: 18 regions
- Target Sector: 13 sectors
- Energy depletion, electricity mix
- Non-CO₂ gas abatement
- (Land use: use SRES/B2(AIM) scenario)

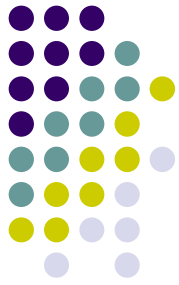
Regions



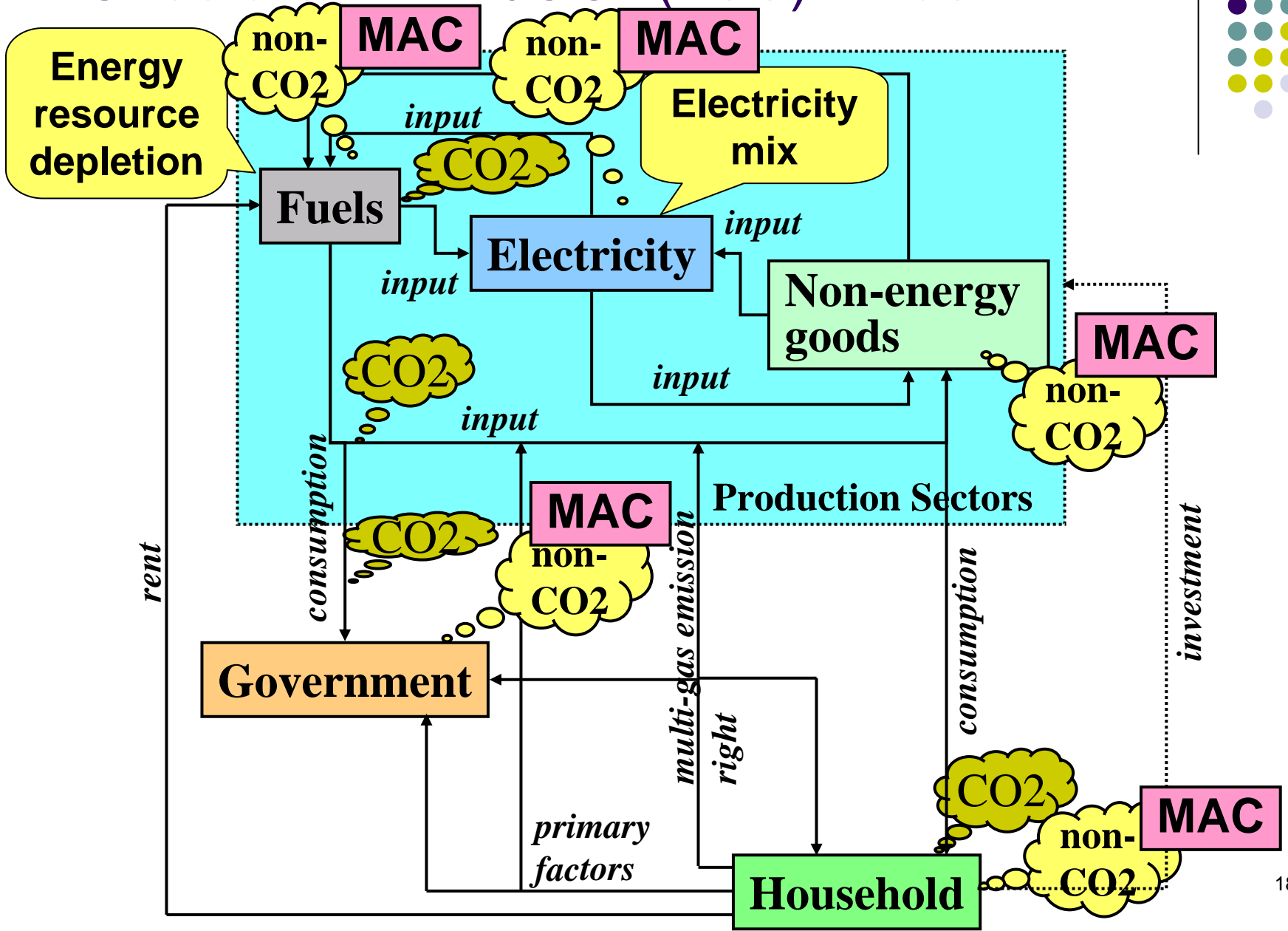
1	ANZ	Australia/NZ	10	OWE	Other Western Europe
2	JPN	Japan	11	EEU	Eastern Europe
3	KOR	Korea, Rep.	12	FSU	FSU
4	CHN	China	13	OPE	OPEC
5	IND	India	14	MEX	Mexico
6	SEA	South & SE Asia	15	BRA	Brazil
7	USA	USA	16	LAM	Latin America
8	CAN	Canada	17	AFR	Africa
9	WEU	Western Europe	18	ROW	Rest of the World

