Research Proposal

Theme:

Effect of a Carbon Tax on Economy

By Sofyan, Lury (ルリ); 4009R046-8; M1

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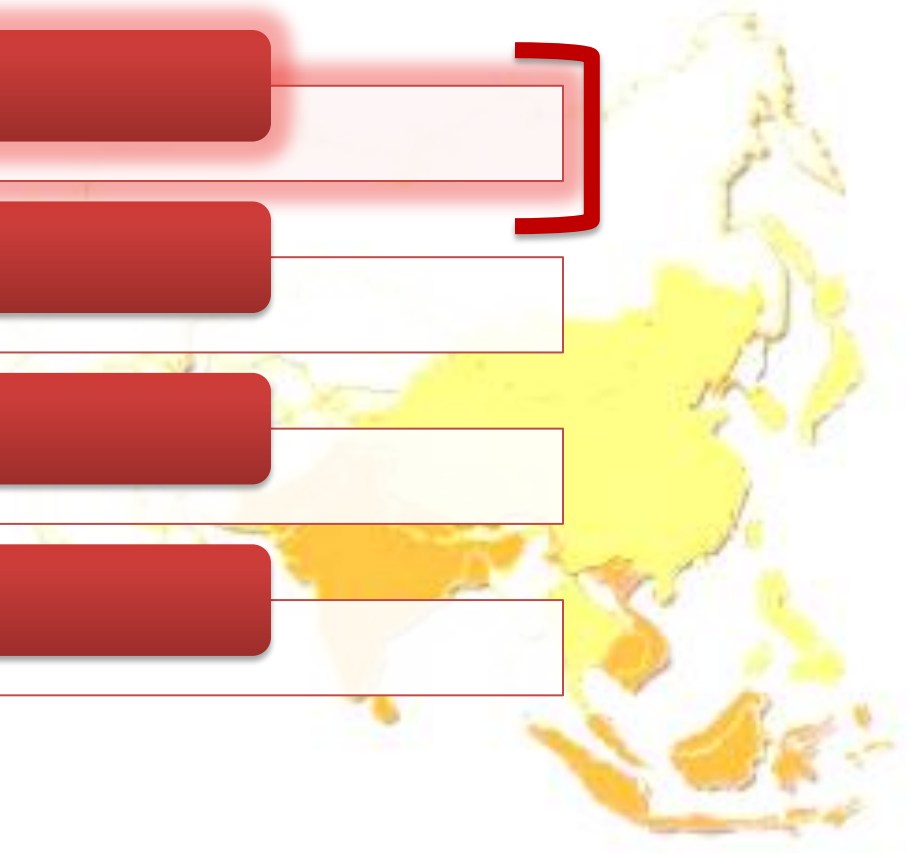
Prof. Matsuoka Shunji Seminar

Content:

- Background
- Research Theme
- Literature Review
- Research Proposition



Background

Why a Carbon Tax (in Developing Country)? Why not Carbon Trading?

1. Experience from European Cap-and-Trade (Emission Trading Scheme): the scheme has undoubtedly suffered from a number of flaws in design and implementation) {a}
2. National carbon taxes can raise significant revenues cost-effectively in developing countries {b}
3. Major advantage of the implementation of an Ecotax in Developing Countries in contrast to emission charge system or tradable discharge system (Matsuoka, 2000, P.15) {c}:
   a) Monitoring system is easier to achieve
   b) Ecotax is implemented by the normal tax administration body (already established)
   c) Do not require information about MAC (as for Emission Charge System), only need information about demand elasticity (can be drawn from market data)
4. Limitation of environment policies in developing countries: low monitoring technology , financial shortage for environmental management, inadequate systematic & personnel skills (Matsuoka, 2000, P.11) {c}

Carbon Tax Vs Cap-and-Trade

"The polarized debate over the relative merits of carbon tax and cap-and-trade is unhelpful and unnecessary. Both carbon tax and cap-and trade system would create economic incentives to drive emission reduction" {d}

Sources:

{a} P. 129 & {d} P.125 UNDP - Human Development Report 2007/2008 "Fighting Climate Change: Human solidarity in divided world" .
{b} World Bank.(1992). Carbon Taxes, the Greenhouse Effect, & Developing Countries . c} Matsuoka, S.(2000).Implementation of Environmental Policy in the Developing Countries: Regulatory Instruments & Their Efficiency. Hiroshima Univ.

