Chapter 10
THE DOUBLE DIVIDEND OF AN ENVIRONMENTAL TAX REFORM IN EAST ASIAN ECONOMIES

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What is the best way for revenue recycling? (Double Dividend?)

Carbon Tax for achieving national Targets

China: to reduce the GHG intensity
by 30% in 2020 (mostly achived in baseline)

Japan: to reduce the GHG emission
in 2020 by 3.8% from 2005 level

Korea: to reduce the GHG emission
in 2020 by 30% from the baseline level

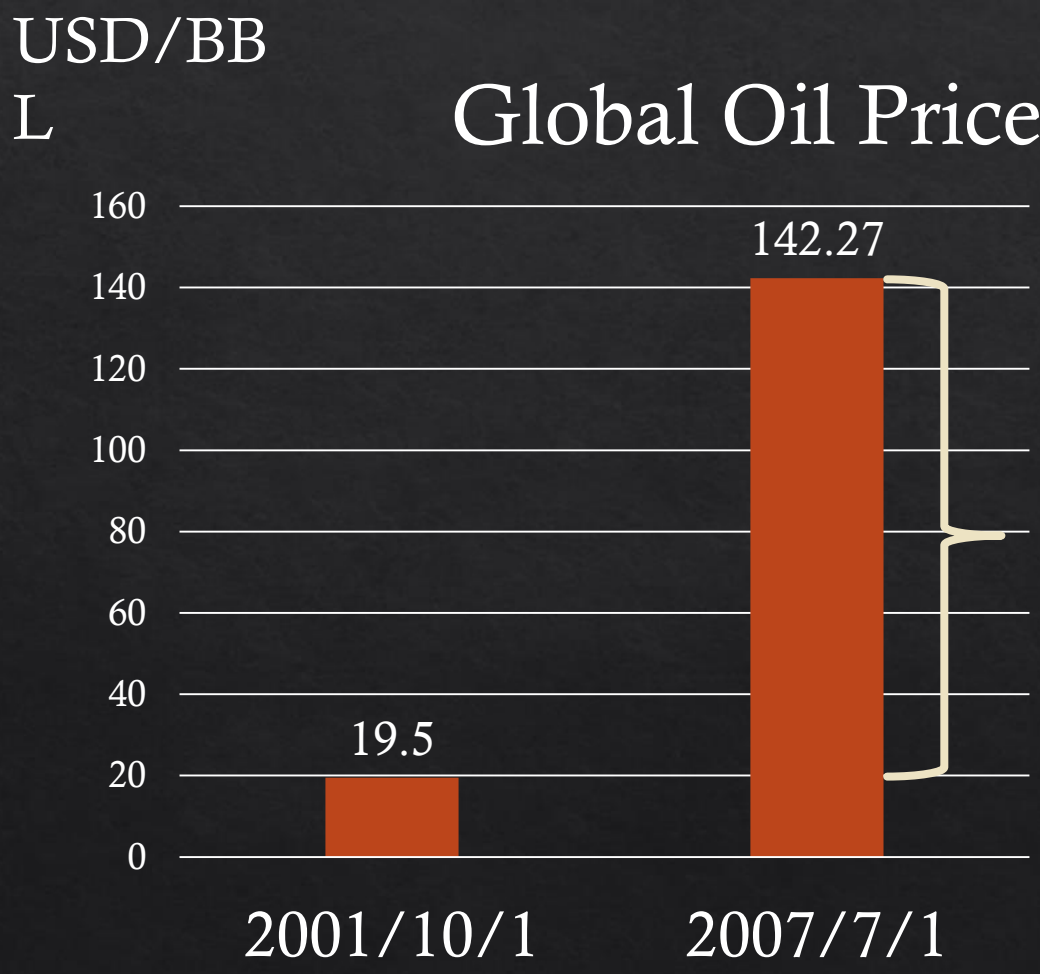
Taiwan: tor reduce the GHG emission
in 2020 to 2005 level, in 2025 to 2000 level

After the target year, carbon tax rate will be raised in correspondence with inflation rate ,1.7%.

Required carbon tax rates to achieve national targets

	c-tax rate ($/tCO2)		CO2 reduction (% from baseline)	
	2020	2030	2020	2030
China	27.5	32.6	-4.67	-9.22
Japan	262.3	310.5	-15.43	-34.94
Korea	392.3	464.3	-30.20	-40.44
Taiwan	586.5	1372.6	-41.93	-65.46
Total			-6.8	

Unprecedented carbon tax rate?



The gap (128$/BBL) corresponds to 307 USD/tCO2

Harmonized carbon tax rate?