Sectors

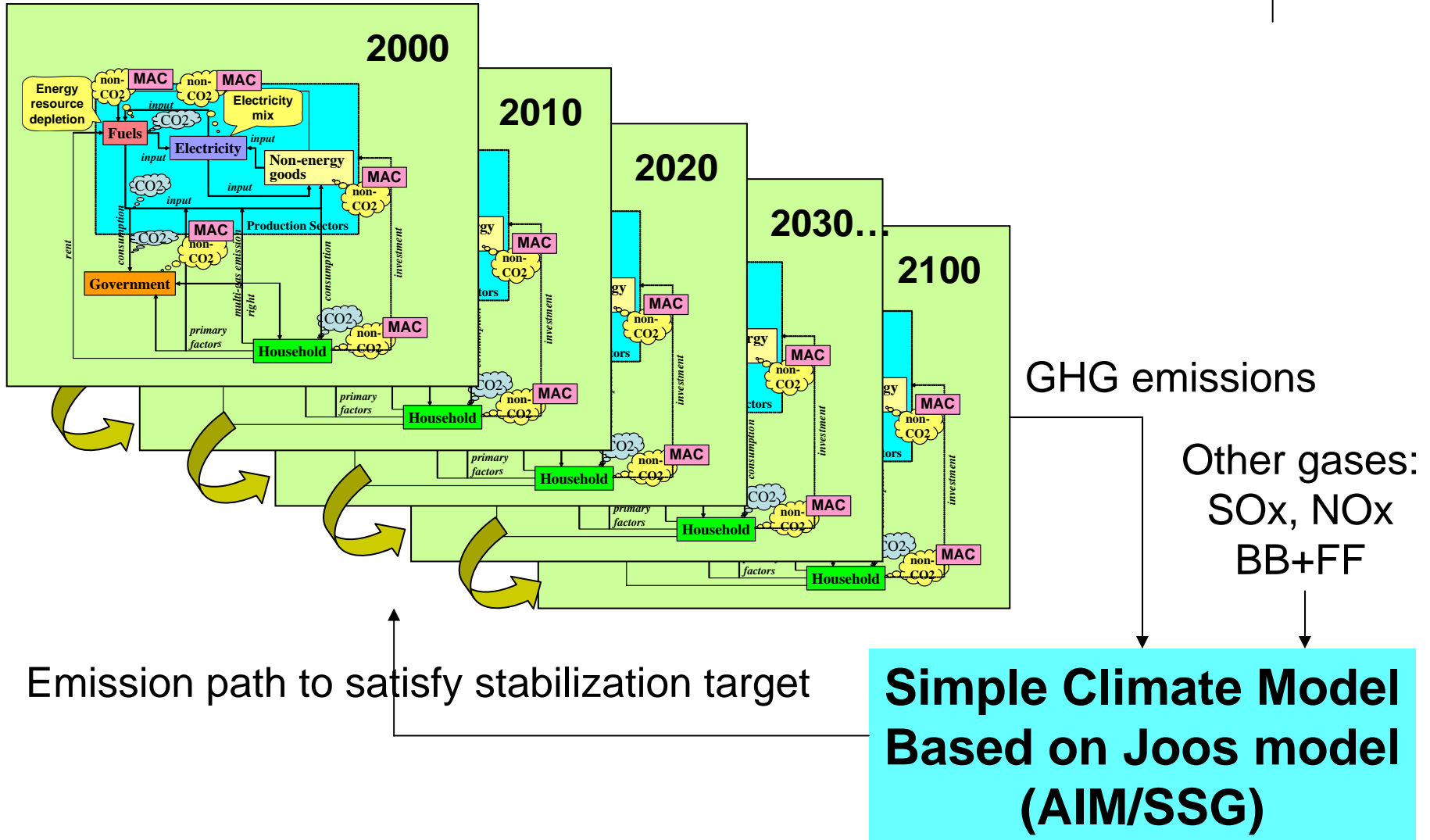
1	GAS	Natural gas works	8	FRS	Forestry
2	ELE	Electricity and heat	9	FSH	Fishing
3	OIL	Refined oil products	10	EII	Energy Intensive Industry
4	COL	Coal transformation	11	OIN	Other Industry
5	CRU	Crude oil	12	T_T	Transport
6	AGR	Agriculture	13	SER	Service
7	LVK	Livestock			