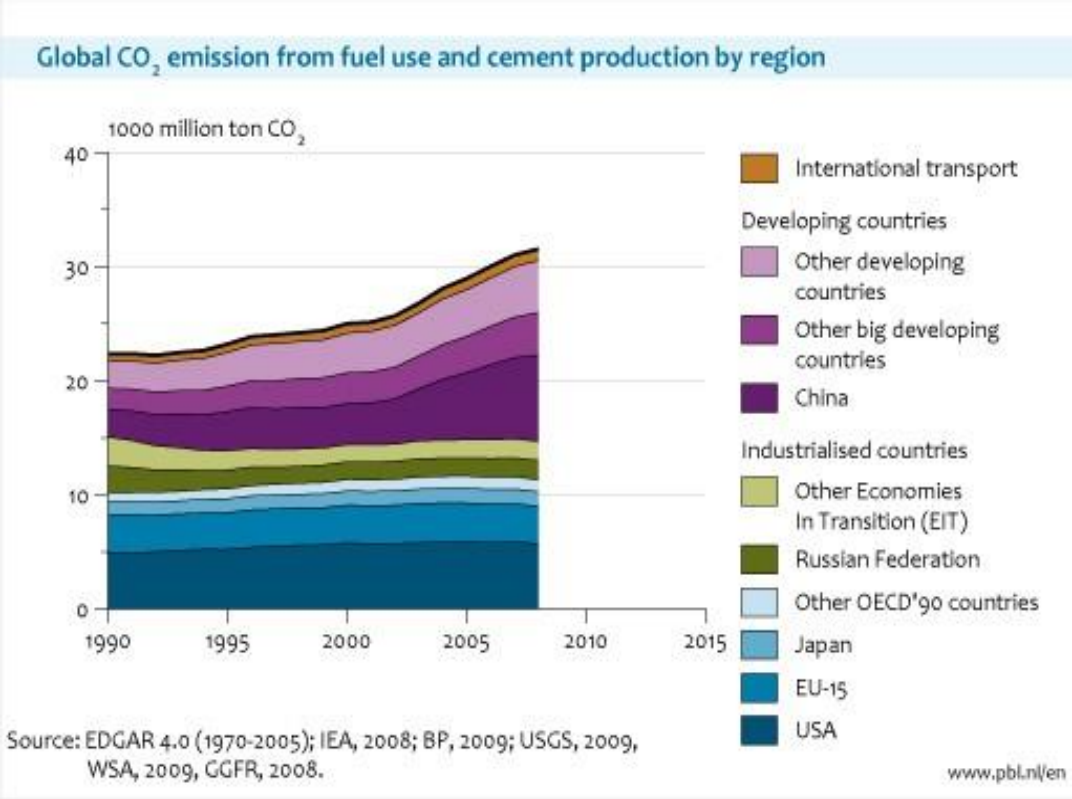
Background - Introductory Findings

Indeed C02 emission in developing countries increasing significantly

1. For the first time in history, the share of global CO2 emissions from developing countries is higher (50.3 %) than from industrialized countries (46.6 %) {a}

2. Population growth is a key determinant of green gas house emissions {b} and more than 75% of the world's people live in developing countries {c)

3. Developing countries are much prone to climate change {d}



Sources:

{a} Emission Database for Global Atmospheric Research (EDGAR), (2009). IPCC also stated that the most rapid growth of energy demand is happen in many developing countries (4th Assessment Report of the IPCC. (2007)) {b} Bongaarts, J. (1992). Population and Development Review, Vol. 18, No. 2, pp. 299-319 Published by: Population Council . {c} Todaro, Michael P. & Smith S.C. (1995). Economic Development. {d{ Stern Review

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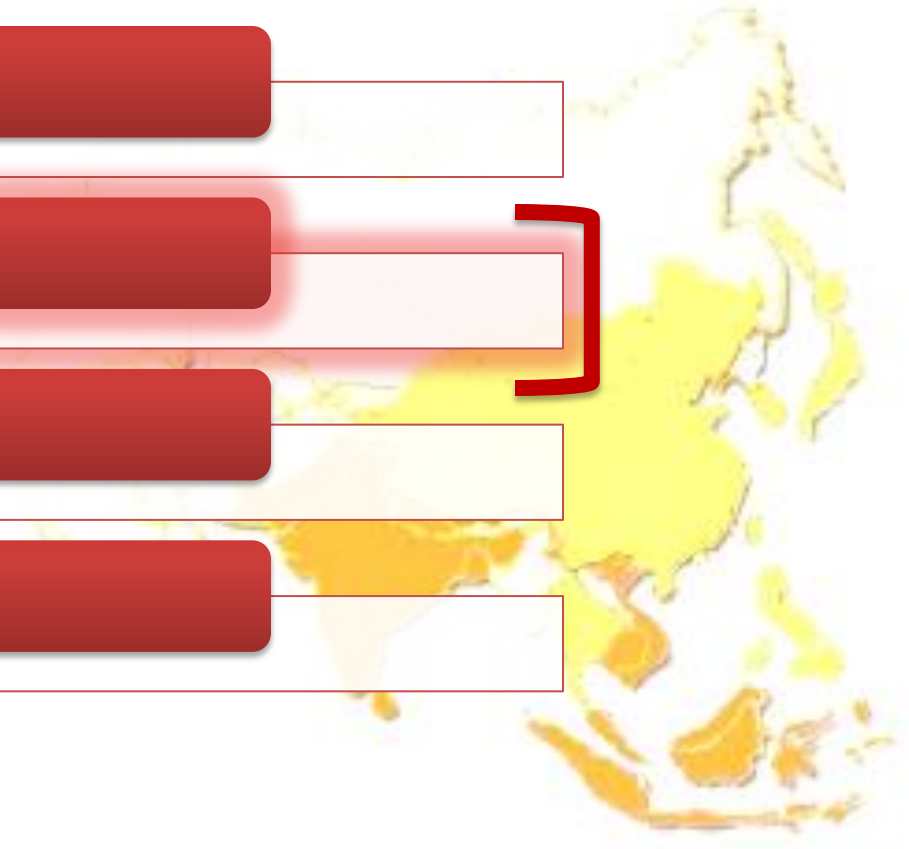