At what level? (No objective criterion)

The tax rate to achieve -6.8% reduction of combined emission.

73.5 USD/tCO2

Required carbon tax rates to achieve national targets

	c-tax rate ($/tCO2)		CO2 reduction (% from baseline)	
	2020	2030	2020	2030
China	73.5	87.0	−6.17	−20.37
Japan	73.5	87.0	−5.76	−9.06
Korea	73.5	87.0	−13.37	−23.26
Taiwan	73.5	87.0	−17.97	−35.46
Total			-6.8	

Notation of scenarios

What Country?

China (C-), Japan (J-), Korea (K-), Taiwan (T-)

Carbon tax rate?

To achieve national target (-N-)
73.5 USD/tCO2 (-735-)

Revenue recycling?

No recycling (-N), VAT or Consumption tax (-C)
Income tax (-I),
Social Security Contribution on Labour (-L)

Table 1: Scenarios

Country	All	4	4	C	C	J	J	K	K	T	T
Targets	B	N	735	N	735	N	735	N	735	N	735
Recycling: N	B	4NN	4-735-C	CNN	C735N	JNN	J735N	KNN	K735N	TNN	T735N
C	B			CNC	C735C	JNC	J735C	KNC	K735C	TNC	T735C
I	B			CNI	C735I	JNI	J735I	KNI	K735I	TNI	T735I
L	B			CNL	C735L	JNL	J735L	KNL	K735L	TNL	T735L

Revenue : GDP

	4NN		4-735N	
	2020	2030	2020	2030
China	3.29%	2.72%	8.65%	6.34%
Japan	5.33%	4.72%	1.65%	1.83%
Korea	9.72%	7.37%	2.23%	1.76%
Taiwan	14.80%	16.65%	2.59%	1.94%

Table 5: China scenarios with carbon tax rate to achieve the national target

China	2020				2030			
from baseline (%)	CNN	CNC	CNI	CNL	CNN	CNC	CNI	CNL
Real GDP	-0.26	-0.26	0.03	-0.26	0.35	0.82	0.59	0.35
CO2	-4.66	-4.43	-4.61	-4.66	-9.23	-9.36	-9.15	-9.23
Employment	-0.20	0.91	-0.14	-0.20	0.22	0.55	0.23	0.22
Consumption	-0.23	0.17	0.61	-0.23	0.61	2.28	1.42	0.61
Investment	-0.49	-0.64	-0.29	-0.49	0.73	0.52	0.85	0.73
Export	0.01	-0.14	0.03	0.01	0.03	0.28	0.06	0.03
Import	0.07	0.21	0.29	0.07	0.20	0.35	0.39	0.20
Import: Oil & Gas etc.	-0.52	-0.60	-0.08	-0.52	0.35	0.94	0.67	0.35
Consumption Price	1.03	-4.04	1.11	1.03	0.30	-4.45	0.34	0.30
Nominal wage and salaries	0.66	-3.20	0.92	0.66	0.71	-1.77	0.87	0.71
Carbon Tax Rate ($/tCO2)	27.5	27.5	27.5	27.5	32.6	32.6	32.6	32.6

Table 6: China scenarios with carbon tax rate at 735$/tCO$_2$

China	2020				2030			
from baseline (%)	C735N	C735C	C735I	C735L	C735N	C735C	C735I	C735L
Real GDP	-0.48	2.59	-0.18	-0.48	1.08	1.71	1.32	1.08
CO2	-6.17	-5.70	-6.12	-6.17	-20.38	-21.51	-20.31	-20.38
Employment	-0.28	1.53	-0.22	-0.28	0.37	0.37	0.39	0.37
Consumption	-1.35	9.81	-0.51	-1.35	1.20	3.28	2.00	1.20
Investment	0.20	-0.34	0.40	0.20	3.22	3.18	3.32	3.22
Export	0.05	-0.36	0.08	0.05	0.17	0.50	0.20	0.17
Import	0.48	1.46	0.69	0.48	1.01	1.30	1.19	1.01
Import: Oil & Gas etc.	-0.23	3.37	0.21	-0.23	1.57	2.48	1.88	1.57
Consumption Price	2.66	-12.04	2.72	2.66	1.14	-9.83	1.17	1.14
Nominal wage and salaries	1.05	-2.81	1.31	1.05	1.83	-5.34	1.98	1.83
Carbon Tax Rate ($/tCO2)	73.5	73.5	73.5	73.5	87.0	87.0	87.0	87.0