Structure of AIM/CGE(Asia) model

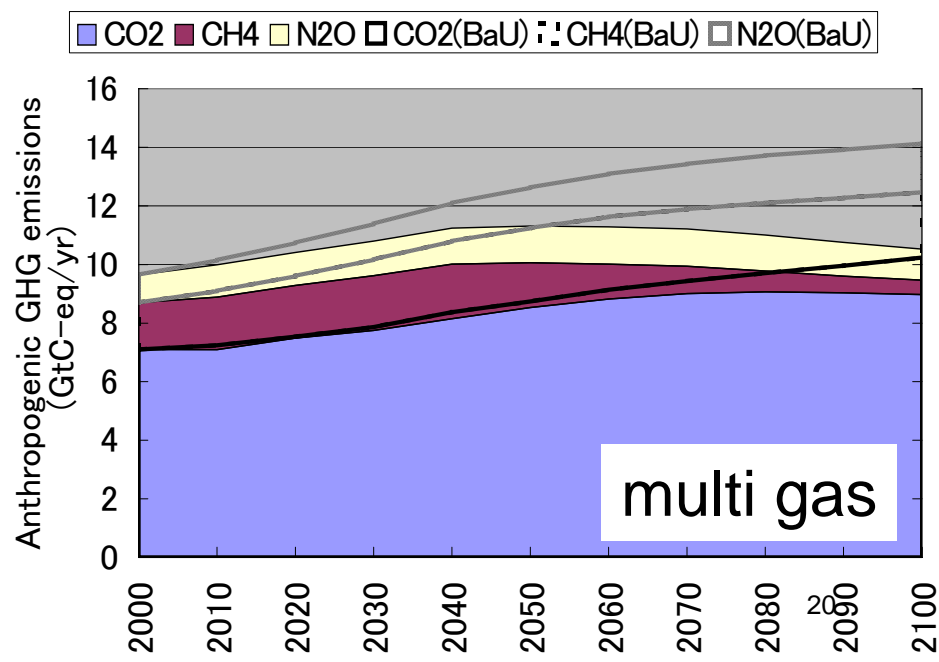
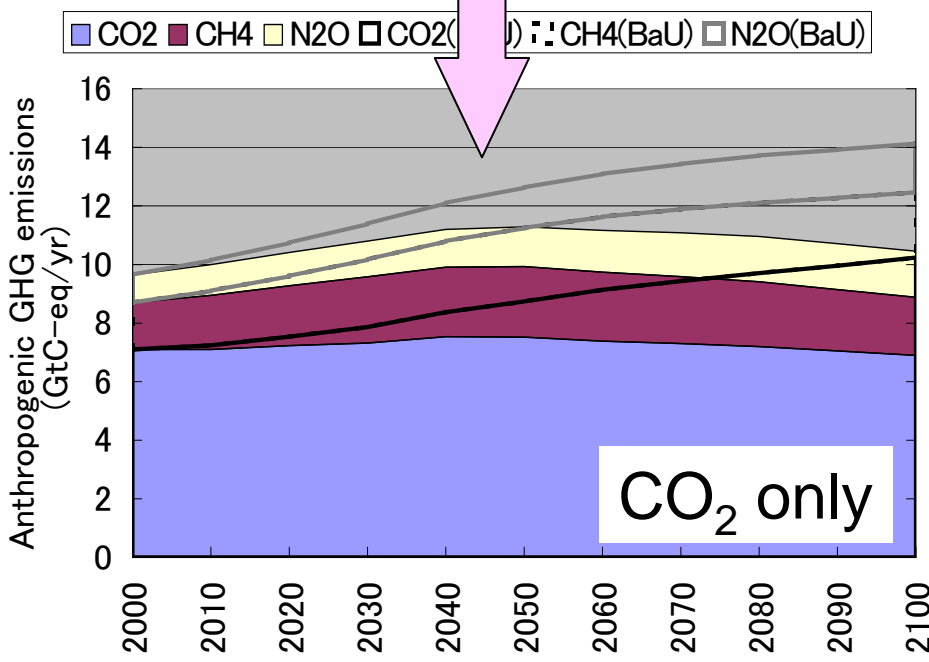
