

# **An Economy-wide Analysis of Policy Responses of Taiwan to Stabilize CO<sub>2</sub> Emissions**

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# Introduction

- The CO<sub>2</sub> emission target and several mitigation policy responses, including energy efficiency improvement, energy substitution, and economic instruments, have been proposed jointly by the Taiwan Environmental Protection Agency and the Taiwan Energy Commission although Kyoto Protocol doesn't list the mitigation target for developing or non-annex B countries (including Taiwan).

# Introduction

- Following the international mitigation tendency and Taiwan's own economy development plan, one of the main conclusions of **1998 National Energy Conference** is to set a mitigation target that Taiwan's CO<sub>2</sub> emission will be reduced to below or above her year 2000 level for the commitment year, 2020.

# Introduction

- Another major conclusion is to improve Taiwan's CO<sub>2</sub> baseline forecasting using both **top-down and bottom-up approaches**.
- The baseline (or reference case) provides projections of growth in carbon dioxide emission in the absence of any policy measures. The results of policy simulations are then interpreted as deviations from the baseline.

# TAIGEM-E

(TAIwan General Equilibrium Model – Energy)

- Computable General Equilibrium (CGE)  
Model derived from ORANI, MONASH. multi-input, multi-output production specification
- 170 industries, 182 commodities, 6 occupation
- annually recursive dynamic CGE model
- Mega Model Solving Capacity (Johansen approach)
- Imperfect Competition

# TAIGEM-E

(TAIwan General Equilibrium Model – Energy)

- Connected with other Global CGE Model, e.g., GTAP-E
- **technology bundle** : 12 known technologies are used to generate electricity, namely hydro stream turbine-oil, stream turbine-coal, stream turbine-gas, combined cycle-oil, combined cycle-gas, gas turbine-oil, gas turbine-gas, diesel, renewables, and nuclear.

Top-down + Bottom-up

- Flexibility of Model Design

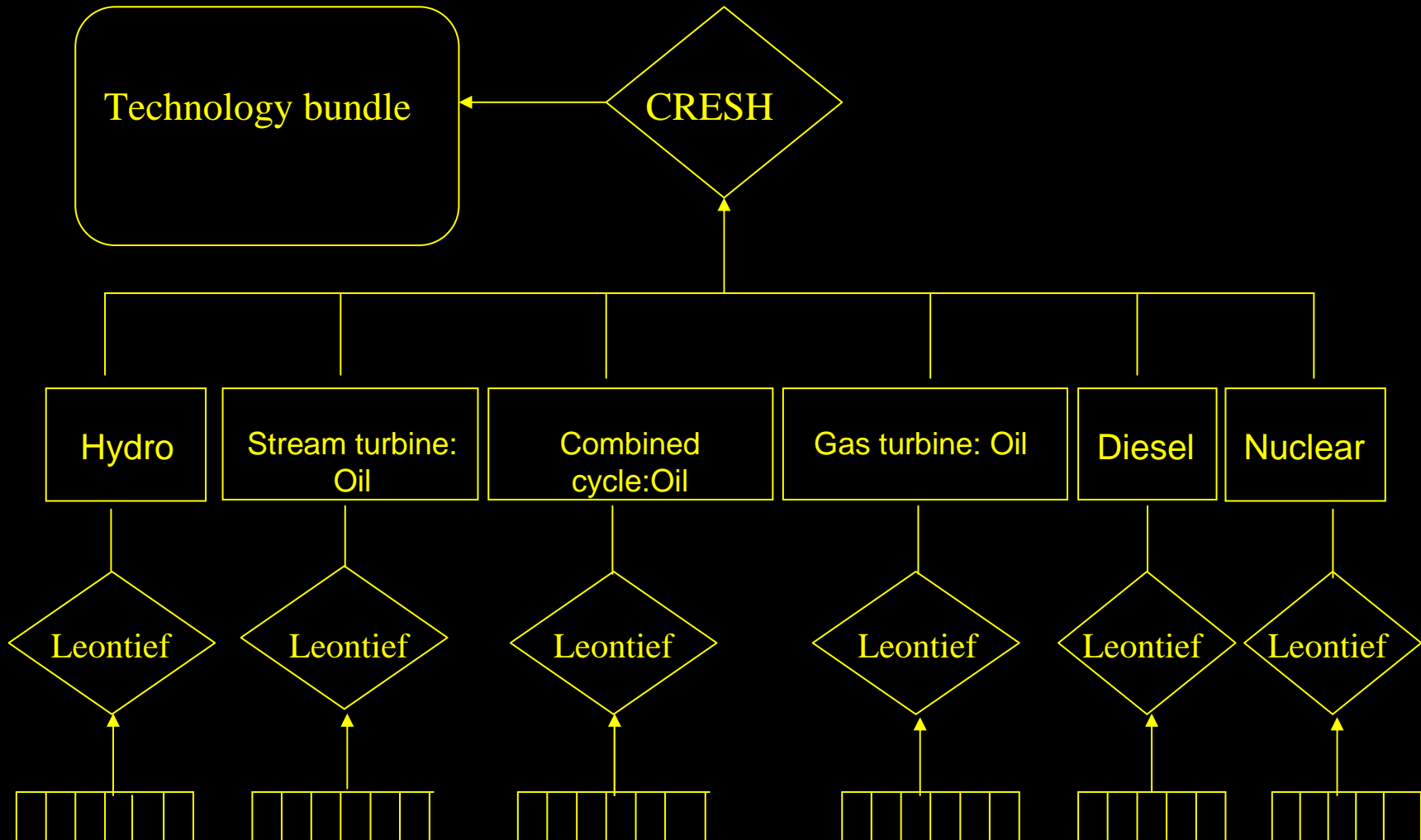
# Dynamic Mechanism of TAIGEM-E

- ✦ TAIGEM-E involves an annual recursive, endogenous investment dynamic mechanism
- ✦ Physical capital accumulation, investment distribution between industries, adjustment of real wage
- ✦ Functions of TAIGEM-E
  - ❖ Historical Simulation (*ex post* analysis)
  - ❖ Decomposition Simulation (*ex post* analysis)
  - ❖ Baseline Forecasting (*ex ante* analysis)
  - ❖ Policy Simulation (*ex ante* analysis)