Research Theme

Effect of a Carbon Tax on Economy

Carbon Tax effect on Economic Growth, Employment Rate, Inflation	• Does carbon tax discourage economic growth, encourage inflation & decrease the employment rate?
Carbon Tax Effect on Competitiveness	• Does carbon tax hampering domestic product competitiveness?
Distributional effect of a Carbon Tax	• Is it a regressive or progressive tax? • Does the well-off have to pay more then the destitute? Vice versa

Sources:
For distribution effect of carbon tax see slide 3. For Carbon tax effect on competitiveness, see Jaffe, A., Peterson, P., Portney, P., Stavins, R., (1995), Zhang & Baranzini (2003). For others see Stern, N (2007)

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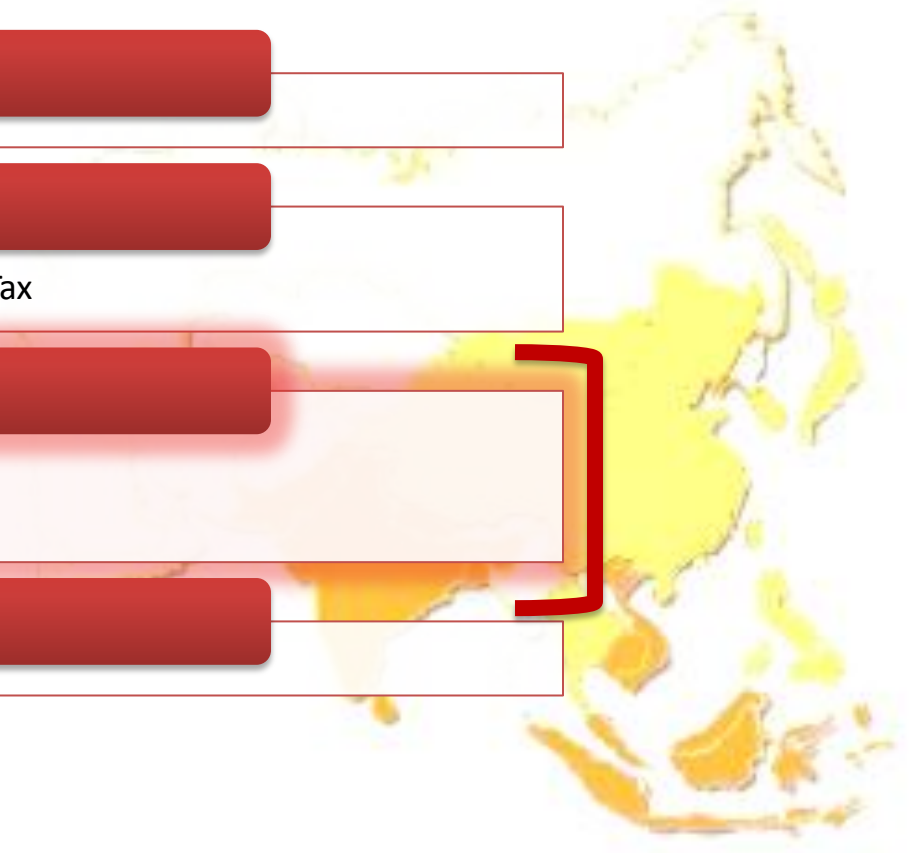
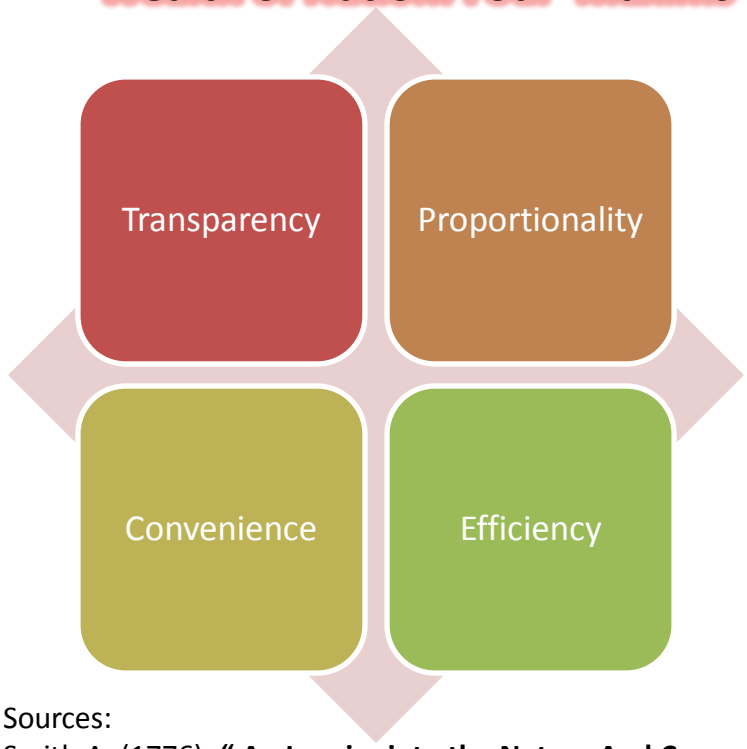
- Research Theme
  - Distribution effect of a Carbon Tax
- Literature Review
  - Theoretical Foundation
  - Previous Studies
- Research Proposition