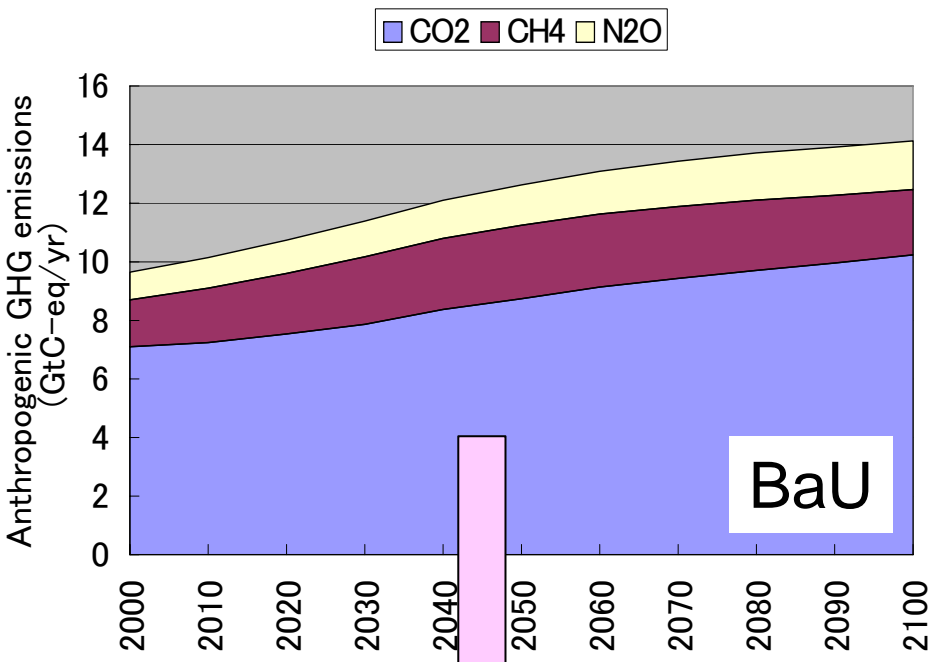
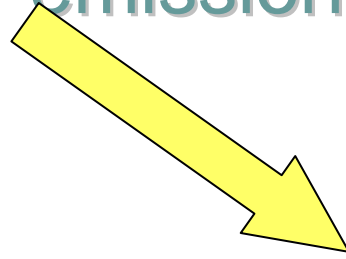