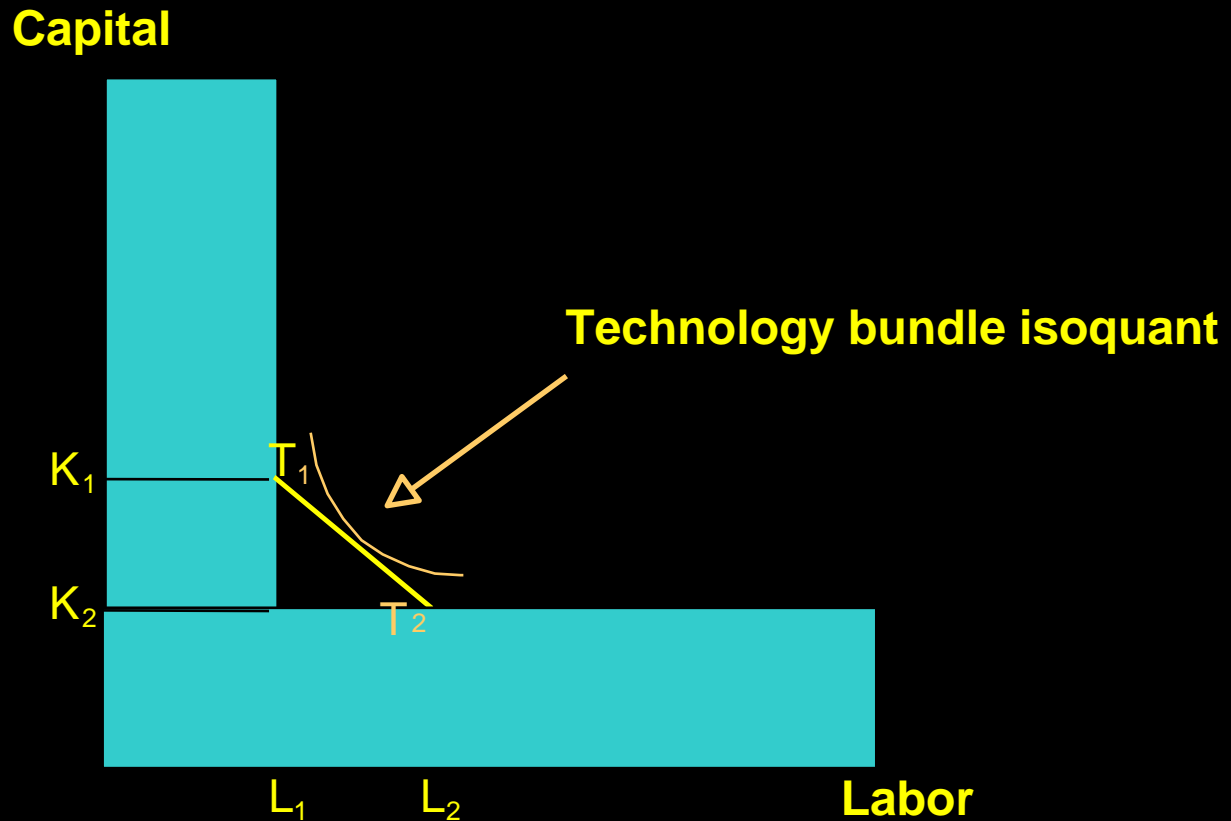




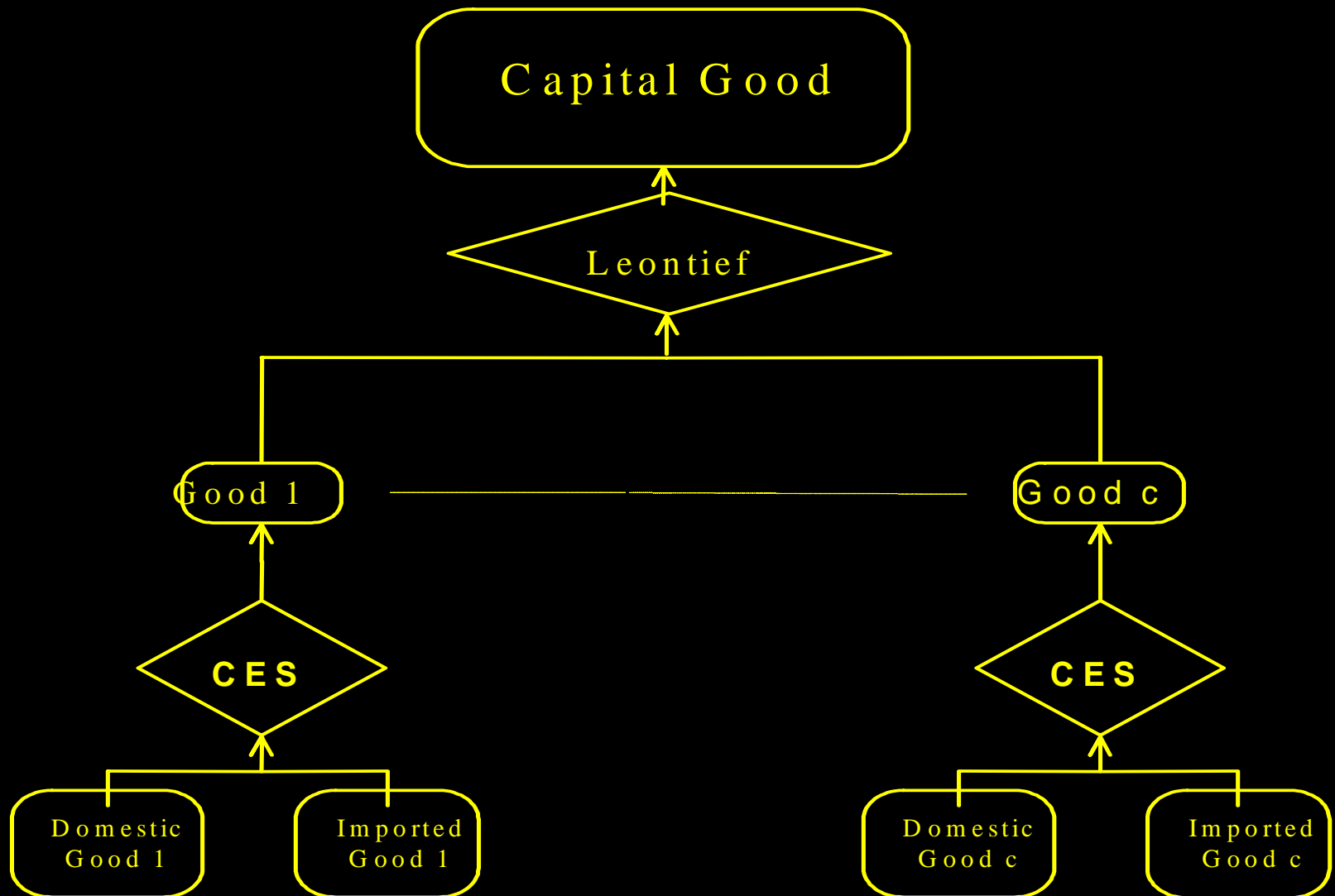
# Technology Bundle of TAIGEM-E Model: Electricity Sector



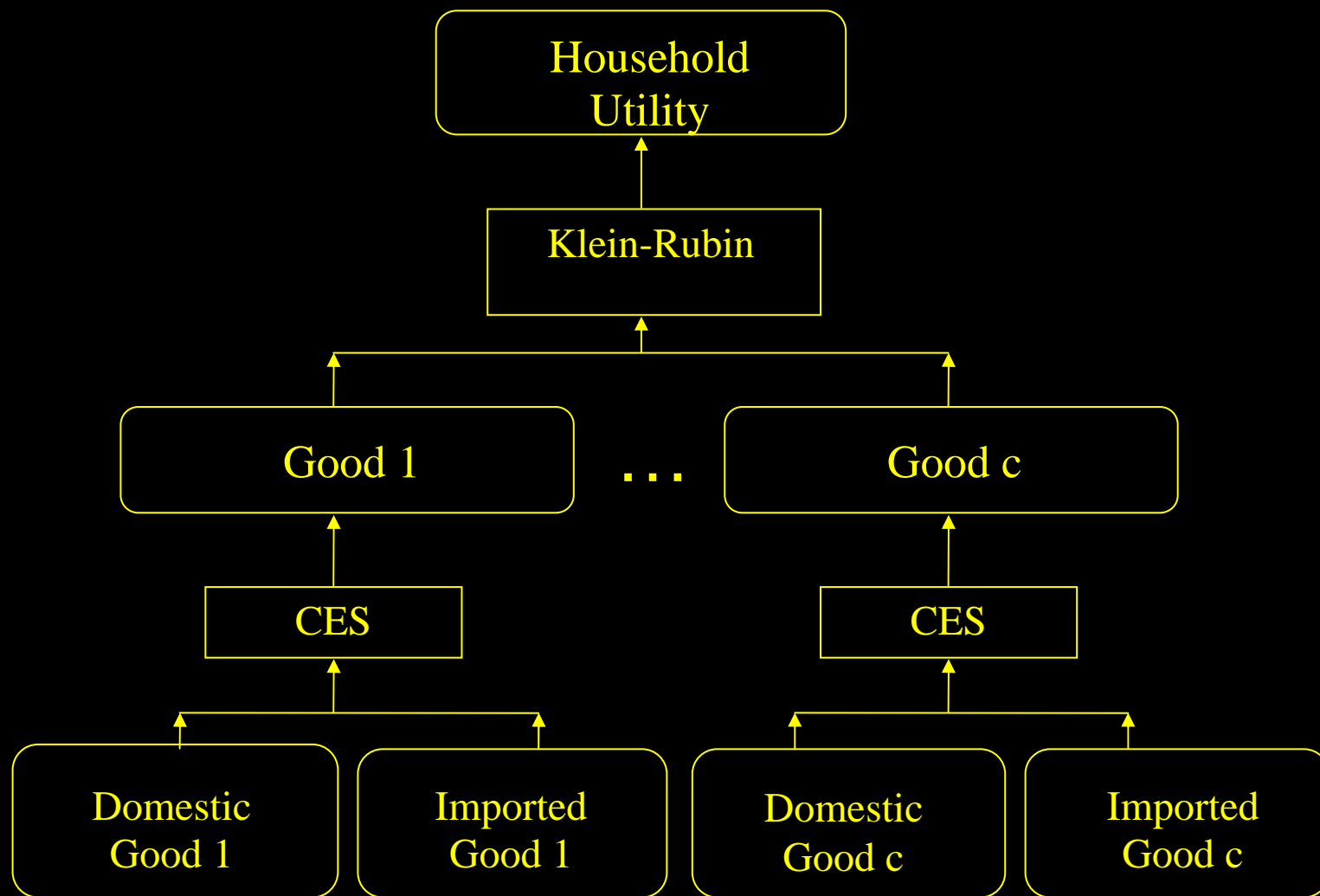
# Technology bundle isoquant of TAIGEM-E