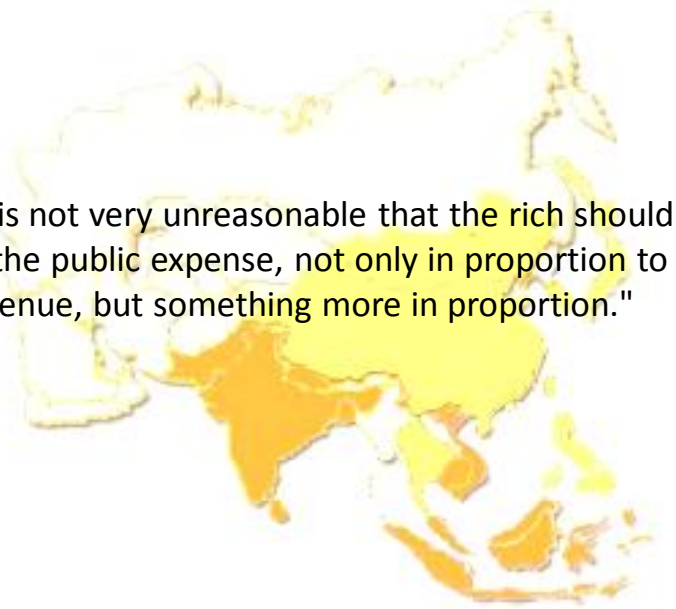


Literature Review - Theoretical Foundation

Importance of a Progressive Distribution effect of a Tax

Wealth of Nation: Four Maxims





"It is not very unreasonable that the rich should contribute to the public expense, not only in proportion to their revenue, but something more in proportion."

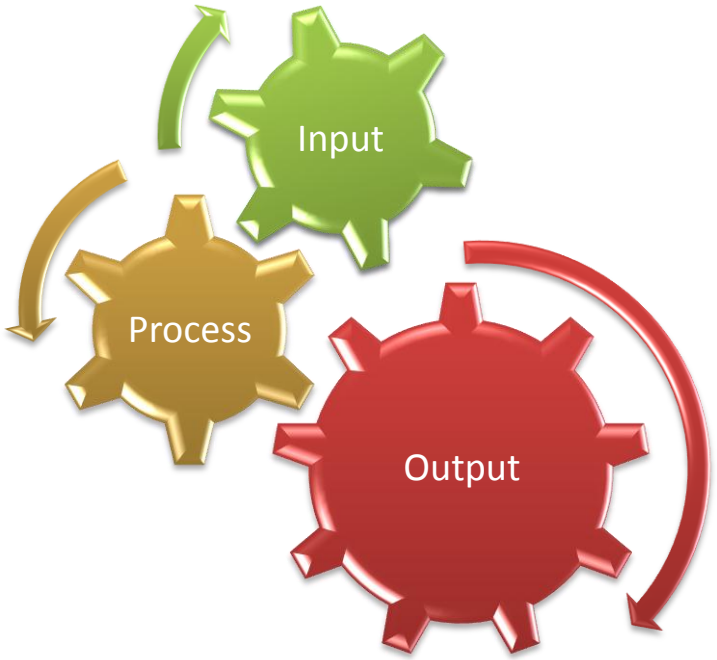
Sources:

Smith,A. (1776). **" An Inquiry into the Nature And Causes of the Wealth of Nations"** - Book Five: Of the Revenue of the Sovereign or Commonwealth. CHAPTER II: Of the Sources of the General or Public Revenue of the Society. ARTICLE I: Taxes upon the Rent of House.

Literature Review – Theoretical Foundation

HDR 2007/2008: The Importance Where should the price be set?

"The literature on environmental taxes is extensive. Most papers, however, do not focus on the distinction between taxes on emissions and taxes on inputs or outputs that are imperfectly correlated with emissions" {a}



Boyce et al: collection of tax would be the most easily and inexpensive at "UPSTREAM" (at the point of sources extraction: at the coal mines, oil refineries, natural gas facilities, and ports) where fossil fuels first enter the economy.