Temperature raise constraint and dynamic recursive model

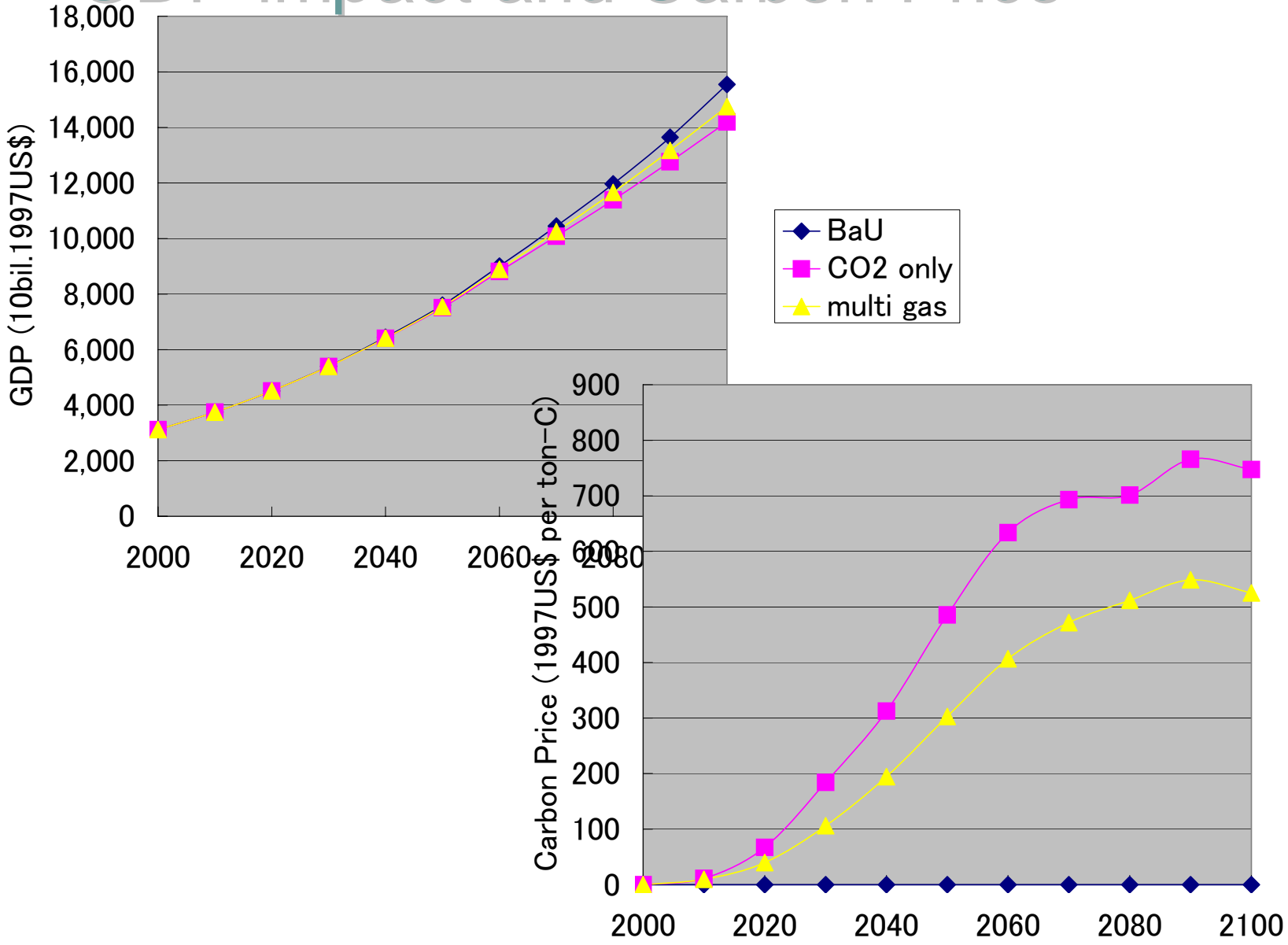




Anthropogenic GHG emissions



GDP impact and Carbon Price

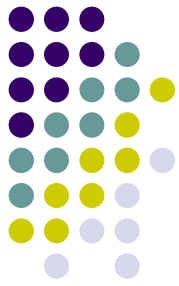




Impact of Japan/Korea FTA

- Simulation cases
 - BaU case: the present condition case
 - FTA case: no tariff between Japan and Korea
- FTA
 - abolition of tariff (considered)
 - overseas investment (not considered)

Region



	code	description
1	JPN	Japan
2	KOR	Korea - Republic of
3	CHN	China
4	AS7	ASEAN7
5	IND	India
6	ANZ	Australia+New Zealand
7	CAN	Canada
8	USA	United States
9	WEU	Western Europe
10	REF	Economic Reform
11	ROW	Rest of the World