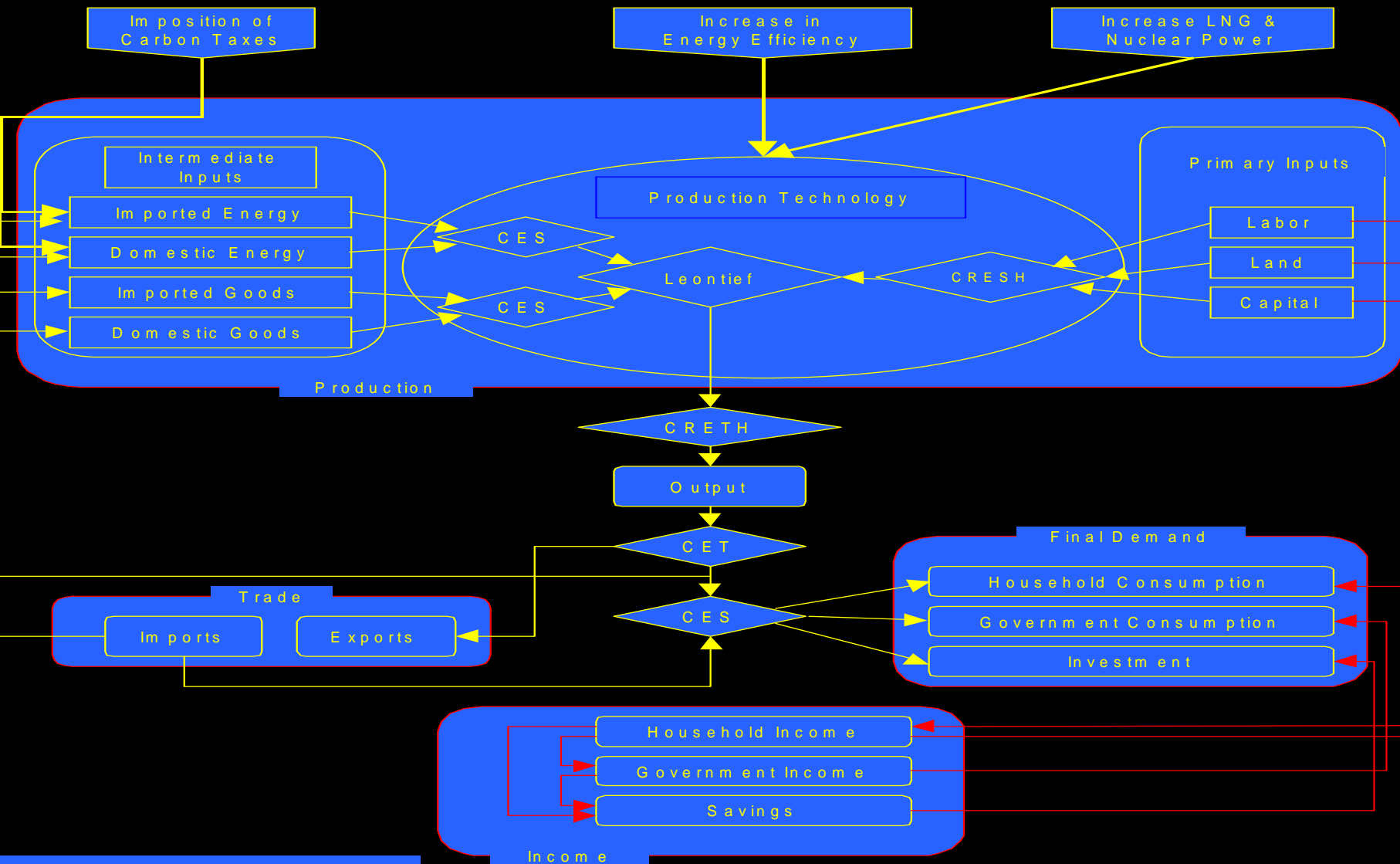
# Nested Structure of Investment Demand



# Nested Structure of Consumer Demand



# Model Structure of TAIGEM-E



Note: real flow  
 money flow

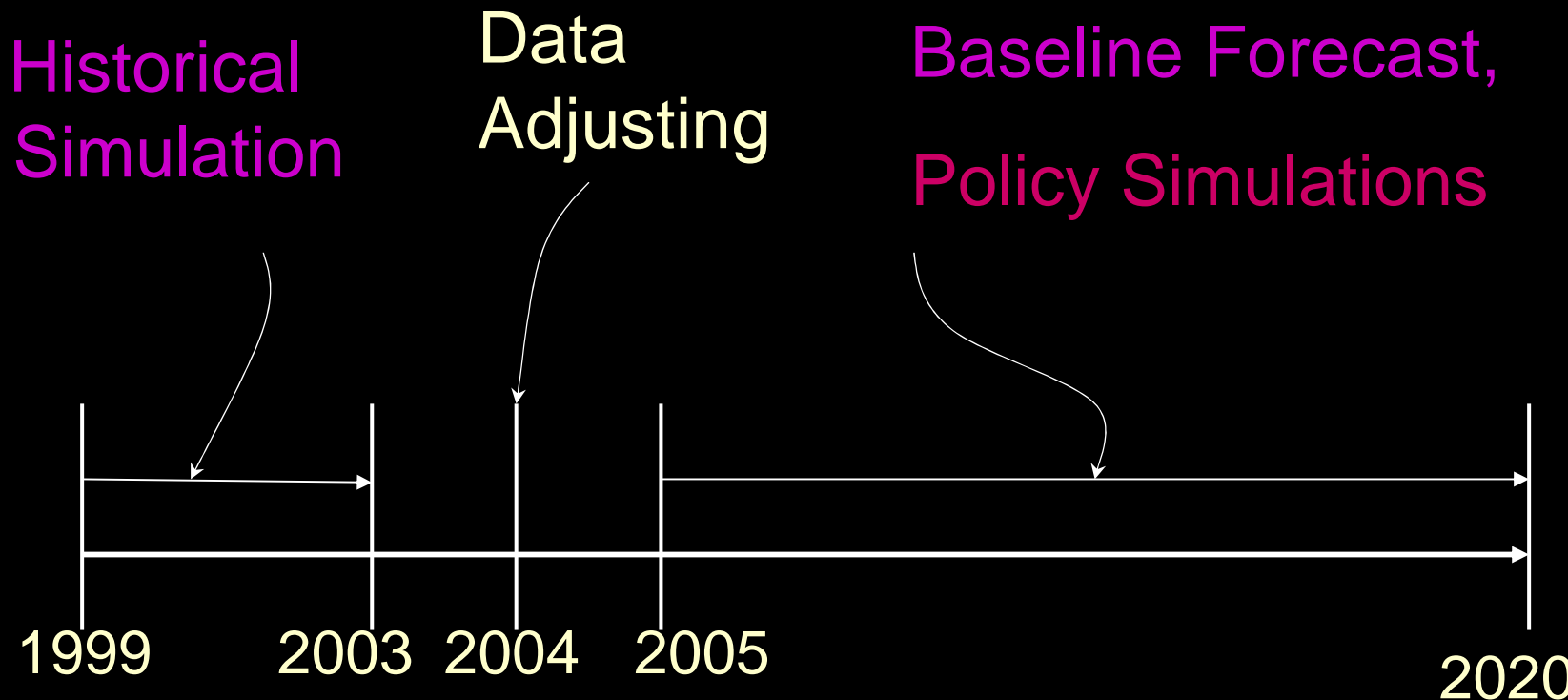
# TAIGEM-E Input-Output Database

		Absorption Matrix					
		1	2	3	4	5	6
		Producers	Investors	Household	Export	Other	Inventor
	Size	I	I	1	1	1	1
Basic Flows	CxS	V1BAS	V2BAS	V3BAS	V4BAS	V5BAS	V6BAS
Margins	CxSxM	V1MAR	V2MAR	V3MAR	V4MAR	V5MAR	n/a
Taxes	CxS	V1TAX	V2TAX	V3TAX	V4TAX	V5TAX	n/a
Labour	N	V1LAB	C = Commodities I = Industries S = 1 Domestic; S = 2 Imported N = Occupation M = Commodities used as margins				
Capital	1	V1CAP					
Land	1	V1LND					
Other Costs	1	V1OCT					

	Joint Production
Size	I
C	MAKE

	Import Duty
Size	1
C	V0TAR

# Simulation Closure of TAIGEM-E



# Simulation Scenarios

- **1, *Baseline*** : 2000-2020.
- **2, *Simulation I*** : the energy usage intensity declining rate is increased in each sector by 2.4% per year over the period 2006-2020.
- **3, *Simulation II*** : from 2011-2020, Carbon Tax is used to bring CO<sub>2</sub> emission level down to the level at 2000.



# Exogenous Shocks for Forecasting CO2 Emissions Baseline From 2000 to 2020

Macroeconomic variables growth rate (%)	2000	2001	2002	2003	2004~2020
Energy-saving decline rate	-0.60	-0.60	-0.60	-0.60	-1.2
Imports	4.54	-13.51	5.71	6.72	endog.
Household consumption	4.84	1.00	2.07	0.84	endog.
Export	18.14	-8.08	10.48	10.94	endog.
Investment	8.38	-21.14	-1.61	-2.05	endog.
Government expenditure	0.28	-0.55	1.47	0.71	endog.
Household <sup>(1)</sup>	2.28	1.80	1.80	1.76	2
Employment Trend	1.20	0.49	1.13	1.07	1.
Aggregate price index	-1.80	0.51	-0.89	-2.21	endog.
Exchange rate	-5.15	6.00	-1.29	0.49	endog.
Imports price index (c.i.f)	-4.62	1.34	-1.25	2.98	endog.
Exports price index	0.87	0.77	0.32	-0.87	endog.
Primary factors productivity	endog.	endog.	endog.	endog.	-2.5
Consumer price index	endog.	endog.	endog.	endog.	2

# The Baseline Scenario Assumptions

## Variables

## TAIGEM-E Baseline Scenario Assumptions

### Macroeconomy

GDP growth rate

GDP growth rates can be either endogenous or exogenous variables

Household

Exogenously set at annual growth rate 2%

CPI

Annual growth rate is set at 2%

Industrial structure

Endogenously determined

Labor (primary factor) demand

Labor is a CES (Constant Elasticity of Substitution) aggregation of the different types of labor force.

## Variables

## TAIGEM<sup>©</sup>-E Baseline Scenario Assumptions

International energy price

Source:

Imported oil: EIA/USDOE,  
International Energy Outlook 2003

Imported stream coal and LNG:  
IEA/OECD, World Energy Outlook  
2003

Imported coking coal and uranium:  
International Energy Outlook 2003

The energy structure

Endogenously determined

Hydro electricity

Exogenous, annual growth rate is 1.8%.

Technology bundle

By CRESH function assumption, the  
substitution elasticity of hydro is 0.1,  
nuclear power is 1.0, coal is 0.1, oil is  
0.5, and LNG is 1.5.

Adjusting industrial structure

Enhancement of energy  
efficiency

Endogenous, and set the annual energy-  
saving declining rate to be 1.2%.

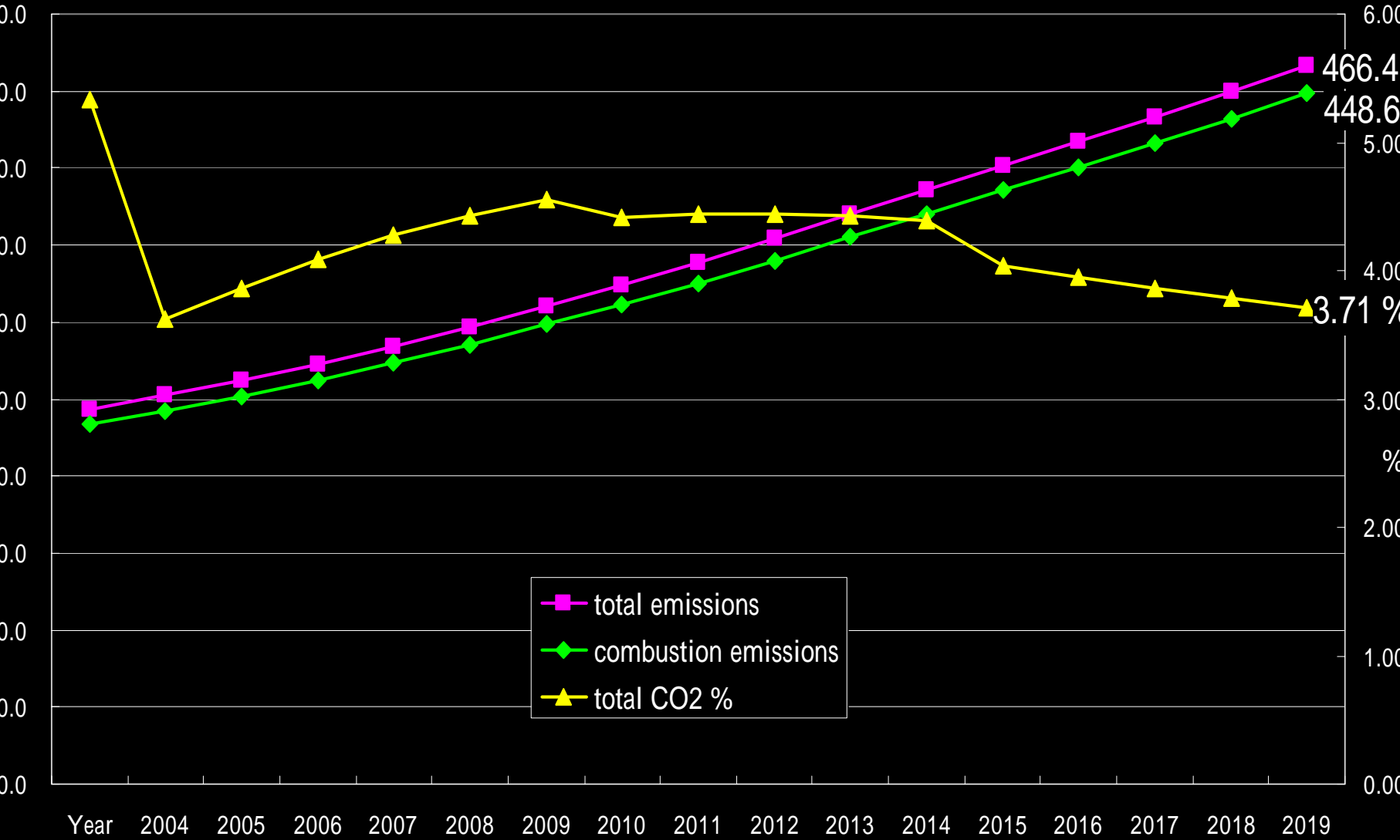
# Selected Results from Baseline Forecasting