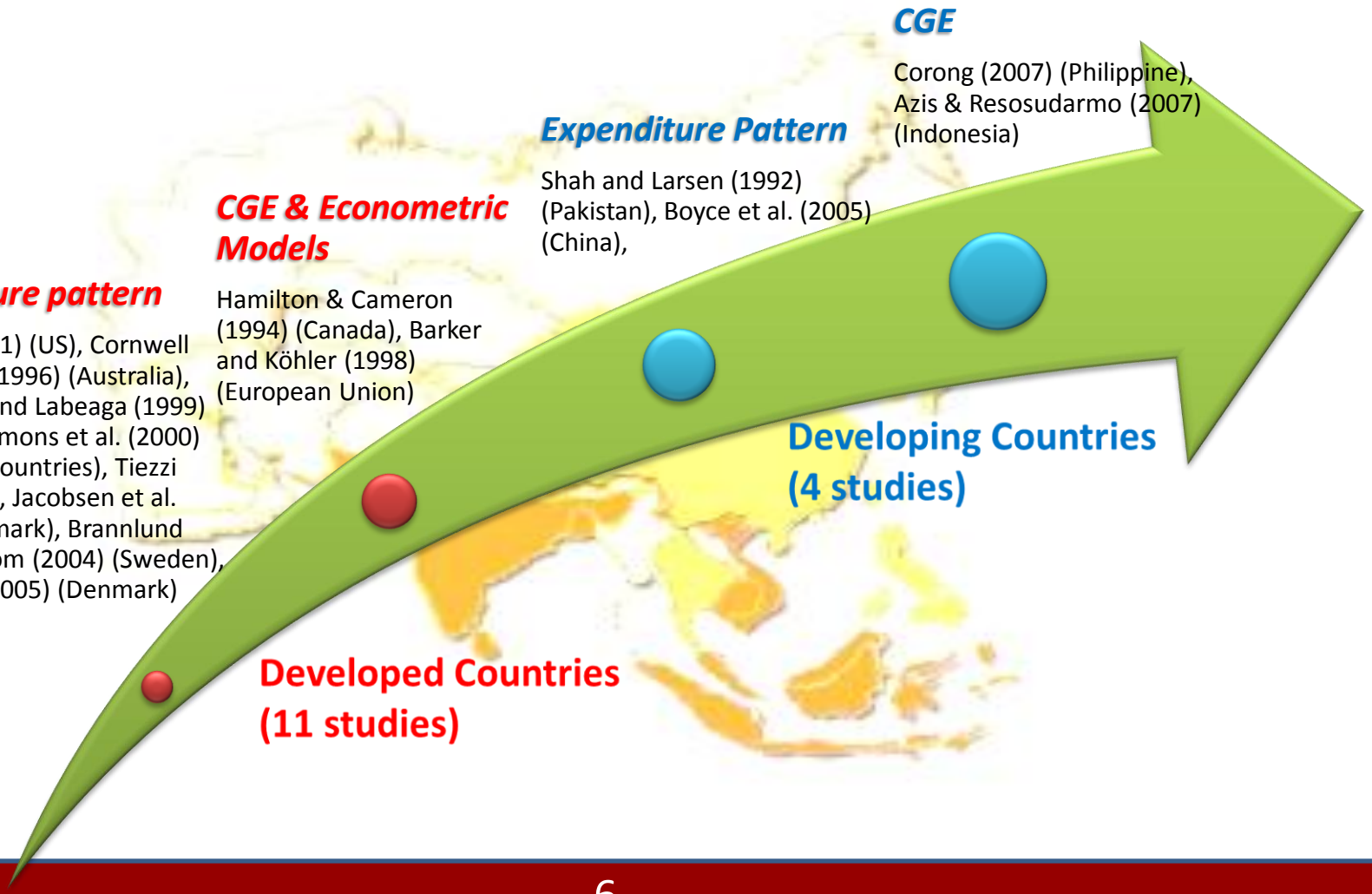
"a true Pigouvian tax is essentially never employed by actual policy. Most actual environmental taxes apply to the output of a polluting industry or to an input that is correlated with emissions, rather than directly to emissions" {a}

Sources:

{a} Fullerton at el.(2001). **Behavioral and Distributional Effects of Environmental Policy - A Tax on Output of the Polluting Industry Is Not a Tax on Pollution**. University of Chicago Press

Literature Review

15 Previous Studies on The distributional Effect of Carbon Tax



Selective Previous Studies in **developed** country

- **Poterba (1991)**:
  Analyzing the distributional effect of a gasoline tax by examining the expenditure pattern of households, especially the pattern of energy spending.

  Methodology: He examines is a charge of US$100 per ton of carbon implemented in 1990. Using data from the U.S. Consumer's Expenditure Survey, Poterba (1991) assumes that the the tax is fully translated into the purchaser's price of various energy related products, and combines these with the data on energy expenditure pattern to estimate the distributional burden of the tax.

  Finding: The gasoline tax is regressive which suggest that if the tax were adopted without any offsetting changes in other tax or transfer programs, the burden would fall more heavily on low-income than well-off households.

Sources:
Poterba (1991). **"Is the gasoline tax regressive?"** NBER working paper No. 3578

Literature Review

Selective Previous Studies in **developing** country

Azis & Resosudarmo (2007):
Analyzing the distributional effect of a carbon tax in Indonesia

Methodology: Using a CGE model with disaggregated households. This model has 38 industries, and 43 commodities with detail energy sectors. Energy commodity includes coals, natural gas, gasoline, automotive diesel oil, industrial diesel oil, kerosene, LPG, and other fuels. This paper incorporates Indonesia SAM 2003 with 181 industries, 181 commodities, and 200 households (100 urban and 100 rural households grouped by expenditure per capita centiles) were constructed. There are 3 scenarios and simulation strategy: 1. A carbon tax will be implemented without revenue recycling, 2.Implementation of a carbon tax will be accompanied by a reduction in the uniform general ad valorem sales tax rate for all commodities,3. To give a uniform lump-sum transfer to all households.