Sector

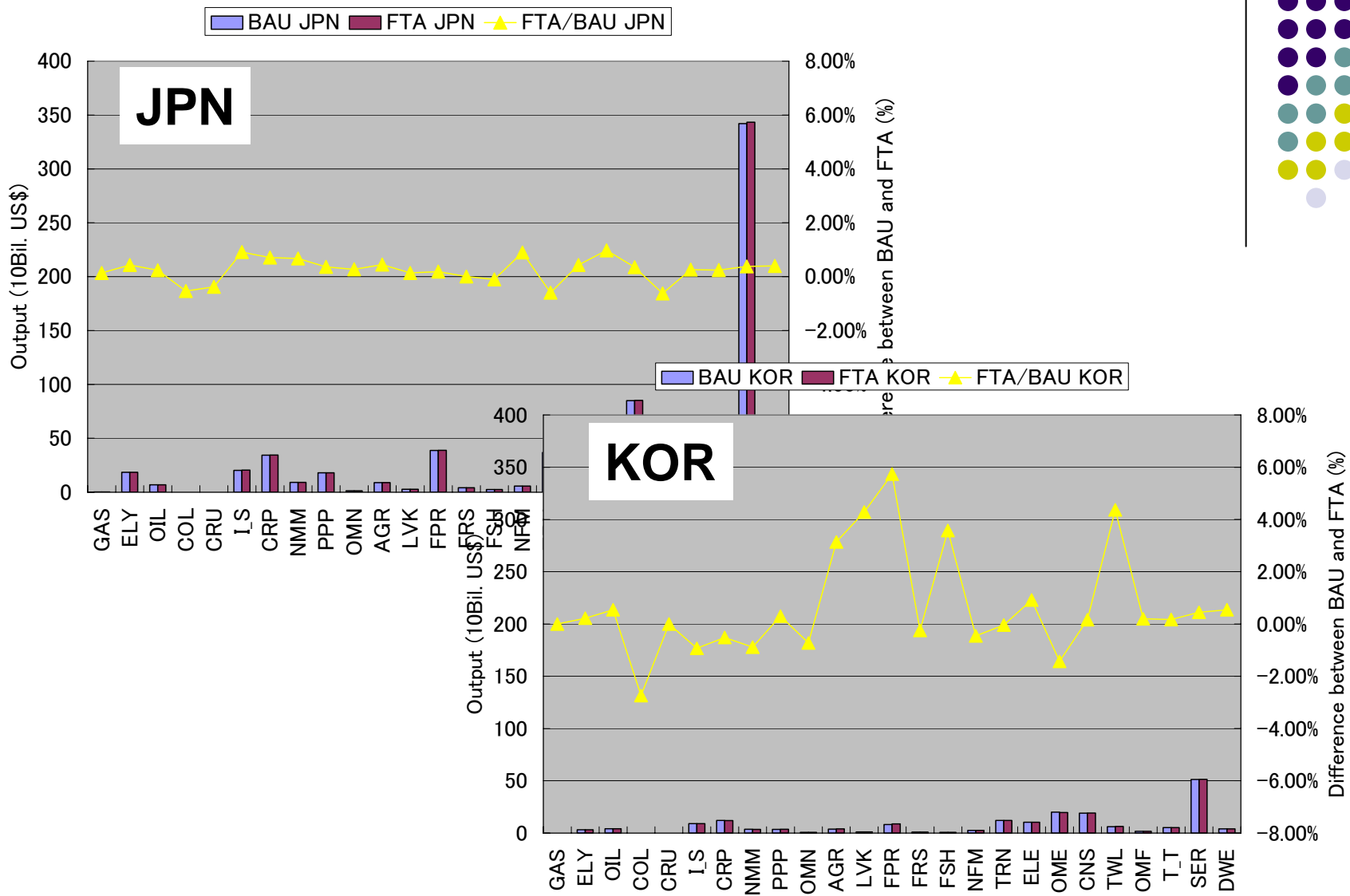


	code	Description		code	description
1	GAS	Natural gas	14	PPP	Paper-pulp-print
2	ELY	Electricity	15	OMN	Mining
3	OIL	Refined oil products	16	NFM	Non-ferrous metals
4	COL	Coal	17	TRN	Transport equipment
5	CRU	Crude oil	18	ELE	Electronic equipment
6	AGR	Agriculture	19	OME	Other machinery
7	LVK	Livestock	20	CNS	Construction
8	FPR	Food products	21	TWL	Textiles-wearing apparel-leather
9	FRS	Forestry	22	OMF	Other manufacturing
10	FSH	Fishing	23	T_T	Transport
11	I_S	Iron and steel industry	24	SER	Commercial and public services
12	CRP	Chemical industry	25	DWE	Dwellings
13	NMM	Mineral products	26	CGD	Capital goods demand