# Forecasting CO2 Emissions Baseline with TAIGEM-E Model

Unit : million tons CO2	Total CO2 Emissions	Combustion Emissions	Total CO2 %
2004	243.5	234.1	5.33
2005	252.4	242.6	3.62
2006	262.1	251.9	3.86
2007	272.9	262.2	4.09
2008	284.5	273.4	4.27
2009	297.1	285.5	4.43
2010	310.7	298.5	4.56
2011	324.4	311.6	4.41
2012	338.8	325.4	4.44
2013	353.9	339.9	4.44
2014	369.5	354.9	4.42
2015	385.7	370.5	4.38
2016	401.3	385.5	4.04
2017	417.2	400.8	3.95
2018	433.3	416.5	3.87
2019	449.7	432.4	3.79
2020	466.4	448.6	3.71
<b>2004-2010</b>	<b>274.8</b>	<b>264.0</b>	<b>4.31</b>
<b>2011-2015</b>	<b>354.5</b>	<b>340.4</b>	<b>4.42</b>
<b>2016-2020</b>	<b>433.6</b>	<b>416.8</b>	<b>3.87</b>

# Baseline Forecasting CO2 Emissions

unit : million tons CO2, %

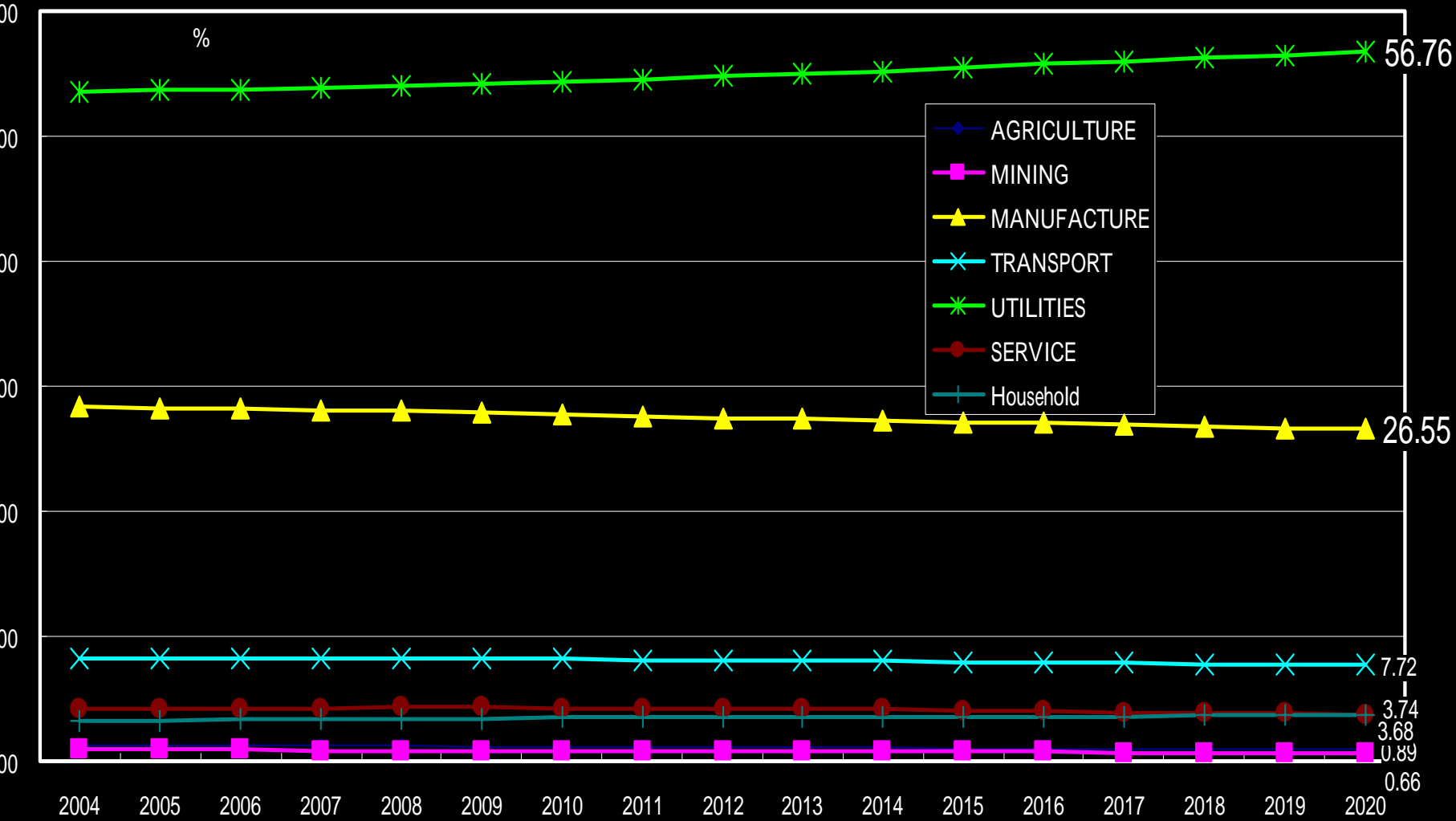


# Sectoral Structure of CO2 Emissions

	AGRICUL- TURE	MINING	MANUFA- CTURE	TRANSPO RTATION	UTILITIES	SERVICE	Household	TC	unit
	1.33	0.92	28.33	8.30	53.62	4.26	3.24		
	1.31	0.91	28.29	8.28	53.66	4.26	3.29		
	1.29	0.90	28.22	8.26	53.72	4.27	3.34		
	1.26	0.88	28.12	8.24	53.84	4.27	3.39		
	1.24	0.86	28.00	8.21	53.98	4.28	3.43		
	1.21	0.85	27.87	8.19	54.15	4.27	3.47		
	1.18	0.83	27.74	8.16	54.33	4.27	3.50		
	1.14	0.81	27.61	8.12	54.57	4.24	3.51		
	1.11	0.80	27.49	8.08	54.80	4.21	3.52		
	1.08	0.78	27.38	8.04	55.02	4.17	3.54		
	1.05	0.76	27.26	8.00	55.24	4.12	3.56		
	1.02	0.74	27.15	7.95	55.46	4.07	3.60		
	0.99	0.73	27.03	7.90	55.73	4.01	3.61		
	0.97	0.71	26.92	7.85	55.98	3.94	3.63		
	0.94	0.70	26.80	7.80	56.24	3.88	3.65		
	0.92	0.68	26.67	7.76	56.50	3.81	3.66		
	0.89	0.66	26.55	7.72	56.76	3.74	3.68		
2010	1.26	0.88	28.08	8.23	53.90	4.27	3.38		
2015	1.08	0.78	27.38	8.04	55.02	4.16	3.54		
2020	0.94	0.70	26.79	7.81	56.24	3.88	3.65		
2020	1.11	0.80	27.50	8.05	54.92	4.12	3.51		