Findings: GDP, as well as consumption expenditure (which can be treated as an indicator of aggregate welfare) fall slightly in all three scenarios. However, the simulation suggests that where revenue from the carbon tax is returned to the economy as the uniform reduction in commodity tax rate, produces the lowest decline in welfare effect. With regards to distributional effects, In general, the simulations suggest that the introduction of a carbon tax in Indonesia would hurt urban households than rural households. Its overall distributive effect nation-wide would be progressive, as shown by the decline in inequality indicators.

Sources:
Azis & Resosudarmo (2007)**: "On the distributional effect of Carbon Tax in Developing Countries: The case of Indonesia".** The Australian National University.

Literature Review

Selective Previous Studies in **developing** country

Boyce et al. (2005): Analyzing the distributional impacts of carbon charges and revenue recycling in China, using data from a nationally representative household income and expenditure survey for the year 1995. They separate household spending into six categories, and apply a carbon loading factor to each of these categories to estimate the carbon usage embodied in these different types of household consumption. The policy simulated is a charge of 300 Yuan per metric ton of carbon (*see. Appendix-3 for further information about methodology that is used*)

C= 0,03ExpF + 0.24ExpI + 0.02ExpH + 1.2ExpE + 0.11ExpT + 0.03ExpO

C:total carbon consumption
Exp: Expenditure
F: Food
I: Industrial goods
H: Housing
E: Fuels & Electricity
T: Transp. & Comm.
O: Others

Table III: Distributional Incidence of a Carbon Charge, 1995

	All households		
Per capita Expenditure Decile	Per capita expenditure (yuan)	Charge per capita (yuan)	Charge / expenditure[a]
1	591	12	2.1%
2	840	17	2.0%
3	1,022	20	2.0%
4	1,218	24	1.9%
5	1,451	28	1.9%
6	1,771	37	2.1%
7	2,258	54	2.4%
8	3,097	87	2.8%
9	4,414	136	3.1%
10	8,866	282	3.2%

Sources:
Boyce et al.(2005). "**A Chinese Sky Trust? Distributional Impacts of Carbon charges and Revenue Recycling in China".** Political Economy Research Institute, University of Massachusetts

Summary

Important Findings

1. 11 studies within developed countries generally suggest that environmental policy in the form of a carbon tax or energy tax is regressive {a}
2. 4 studies within developing countries found that what to be expected to happen in developed countries does not necessarily applied in developing countries. Studies above found contradictive conclusion that a carbon tax in developing countries could not be regressive or even progressive {b}
3. This contradictive finding is mainly contributed by the different patterns of household expenditure and energy use in developing countries and industrialized countries {b}

Remaining Question

How is the pattern of household expenditure and energy use in developing countries? Does the distributional Effect of a carbon tax in Developing Countries resemble to that Developed countries?

Note:
{a} This finding also confirmed by:
The survey by Baranzini et al. (2000), OECD (1994), OECD (1996), Kristörm (2003), and Boyce et al.(2005) confirm this general tendency
{b} It is firmly argue by Azis & Resosudarmo (2007) and Boyce et al. (2005).