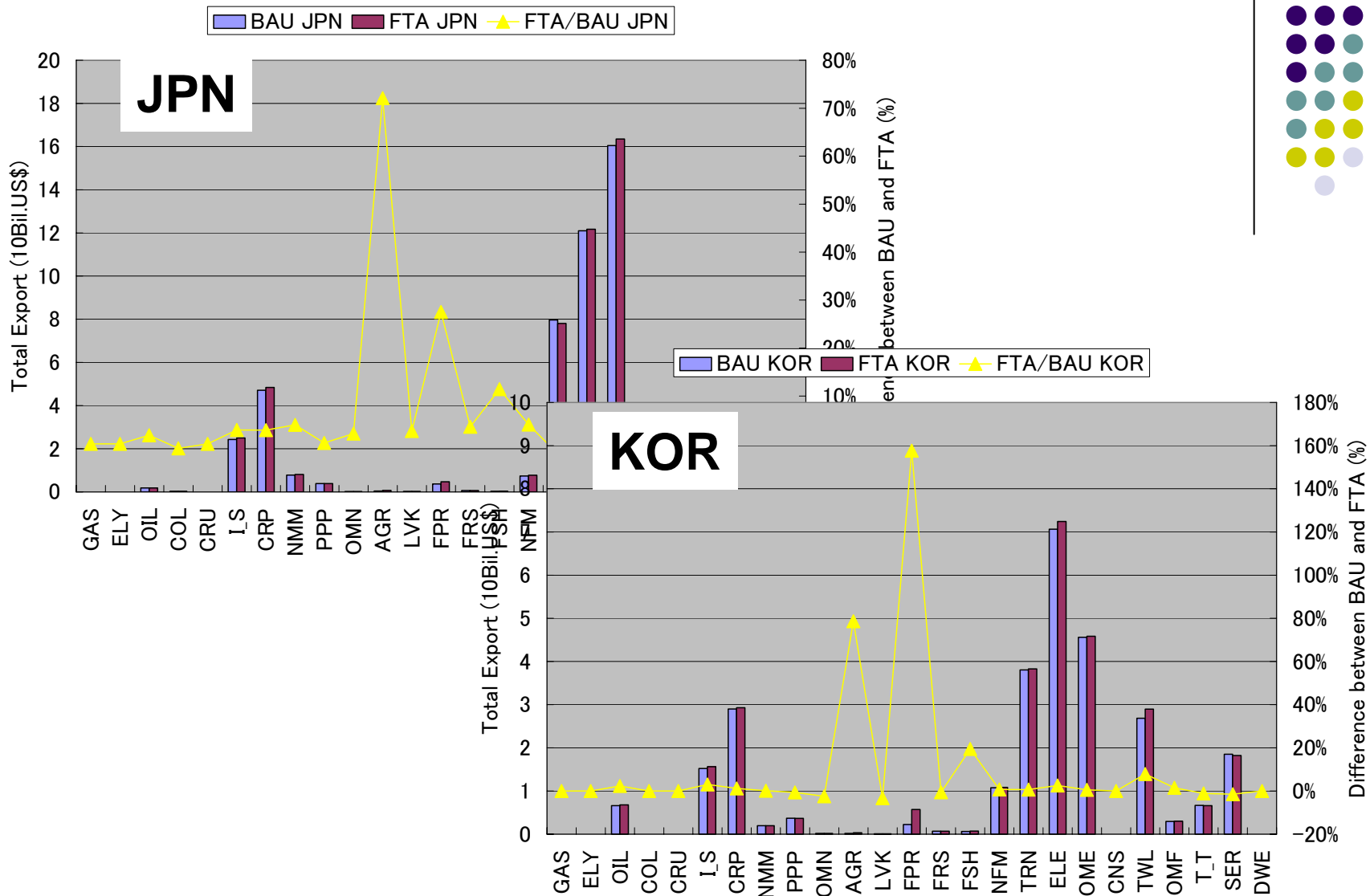


Output, Export, Tariff rate by sector of Japan and Korea in 1997(10bil.US\$)