# Sectoral Structure of CO2 Emissions

unit : %



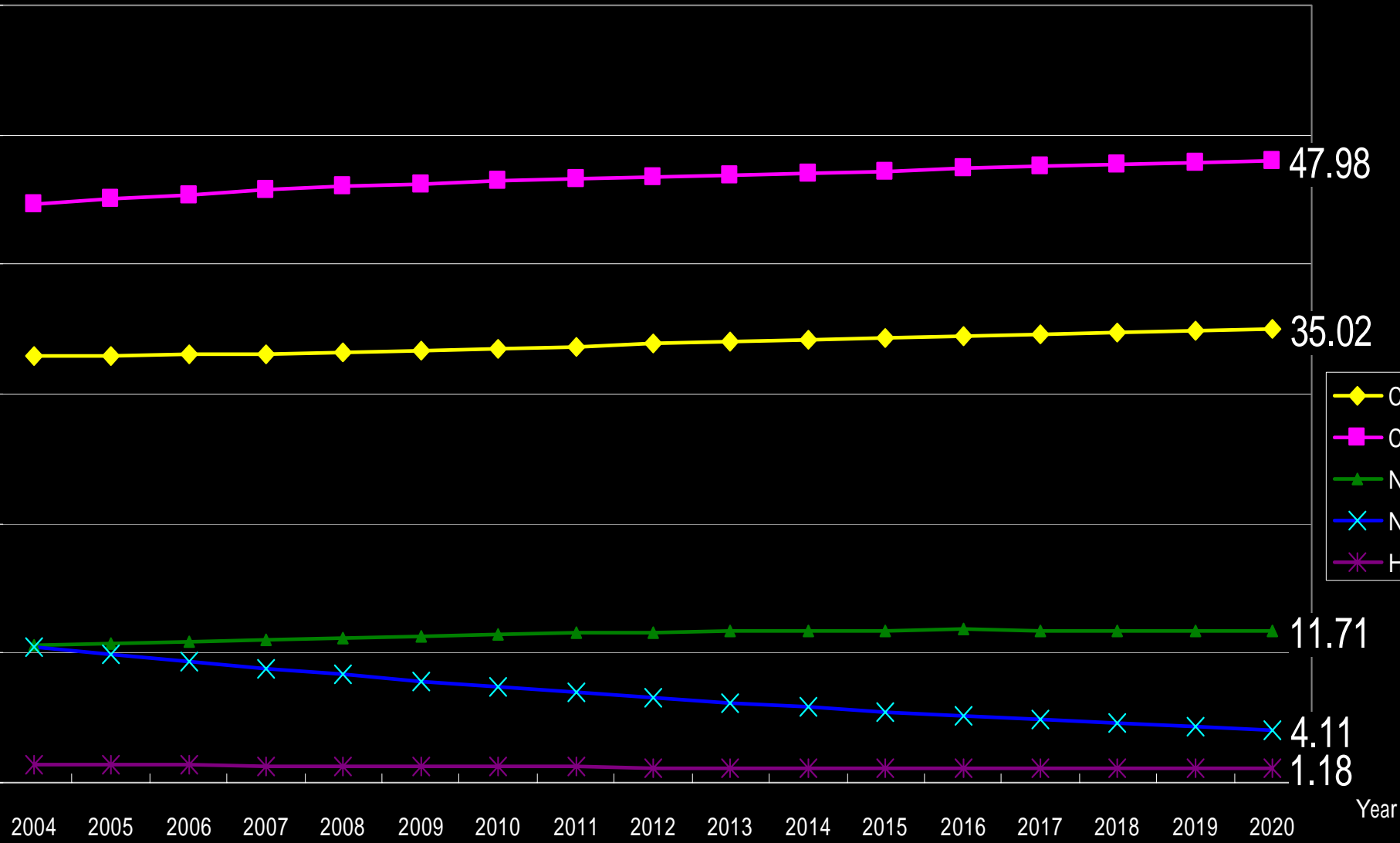


# Energy Structure Projections

	Coal	CrudeOil	NaturalGas	NuclearEle	HydroElect	unit
						TOTAL
2004	32.88	44.68	10.54	10.46	1.44	100
2005	32.96	45.06	10.72	9.86	1.39	100
2006	33.02	45.41	10.87	9.34	1.36	100
2007	33.13	45.71	10.99	8.85	1.32	100
2008	33.23	45.99	11.13	8.36	1.29	100
2009	33.37	46.23	11.27	7.88	1.25	100
2010	33.52	46.43	11.40	7.42	1.22	100
2011	33.67	46.62	11.53	6.98	1.20	100
2012	33.88	46.75	11.61	6.58	1.18	100
2013	34.07	46.89	11.68	6.20	1.17	100
2014	34.23	47.04	11.74	5.83	1.16	100
2015	34.38	47.21	11.78	5.49	1.15	100
2016	34.49	47.40	11.80	5.16	1.15	100
2017	34.65	47.54	11.79	4.87	1.15	100
2018	34.79	47.69	11.76	4.60	1.16	100
2019	34.91	47.84	11.74	4.34	1.17	100
2020	35.02	47.98	11.71	4.11	1.18	100
04-2010	33.16	45.64	10.99	8.88	1.32	100
1-2015	34.05	46.90	11.67	6.22	1.17	100
6-2020	34.77	47.69	11.76	4.62	1.16	100

# Energy Structure Projections

unit : %

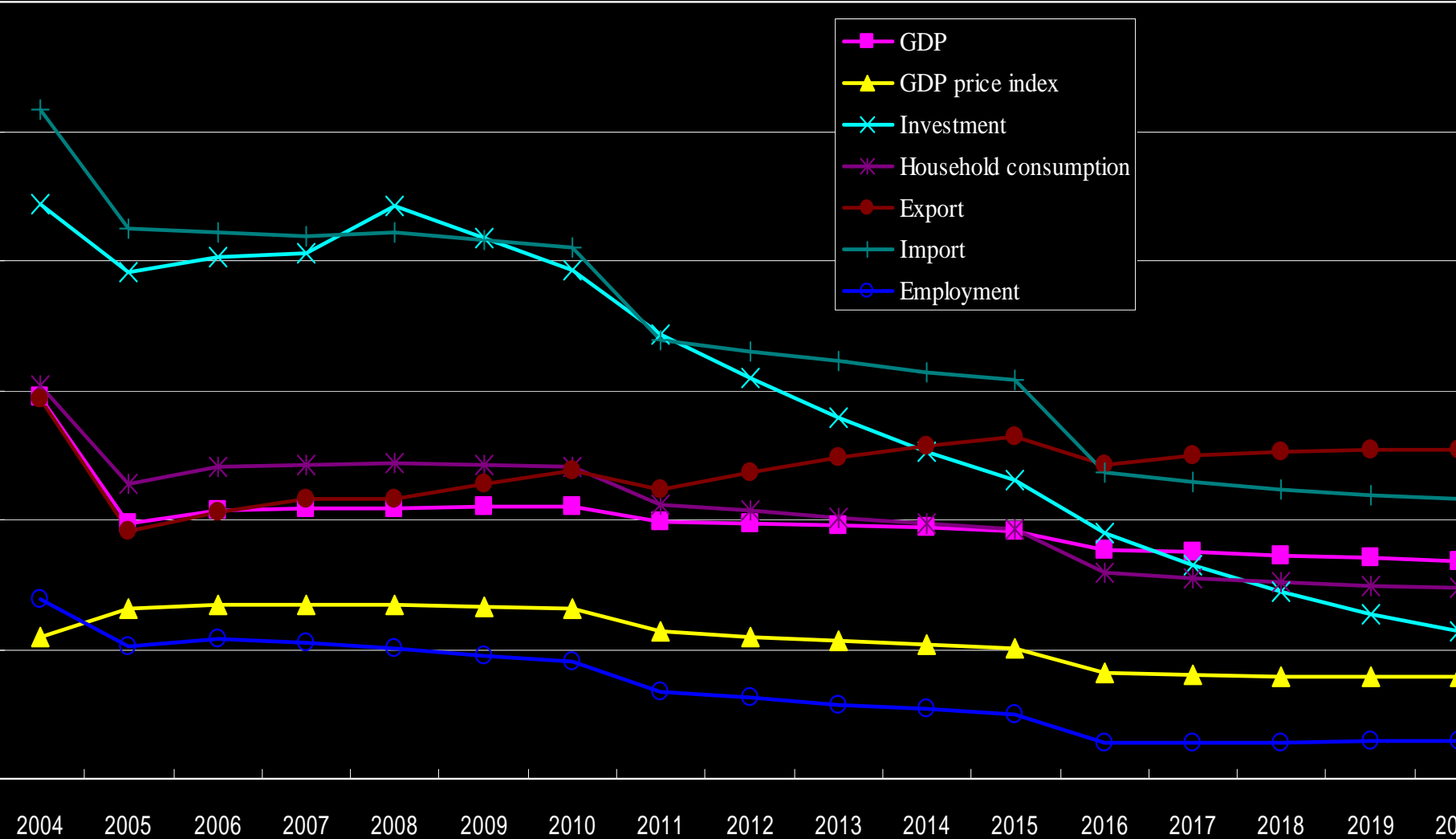


# Macro-economic Results of Baseline Forecasting

Year	GDP	GDP price index	Investment	Household consumption	Export	Import	unit Employment
2004	5.88	2.18	8.87	6.06	5.86	10.35	2.7
2005	3.93	2.63	7.82	4.56	3.82	8.50	2.0
2006	4.13	2.67	8.06	4.81	4.12	8.45	2.1
2007	4.18	2.68	8.13	4.85	4.32	8.38	2.0
2008	4.19	2.68	8.86	4.87	4.31	8.44	2.0
2009	4.20	2.66	8.36	4.86	4.55	8.32	1.9
2010	4.19	2.64	7.85	4.83	4.77	8.20	1.8
2011	3.97	2.27	6.87	4.23	4.46	6.79	1.3
2012	3.94	2.20	6.18	4.14	4.73	6.61	1.2
2013	3.91	2.13	5.58	4.04	4.95	6.44	1.1
2014	3.87	2.07	5.06	3.94	5.14	6.29	1.0
2015	3.83	2.02	4.62	3.85	5.28	6.15	1.0
2016	3.54	1.64	3.81	3.18	4.85	4.73	0.5
2017	3.50	1.60	3.30	3.10	4.98	4.59	0.5
2018	3.46	1.58	2.88	3.04	5.06	4.48	0.5
2019	3.41	1.58	2.55	2.99	5.09	4.39	0.5
2020	3.37	1.58	2.28	2.96	5.09	4.32	0.5
<b>2010</b>	<b>4.39</b>	<b>2.59</b>	<b>8.28</b>	<b>4.98</b>	<b>4.53</b>	<b>8.66</b>	<b>2.1</b>
<b>2015</b>	<b>3.90</b>	<b>2.14</b>	<b>5.66</b>	<b>4.04</b>	<b>4.91</b>	<b>6.45</b>	<b>1.1</b>
<b>2020</b>	<b>3.46</b>	<b>1.60</b>	<b>2.96</b>	<b>3.05</b>	<b>5.02</b>	<b>4.50</b>	<b>0.5</b>