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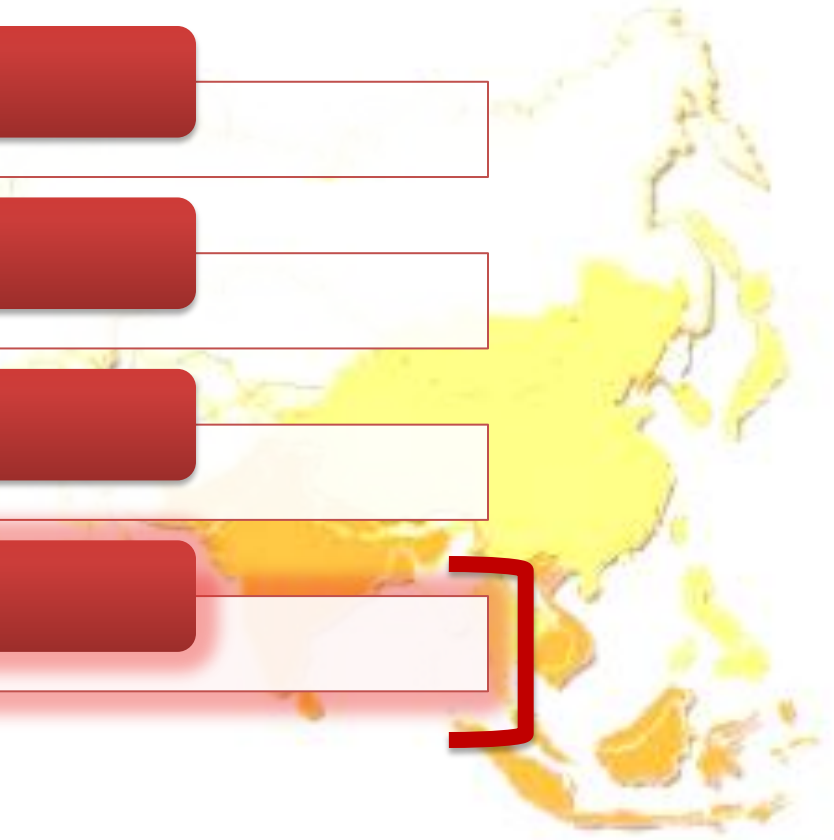
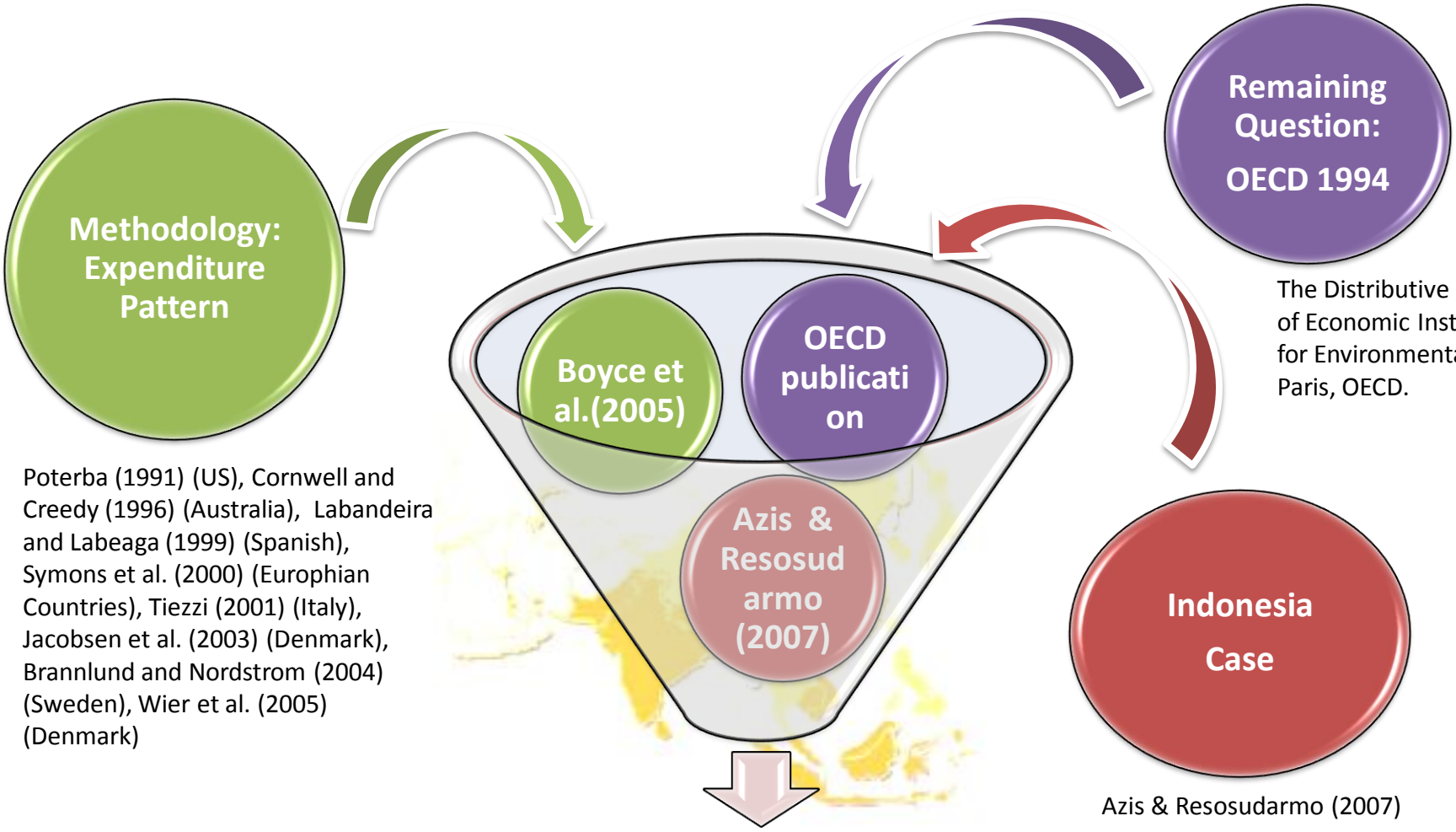


Research Proposition

Objective	• To investigate the distributional effect of a carbon tax in South East Asia (Indonesia)
Research Question	• Does carbon tax give a progressive distributional effect – (Indonesia) Case?
This Research (Will) Accommodates	• Different approach from Azis & Resosudarmo (2007) is used to address the issue of distributional effect of Carbon Tax in Indonesia • Incorporate time series household data to avoid seasonal turbulence and anomaly data