Table 7: Japan scenarios with carbon tax rate to achieve the national target

Japan	2020				2030			
from baseline (%)	JNN	JNC	JNI	JNL	JNN	JNC	JNI	JNL
Real GDP	-0.82	3.08	2.71	-0.31	-1.45	3.99	3.05	-0.76
CO2	-15.43	-12.01	-12.66	-15.02	-34.91	-30.26	-30.79	-34.03
Employment	-0.39	0.65	0.59	0.00	-1.14	1.31	0.77	-0.76
Consumption	-2.42	4.76	3.35	-1.18	-4.70	4.11	2.24	-2.95
Investment	-0.29	-0.40	1.58	-1.04	-0.49	-0.62	0.67	-2.45
Export	0.08	-0.05	0.41	-0.12	-0.15	0.15	0.18	-0.42
Import	-3.18	-0.46	-0.33	-2.92	-6.47	-3.68	-3.89	-6.48
Import: Oil & Gas etc.	-5.79	-5.44	-5.33	-5.78	-3.23	-2.94	-2.95	-3.24
Consumption Price	3.79	-6.74	2.19	2.61	5.81	-4.05	3.01	3.71
Nominal wage and salaries	1.75	-2.80	2.65	3.62	2.71	-2.34	3.08	2.53
Carbon Tax Rate ($/tCO2)	262.3	262.3	262.3	262.3	310.5	310.5	310.5	310.5

Table 8: Japan scenarios with carbon tax rate at 735$/tCO$_2$

Japan	2020				2030			
from baseline (%)	J735N	J735C	J735I	J735L	J735N	J735C	J735I	J735L
Real GDP	-0.19	0.85	0.84	-0.04	-0.58	0.96	0.80	-0.39
CO2	-5.78	-4.65	-4.87	-5.64	-9.05	-7.54	-7.84	-8.86
Employment	-0.11	0.16	0.17	0.01	-0.37	0.34	0.24	-0.23
Consumption	-0.67	1.27	1.01	-0.31	-1.17	1.32	0.89	-0.67
Investment	-0.10	-0.21	0.43	-0.32	-0.68	-0.59	-0.09	-1.26
Export	0.03	-0.03	0.12	-0.03	-0.19	-0.07	-0.02	-0.26
Import	-1.06	-0.32	-0.24	-0.98	-1.48	-0.61	-0.62	-1.48
Import: Oil & Gas etc.	-2.23	-2.12	-2.08	-2.22	-1.35	-1.20	-1.20	-1.34
Consumption Price	1.06	-2.00	0.59	0.72	0.86	-1.75	0.62	0.42
Nominal wage and salaries	0.44	-0.75	0.71	1.04	0.18	-0.95	0.75	0.41
Carbon Tax Rate ($/tCO2)	73.5	73.5	73.5	73.5	87.0	87.0	87.0	87.0

Table 9: Korea scenarios with carbon tax rate to achieve the national target

Korea	2020				2030			
from baseline (%)	KNN	KNC	KNI	KNL	KNN	KNC	KNI	KNL
Real GDP	-1.92	4.27	2.30	-1.53	-0.92	2.87	1.08	-0.73
CO2	-30.04	-25.88	-27.92	-29.73	-40.51	-36.35	-38.18	-40.25
Employment	-0.38	2.71	1.37	0.04	-0.39	1.61	-0.11	-0.22
Consumption	-4.64	8.95	4.62	-3.64	-4.42	6.87	2.55	-3.64
Investment	-2.29	1.91	0.61	-2.18	-0.95	5.12	1.43	-0.83
Export	-0.22	-0.08	-0.13	-0.21	-0.16	0.13	0.04	-0.16
Import	-1.87	0.64	-0.15	-1.67	-2.32	2.19	0.57	-2.01
Import: Oil & Gas etc.	-7.40	-3.17	-4.57	-7.10	-5.88	-2.05	-3.67	-5.68
Consumption Price	6.39	-8.79	3.03	5.84	4.79	-5.71	4.09	4.47
Nominal wage and salaries	2.67	-3.11	1.57	4.26	0.70	2.76	2.91	2.24
Carbon Tax Rate ($/tCO2)	392.3	392.3	392.3	392.3	464.3	464.3	464.3	464.3