# Macro-economic Results of Baseline Forecasting

unit : %



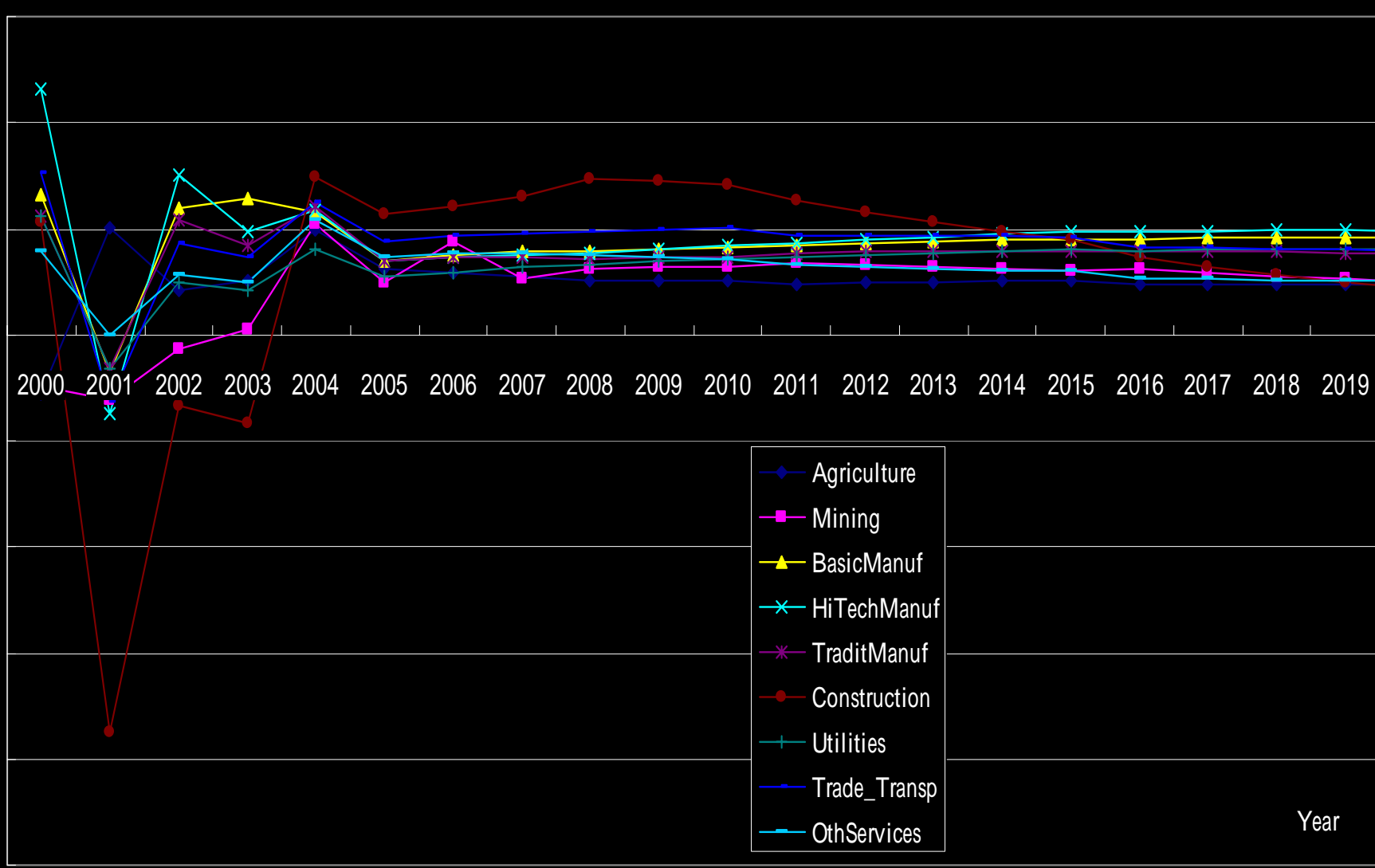
# Microeconomic Results of Baseline Projection – Growth Rate of Industry

	Agriculture	Mining	Basic-Manuf	HiTech-Manuf	Traditional-Manuf	Construction	Utilities	Trade_Transport	Construction
04	4.99	5.26	5.76	5.91	6.02	7.44	4.05	6.24	5.00
05	3.09	2.51	3.52	3.49	3.49	5.67	2.72	4.43	3.00
06	2.89	4.36	3.77	3.68	3.63	6.08	2.96	4.66	3.00
07	2.75	2.70	3.94	3.80	3.64	6.49	3.17	4.79	3.00
08	2.60	3.13	3.93	3.85	3.58	7.38	3.31	4.89	3.00
09	2.56	3.21	4.04	4.03	3.63	7.26	3.45	4.97	3.00
10	2.55	3.21	4.12	4.20	3.69	7.04	3.59	5.02	3.00
11	2.40	3.42	4.18	4.31	3.82	6.33	3.63	4.69	3.00
12	2.44	3.33	4.29	4.49	3.90	5.82	3.72	4.69	3.00
13	2.48	3.23	4.38	4.63	3.94	5.33	3.82	4.68	3.00
14	2.51	3.11	4.45	4.74	3.97	4.88	3.92	4.65	3.00
15	2.54	2.98	4.51	4.82	3.98	4.47	4.01	4.62	2.00
16	2.39	3.10	4.52	4.83	3.96	3.70	3.98	4.16	2.00
17	2.41	2.94	4.58	4.90	3.95	3.21	4.01	4.12	2.00
18	2.41	2.78	4.60	4.93	3.91	2.80	4.03	4.07	2.00
19	2.41	2.63	4.61	4.93	3.87	2.46	4.04	4.02	2.00
20	2.39	2.50	4.59	4.91	3.82	2.19	4.04	3.98	2.00
2010	3.06	3.48	4.16	4.14	3.95	6.77	3.32	5.00	4.00
2015	2.48	3.21	4.36	4.60	3.92	5.37	3.82	4.67	3.00
2020	2.40	2.79	4.58	4.90	3.90	2.87	4.02	4.07	2.00
2020	2.69	3.20	4.34	4.50	3.93	5.21	3.67	4.63	3.00

unit

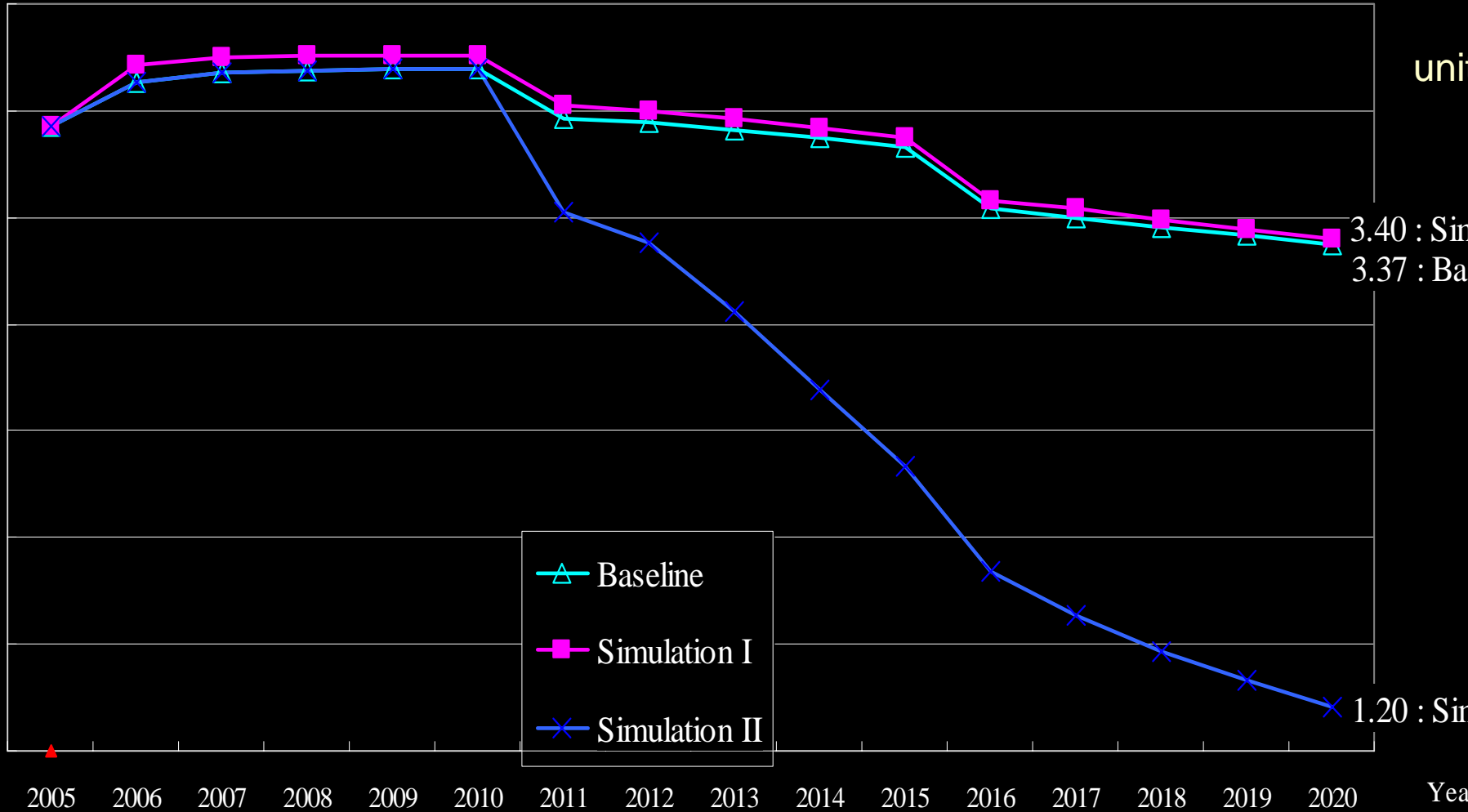
# Microeconomic Results of Baseline Projection – Growth Rate of Industry