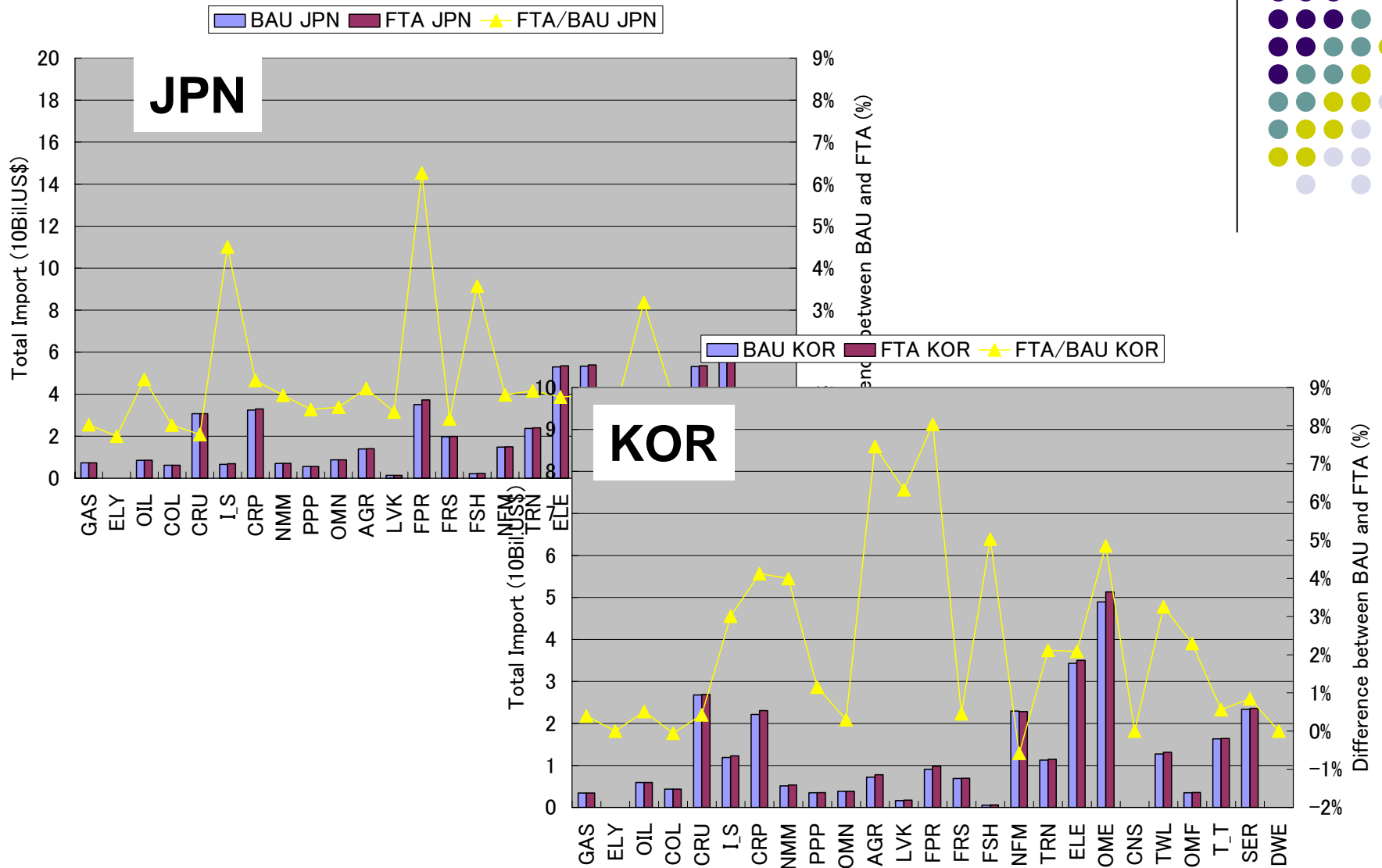
	Output (10Bil\$)		Export (10Bil\$)		Tariff (%)	
	JPN	KOR	jpn->kor	kor->jpn	jpn->kor	kor->jpn
GAS	0.09	0.00				
ELY	16.79	1.79				
OIL	5.98	2.24	0.01	0.14	7.0%	3.0%
COL	0.02	0.01	0.00		7.0%	3.0%
CRU	0.01	0.00				
I_S	17.16	4.01	0.22	0.14		
CRP	30.65	6.37	0.39	0.13	8.0%	3.0%
NMM	8.12	1.74	0.09	0.03	7.0%	1.0%
PPP	15.87	2.06	0.02	0.01	6.0%	2.0%
OMN	1.20	0.33	0.00	0.00	3.0%	
AGR	7.14	2.22	0.00	0.01	74.4%	38.0%
LVK	2.22	0.67	0.00	0.00	10.2%	5.0%
FPR	33.40	5.08	0.02	0.12	44.5%	41.8%
FRS	3.95	0.48	0.00	0.01	7.8%	1.1%
FSH	1.85	0.42	0.00	0.03	12.0%	7.0%
NFM	5.06	1.07	0.06	0.05	7.0%	1.0%
TRN	35.69	5.85	0.07	0.01	7.2%	
ELE	42.24	5.48	0.52	0.33	8.0%	
OME	46.11	9.38	1.07	0.20	8.0%	0.2%
CNS	74.08	8.79				
TWL	10.49	4.11	0.06	0.16	7.9%	11.3%
OMF	9.97	1.00	0.03	0.03	7.0%	3.0%
T_T	40.80	3.08	0.10	0.05		
SER	295.84	29.48	0.04	0.05	0.2%	
DWE	47.68	2.43				
Total	752.40	98.07	2.71	1.51	7.2%	5.7%



Output in 2010 (10Bil\$)



Export between JPN/KOR in 2010 (10Bil\$)



Import between JPN/KOR in 2010 (10Bil\$)



Country CGE model and Global CGE model