Table 10: Korea scenarios with carbon tax rate at 735$/tCO$_2$

Korea	2020				2030			
from baseline (%)	K735N	K735C	K735I	K735L	K735N	K735C	K735I	K735L
Real GDP	-0.55	1.50	0.50	-0.12	0.04	1.00	0.54	0.23
CO2	-13.17	-11.21	-12.40	-12.76	-23.52	-22.03	-22.70	-23.21
Employment	-0.14	0.88	0.31	0.25	-0.03	0.22	-0.05	0.17
Consumption	-1.25	3.29	1.07	-0.21	-1.42	1.64	0.31	-0.62
Investment	-0.95	0.33	-0.22	-0.79	1.49	3.26	2.15	1.64
Export	-0.09	-0.04	-0.06	-0.08	-0.03	0.06	0.01	-0.03
Import	-0.65	0.16	-0.19	-0.44	-0.60	0.79	0.13	-0.28
Import: Oil & Gas etc.	-2.38	-0.91	-1.64	-2.03	-1.26	0.05	-0.66	-1.02
Consumption Price	1.61	-3.60	0.84	1.04	1.54	-1.26	1.31	1.22
Nominal wage and salaries	0.76	-0.80	0.47	2.38	0.24	0.85	0.74	1.92
Carbon Tax Rate ($/tCO2)	73.5	73.5	73.5	73.5	87.0	87.0	87.0	87.0

Table 11: Taiwan scenarios with carbon tax rate to achieve the national target

Taiwan	2020				2030			
from baseline (%)	TNN	TNC	TNI	TNL	TNN	TNC	TNI	TNL
Real GDP	-1.23	1.52	5.96	-0.06	-1.46	1.62	7.83	-0.10
CO2	-41.93	-41.45	-41.20	-41.80	-65.47	-65.27	-64.75	-65.42
Employment	-0.67	-0.07	-0.52	2.21	0.21	0.33	0.46	2.16
Consumption	-4.85	-0.02	7.66	-2.77	-6.77	-0.62	11.65	-4.06
Investment	-1.38	-1.56	-1.30	-1.68	4.84	4.67	4.87	4.51
Export	0.12	0.02	0.10	-0.06	0.44	0.15	0.28	0.06
Import	-2.66	-2.74	-2.64	-2.84	-1.82	-2.07	-1.91	-2.23
Import: Oil & Gas etc.	-7.47	-7.45	-7.38	-7.48	-4.67	-4.64	-4.54	-4.68
Consumption Price	6.67	0.50	4.91	5.17	8.58	0.66	3.50	5.62
Nominal wage and salaries	2.68	0.46	2.20	6.49	4.88	0.94	2.72	5.96
Carbon Tax Rate ($/tCO$_2$)	586.5	586.5	586.5	586.5	1372.6	1372.6	1372.6	1372.6

Table 12: Taiwan scenarios with carbon tax rate at 735$/tCO$_2$

Taiwan	2020				2030			
from baseline (%)	T735N	T735C	T735I	T735L	T735N	T735C	T735I	T735L
Real GDP	-0.03	1.98	1.26	0.55	0.10	2.12	1.24	0.80
CO2	-18.00	-17.44	-17.80	-17.93	-35.52	-35.38	-35.31	-35.39
Employment	-0.13	0.36	-0.10	1.60	0.13	0.14	0.16	0.90
Consumption	-0.92	2.62	1.34	0.13	-1.15	2.77	1.11	0.19
Investment	-0.19	-0.26	-0.17	-0.38	3.58	3.95	3.61	3.50
Export	0.01	-0.05	0.01	-0.09	0.09	-0.04	0.07	-0.04
Import	-0.82	-0.85	-0.81	-0.91	-0.34	-0.46	-0.35	-0.51
Import: Oil & Gas etc.	-2.26	-2.21	-2.23	-2.27	-1.11	-1.10	-1.09	-1.11
Consumption Price	1.20	-3.46	0.95	0.51	1.47	-2.87	0.87	0.18
Nominal wage and salaries	0.42	-0.95	0.37	2.77	0.82	-1.53	0.56	1.21
Carbon Tax Rate ($/tCO$_2$)	73.5	73.5	73.5	73.5	87.0	87.0	87.0	87.0

Discussion

(1) To achieve national targets for Japan, Korea and Taiwan, it requires fairly high carbon tax rates.
(2) The economic burden of reducing CO_2 emission is by no means catastrophic even if the necessary reduction effort is significant and required carbon tax rate is very high.
(3) If China contribute to higher share of CO_2 reductions with the same tax rates as other three countries, the reduction burden for other countries are substantially eased, even when the reduced CO_2 emission of 4 countries is the same.

Discussion (cont.)

(4) The results of a single-country carbon tax and harmonized carbon tax is not much different for a country which introduces it.
(5) There are strongest possibility of positive double dividend with revenue recycling via VAT reduction. The possibility of positive double dividend with other recycling option depends on country-specific conditions, especially the revenue of existing taxes and SSC.
(6) Higher reduction effort and higher carbon tax rate does not necessarily mean higher economic burden, especially in cases where the strong double dividend is observed.