unit : %



**Selected Result Comparison of  
Baseline Forecasting  
and Policy Simulations**

# Impacts on Taiwan's GDP growth rate





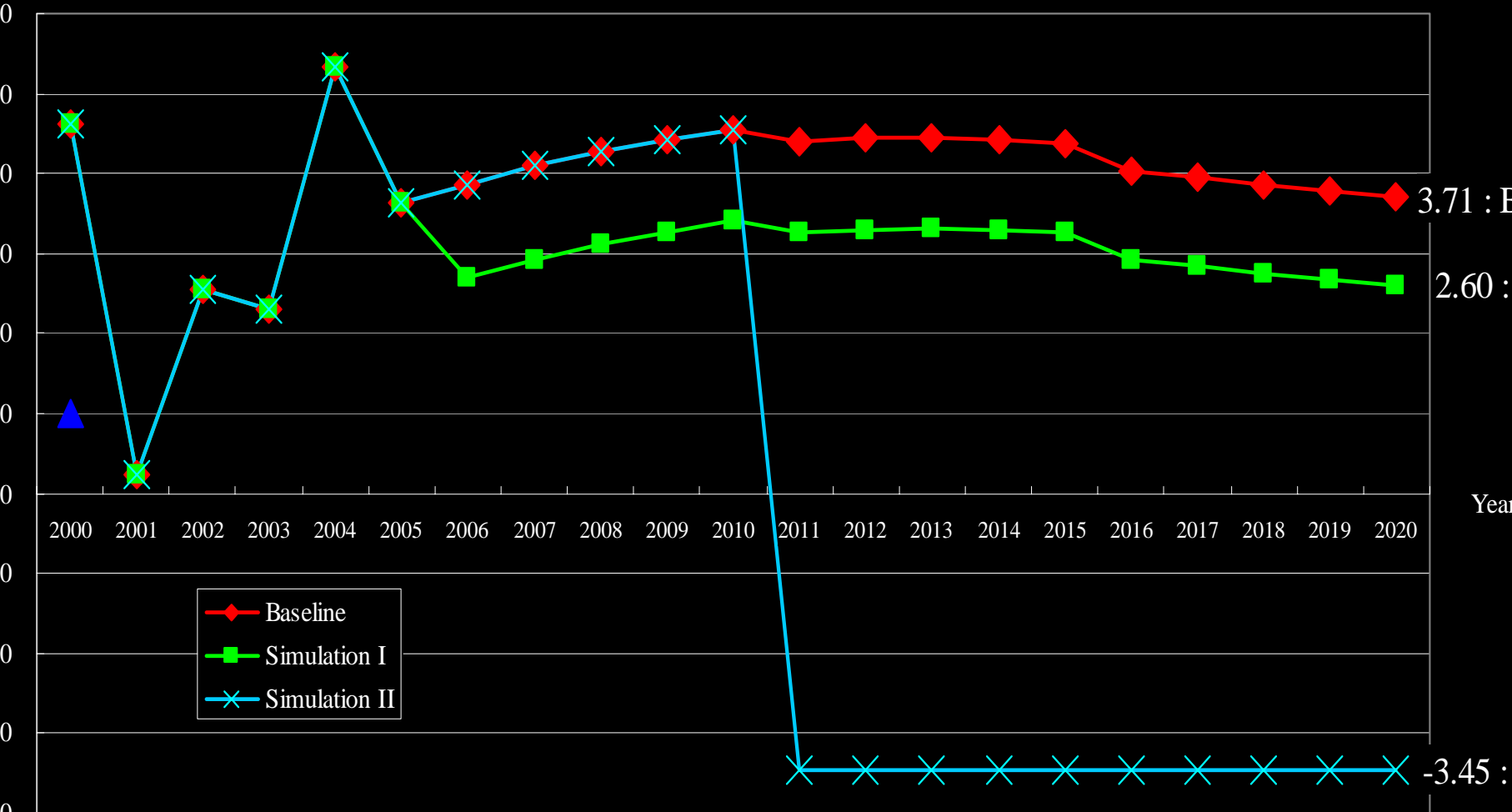
# Impacts on Taiwan's CO2 Emissions

unit : million tons CO2



# Impacts on Taiwan's CO2 growth rate

Total CO2 % change



# Sectoral Structure of CO2 Emissions

unit

Agriculture sector			Industrial Sector			Transportation sector			Utility			Residential- Com	
Baseline	Sim. I	Sim. II	Baseline	Sim. I	Sim. II	Baseline	Sim. I	Sim. II	Baseline	Sim. I	Sim. II	Baseline	Sim. I
1.33	1.33	1.33	29.25	29.25	29.25	8.30	8.30	8.30	53.62	53.62	53.62	7.50	7.50
1.31	1.31	1.31	29.19	29.19	29.19	8.28	8.28	8.28	53.66	53.66	53.66	7.56	7.56
1.29	1.29	1.29	29.12	29.12	29.12	8.26	8.26	8.26	53.72	53.71	53.72	7.61	7.62
1.26	1.26	1.26	29.00	29.00	29.00	8.24	8.24	8.24	53.84	53.81	53.84	7.66	7.69
1.24	1.23	1.24	28.87	28.86	28.87	8.21	8.21	8.21	53.98	53.94	53.98	7.71	7.75
1.21	1.20	1.21	28.72	28.71	28.72	8.19	8.19	8.19	54.15	54.09	54.15	7.74	7.81
1.18	1.17	1.18	28.57	28.56	28.57	8.16	8.16	8.16	54.33	54.26	54.33	7.76	7.85
1.14	1.14	1.21	28.42	28.42	28.17	8.12	8.11	8.59	54.57	54.48	53.90	7.75	7.85
1.11	1.11	1.26	28.29	28.29	28.89	8.08	8.07	9.10	54.80	54.69	52.22	7.73	7.84
1.08	1.08	1.30	28.15	28.16	29.57	8.04	8.03	9.61	55.02	54.89	50.67	7.71	7.84
1.05	1.05	1.34	28.02	28.04	30.00	8.00	7.99	10.11	55.24	55.09	49.50	7.69	7.83
1.02	1.02	1.39	27.89	27.92	30.12	7.95	7.95	10.62	55.46	55.29	48.74	7.67	7.82
0.99	0.99	1.43	27.76	27.80	30.01	7.90	7.89	11.10	55.73	55.54	48.36	7.62	7.78
0.97	0.96	1.48	27.63	27.68	29.70	7.85	7.84	11.59	55.98	55.78	48.19	7.57	7.74
0.94	0.94	1.53	27.49	27.56	29.24	7.80	7.79	12.09	56.24	56.01	48.16	7.52	7.70
0.92	0.91	1.58	27.35	27.43	28.68	7.76	7.75	12.58	56.50	56.25	48.20	7.47	7.66
0.89	0.89	1.64	27.21	27.30	28.07	7.72	7.71	13.08	56.76	56.48	48.28	7.42	7.62
<b>1.26</b>	<b>1.26</b>	<b>1.26</b>	<b>28.96</b>	<b>28.96</b>	<b>28.96</b>	<b>8.23</b>	<b>8.23</b>	<b>8.23</b>	<b>53.90</b>	<b>53.87</b>	<b>53.90</b>	<b>7.65</b>	<b>7.68</b>
<b>1.08</b>	<b>1.08</b>	<b>1.30</b>	<b>28.16</b>	<b>28.17</b>	<b>29.35</b>	<b>8.04</b>	<b>8.03</b>	<b>9.61</b>	<b>55.02</b>	<b>54.89</b>	<b>51.00</b>	<b>7.71</b>	<b>7.84</b>
<b>0.94</b>	<b>0.94</b>	<b>1.53</b>	<b>27.49</b>	<b>27.55</b>	<b>29.14</b>	<b>7.81</b>	<b>7.80</b>	<b>12.09</b>	<b>56.24</b>	<b>56.01</b>	<b>48.24</b>	<b>7.52</b>	<b>7.70</b>

# Energy Structure Comparison

													unit
Coal			Crude Oil			Natural Gas			Nuclear			Hydro	
Baseline	Sim. I	Sim. II	Baseline	Sim. I	Sim. II	Baseline	Sim. I	Sim. II	Baseline	Sim. I	Sim. II	Baseline	Sim.
32.88	32.11	32.11	44.68	43.92	43.92	10.54	9.38	9.38	10.46	13.06	13.06	1.44	1.53
32.96	32.55	32.55	45.06	43.83	43.83	10.72	9.69	9.69	9.86	12.39	12.39	1.39	1.53
33.02	32.51	32.51	45.41	44.34	44.34	10.87	10.36	10.36	9.34	11.31	11.31	1.36	1.47
33.13	32.65	32.65	45.71	44.59	44.59	10.99	10.47	10.47	8.85	10.84	10.84	1.32	1.46
33.23	32.88	32.88	45.99	44.68	44.68	11.13	10.54	10.54	8.36	10.46	10.46	1.29	1.44
33.37	32.96	32.96	46.23	45.06	45.06	11.27	10.72	10.72	7.88	9.86	9.86	1.25	1.39
33.52	33.02	33.02	46.43	45.41	45.41	11.40	10.87	10.87	7.42	9.34	9.34	1.22	1.36
33.67	33.03	33.13	46.62	45.72	45.71	11.53	11.00	10.99	6.98	8.92	8.85	1.20	1.33
33.88	33.02	33.23	46.75	46.02	45.99	11.61	11.15	11.13	6.58	8.50	8.36	1.18	1.31
34.07	33.05	33.37	46.89	46.27	46.23	11.68	11.30	11.27	6.20	8.08	7.88	1.17	1.29
34.23	33.09	33.52	47.04	46.51	46.43	11.74	11.45	11.40	5.83	7.68	7.42	1.16	1.27
34.38	33.13	33.67	47.21	46.74	46.62	11.78	11.58	11.53	5.49	7.28	6.98	1.15	1.26
34.49	33.22	31.68	47.40	46.91	47.92	11.80	11.69	11.94	5.16	6.93	7.22	1.15	1.25
34.65	33.31	29.26	47.54	47.09	49.57	11.79	11.77	12.55	4.87	6.58	7.35	1.15	1.25
34.79	33.37	27.13	47.69	47.28	51.17	11.76	11.84	12.90	4.60	6.25	7.47	1.16	1.25
34.91	33.42	25.38	47.84	47.48	52.64	11.74	11.90	12.98	4.34	5.93	7.60	1.17	1.26
35.02	33.45	23.99	47.98	47.70	53.85	11.71	11.95	12.91	4.11	5.63	7.77	1.18	1.27
<b>33.16</b>	<b>32.67</b>	<b>32.67</b>	<b>45.64</b>	<b>44.55</b>	<b>44.55</b>	<b>10.99</b>	<b>10.29</b>	<b>10.29</b>	<b>8.88</b>	<b>11.04</b>	<b>11.04</b>	<b>1.32</b>	<b>1.45</b>
<b>34.05</b>	<b>33.06</b>	<b>33.39</b>	<b>46.90</b>	<b>46.25</b>	<b>46.20</b>	<b>11.67</b>	<b>11.30</b>	<b>11.26</b>	<b>6.22</b>	<b>8.09</b>	<b>7.90</b>	<b>1.17</b>	<b>1.29</b>
<b>34.77</b>	<b>33.35</b>	<b>27.49</b>	<b>47.69</b>	<b>47.29</b>	<b>51.03</b>	<b>11.76</b>	<b>11.83</b>	<b>12.65</b>	<b>4.62</b>	<b>6.27</b>	<b>7.48</b>	<b>1.16</b>	<b>1.26</b>

# Macroeconomic Results Comparison

unit

	Real GDP %			Employment			Household Consumption			Export	
	Baseline	Sim I	Sim II	Baseline	Sim I	Sim II	Baseline	Sim I	Sim II	Baseline	Sim I
	5.88	5.88	5.88	2.78	2.78	2.78	6.06	6.06	6.06	5.86	5.86
	3.93	3.93	3.93	2.05	2.05	2.05	4.56	4.56	4.56	3.82	3.82
	4.13	4.21	4.13	2.15	2.19	2.15	4.81	4.87	4.81	4.12	4.12
	4.18	4.25	4.18	2.09	2.13	2.09	4.85	4.91	4.85	4.32	4.32
	4.19	4.26	4.19	2.01	2.05	2.01	4.87	4.93	4.87	4.31	4.30
	4.20	4.26	4.20	1.91	1.94	1.91	4.86	4.92	4.86	4.55	4.54
	4.19	4.26	4.19	1.80	1.82	1.80	4.83	4.88	4.83	4.77	4.76
	3.97	4.03	3.52	1.34	1.36	0.56	4.23	4.29	3.85	4.46	4.45
	3.94	4.00	3.38	1.24	1.26	0.43	4.14	4.19	3.62	4.73	4.72
	3.91	3.96	3.06	1.15	1.16	0.02	4.04	4.09	3.25	4.95	4.95
	3.87	3.92	2.70	1.07	1.07	-0.42	3.94	3.98	2.86	5.14	5.13
	3.83	3.87	2.33	1.00	1.00	-0.78	3.85	3.88	2.50	5.28	5.28
	3.54	3.58	1.85	0.56	0.56	-1.31	3.18	3.21	1.69	4.85	4.84
	3.50	3.54	1.63	0.55	0.55	-1.34	3.10	3.13	1.51	4.98	4.98
	3.46	3.49	1.47	0.56	0.55	-1.28	3.04	3.07	1.39	5.06	5.05
	3.41	3.45	1.33	0.57	0.57	-1.19	2.99	3.02	1.29	5.09	5.09
	3.37	3.40	1.20	0.59	0.58	-1.10	2.96	2.98	1.22	5.09	5.09
10	<b>4.39</b>	<b>4.44</b>	<b>4.39</b>	<b>2.11</b>	<b>2.14</b>	<b>2.11</b>	<b>4.98</b>	<b>5.02</b>	<b>4.98</b>	<b>4.53</b>	<b>4.53</b>
15	<b>3.90</b>	<b>3.96</b>	<b>3.00</b>	<b>1.16</b>	<b>1.17</b>	<b>-0.04</b>	<b>4.04</b>	<b>4.08</b>	<b>3.22</b>	<b>4.91</b>	<b>4.91</b>
20	<b>3.46</b>	<b>3.49</b>	<b>1.50</b>	<b>0.56</b>	<b>0.56</b>	<b>-1.24</b>	<b>3.05</b>	<b>3.08</b>	<b>1.42</b>	<b>5.02</b>	<b>5.01</b>
20	<b>3.97</b>	<b>4.02</b>	<b>3.13</b>	<b>1.38</b>	<b>1.39</b>	<b>0.49</b>	<b>4.14</b>	<b>4.17</b>	<b>3.41</b>	<b>4.79</b>	<b>4.78</b>

# Industrial Output Comparison

	Agriculture			Mining			BasicManuf			HiTechManu		unit
	Baseline	Sim I	Sim II	Baseline	Sim I	Sim II	Baseline	Sim I	Sim II	Baseline	Sim I	
	4.99	4.99	4.99	5.26	5.26	5.26	5.76	5.76	5.76	5.91	5.91	
	3.09	3.09	3.09	2.51	2.51	2.51	3.52	3.52	3.52	3.49	3.49	
	2.89	2.93	2.89	4.36	3.59	4.36	3.77	3.80	3.77	3.68	3.68	
	2.75	2.78	2.75	2.70	1.96	2.70	3.94	3.96	3.94	3.80	3.80	
	2.60	2.63	2.60	3.13	2.36	3.13	3.93	3.96	3.93	3.85	3.85	
	2.56	2.59	2.56	3.21	2.39	3.21	4.04	4.07	4.04	4.03	4.02	
	2.55	2.58	2.55	3.21	2.35	3.21	4.12	4.15	4.12	4.20	4.19	
	2.40	2.43	2.09	3.42	2.51	4.83	4.18	4.21	3.25	4.31	4.30	
	2.44	2.47	2.09	3.33	2.38	2.97	4.29	4.32	3.12	4.49	4.47	
	2.48	2.50	1.99	3.23	2.24	3.32	4.38	4.41	2.62	4.63	4.61	
	2.51	2.53	1.89	3.11	2.10	2.43	4.45	4.48	1.95	4.74	4.72	
	2.54	2.56	1.78	2.98	1.94	1.07	4.51	4.54	1.21	4.82	4.80	
	2.39	2.40	1.54	3.10	2.04	-0.42	4.52	4.55	0.65	4.83	4.81	
	2.41	2.42	1.46	2.94	1.86	-2.04	4.58	4.62	0.24	4.90	4.87	
	2.41	2.43	1.38	2.78	1.69	-3.43	4.60	4.65	-0.05	4.93	4.90	
	2.41	2.42	1.28	2.63	1.54	-4.53	4.61	4.66	-0.29	4.93	4.90	
	2.39	2.40	1.16	2.50	1.40	-5.33	4.59	4.64	-0.53	4.91	4.88	
10	3.06	3.09	3.06	3.48	2.92	3.48	4.16	4.17	4.16	4.14	4.13	
15	2.48	2.50	1.97	3.21	2.24	2.92	4.36	4.39	2.43	4.60	4.58	
20	2.40	2.42	1.36	2.79	1.70	-3.15	4.58	4.62	0.01	4.90	4.87	
20	2.69	2.72	2.24	3.20	2.36	1.37	4.34	4.37	2.43	4.50	4.48	

# Industrial Output Comparison

													unit	
TraditManuf			Construction			Utilities			Trade_Transp			OthService		
BaseLjn	Sim	Sim II	BaseLjn	Sim	Sim	BaseLjn	Sim	Sim II	BaseLjn	Sim	Sim II	BaseLjn	Sim	
6.02	6.02	6.02	7.44	7.44	7.44	4.05	4.05	4.05	5.27	5.27	5.27	6.18	6.18	
3.49	3.49	3.49	5.67	5.67	5.67	2.72	2.72	2.72	3.28	3.28	3.28	4.62	4.62	
3.63	3.67	3.63	6.08	6.17	6.08	2.96	2.95	2.96	3.37	3.39	3.37	4.97	5.01	
3.64	3.68	3.64	6.49	6.58	6.49	3.17	3.17	3.17	3.40	3.41	3.40	5.00	5.05	
3.58	3.62	3.58	7.38	7.48	7.38	3.31	3.33	3.31	3.41	3.43	3.41	4.95	4.99	
3.63	3.67	3.63	7.26	7.35	7.26	3.45	3.48	3.45	3.42	3.44	3.42	4.88	4.92	
3.69	3.73	3.69	7.04	7.13	7.04	3.59	3.63	3.59	3.42	3.44	3.42	4.78	4.82	
3.82	3.87	3.04	6.33	6.42	5.21	3.63	3.68	2.14	3.19	3.21	2.85	4.36	4.40	
3.90	3.94	2.92	5.82	5.91	4.89	3.72	3.77	2.19	3.17	3.19	2.79	4.25	4.29	
3.94	3.98	2.52	5.33	5.42	3.65	3.82	3.87	2.21	3.14	3.16	2.58	4.14	4.18	
3.97	4.01	2.02	4.88	4.96	2.26	3.92	3.98	2.19	3.11	3.12	2.33	4.04	4.07	
3.98	4.01	1.52	4.47	4.55	0.91	4.01	4.07	2.04	3.07	3.08	2.09	3.95	3.98	
3.96	3.99	1.20	3.70	3.78	-0.58	3.98	4.05	1.82	2.79	2.80	1.68	3.50	3.52	
3.95	3.97	0.93	3.21	3.28	-1.75	4.01	4.07	1.75	2.75	2.76	1.54	3.45	3.47	
3.91	3.94	0.71	2.80	2.87	-2.74	4.03	4.09	1.77	2.70	2.71	1.43	3.41	3.43	
3.87	3.89	0.50	2.46	2.53	-3.55	4.04	4.11	1.85	2.66	2.66	1.34	3.37	3.39	
3.82	3.84	0.28	2.19	2.25	-4.17	4.04	4.12	1.98	2.61	2.62	1.27	3.35	3.36	
<b>3.95</b>	<b>3.98</b>	<b>3.95</b>	<b>6.77</b>	<b>6.83</b>	<b>6.77</b>	<b>3.32</b>	<b>3.33</b>	<b>3.32</b>	<b>3.65</b>	<b>3.67</b>	<b>3.65</b>	<b>5.05</b>	<b>5.08</b>	
<b>3.92</b>	<b>3.96</b>	<b>2.40</b>	<b>5.37</b>	<b>5.45</b>	<b>3.38</b>	<b>3.82</b>	<b>3.87</b>	<b>2.15</b>	<b>3.14</b>	<b>3.15</b>	<b>2.53</b>	<b>4.15</b>	<b>4.18</b>	
<b>3.90</b>	<b>3.93</b>	<b>0.72</b>	<b>2.87</b>	<b>2.94</b>	<b>-2.56</b>	<b>4.02</b>	<b>4.09</b>	<b>1.83</b>	<b>2.70</b>	<b>2.71</b>	<b>1.45</b>	<b>3.41</b>	<b>3.43</b>	

**Many Thanks  
for Your Attentions!**