Research Proposition



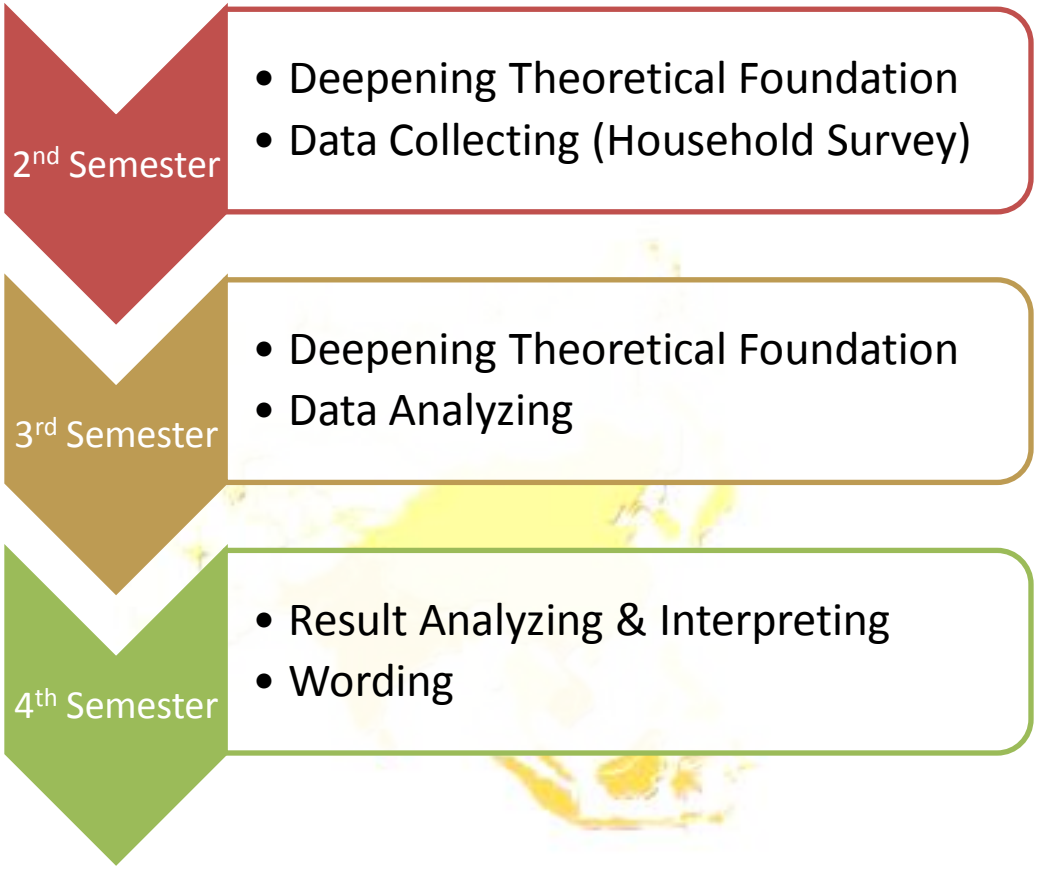
Poterba (1991) (US), Cornwell and Creedy (1996) (Australia), Labandeira and Labeaga (1999) (Spanish), Symons et al. (2000) (Europhian Countries), Tiezzi (2001) (Italy), Jacobsen et al. (2003) (Denmark), Brannlund and Nordstrom (2004) (Sweden), Wier et al. (2005) (Denmark)

The Distributive Effects of Economic Instruments for Environmental Policy. Paris, OECD.

Azis & Resosudarmo (2007)

This Research

Research Schedule



Selective References

Distributional effect of carbon tax	Azis & Resosudarmo (2007): "On the distributional effect of Carbon Tax in Developing Countries: The case of Indonesia". The Australian National University Boyce et al.(2005). "A Chinese Sky Trust? Distributional Impacts of Carbon charges and Revenue Recycling in China". Political Economy Research Institute, University of Massachusetts Matsuoka, S.(2000).Implementation of Environmental Policy in the Developing Countries: Regulatory Instruments & Their Efficiency. Hiroshima Univ. Poterba (1991). Is the gasoline tax regressive? NBER working paper No. 3578
Data	EDGAR: ihttp://equalc.com/ja/news/94-global-co2-emissions-annual-increase-halved-in-2008
Others	Bongaarts, J. (1992). Population and Development Review, Vol. 18, No. 2, pp. 299-319 Published by: Population Council UNDP - Human Development Report 2007/2008 "Fighting Climate Change: Human solidarity in divided world". P.125

ありがとうございました

Appendix - 1

Azis & Resosudarmo ,2007: Distributional Result

	SIM 1 No-revenue recycling	SIM 2 Uniform cut on com. tax rate	SIM 3 Uniform transfers
Urban			
Ex-ante Poverty Incidence	13.600	13.600	13.600
Ex-post Poverty Incidence	13.768	13.613	12.915
Change in Poverty Incidence	0.168	0.013	-0.685
Rural			
Ex-ante Poverty Incidence	20.200	20.200	20.200
Ex-post Poverty Incidence	19.430	19.743	16.198
Change in Poverty Incidence	-0.770	-0.457	-4.002
Urban + Rural			
Ex-ante Poverty Incidence	17.194	17.194	17.194
Ex-post Poverty Incidence	16.852	16.951	14.703
Change in Poverty Incidence	-0.343	-0.243	-2.492
Urban			
Ex-ante Gini Coefficient	0.347	0.347	0.347
Ex-post Gini Coefficient	0.347	0.347	0.337
Change in Gini Coefficient	0.000	0.000	-0.010
Rural			
Ex-ante Gini Coefficient	0.277	0.277	0.277
Ex-post Gini Coefficient	0.274	0.275	0.260
Change in Gini Coefficient	-0.003	-0.002	-0.017
Urban + Rural			
Ex-ante Gini Coefficient	0.350	0.350	0.350
Ex-post Gini Coefficient	0.347	0.348	0.333
Change in Gini Coefficient	-0.003	-0.002	-0.017

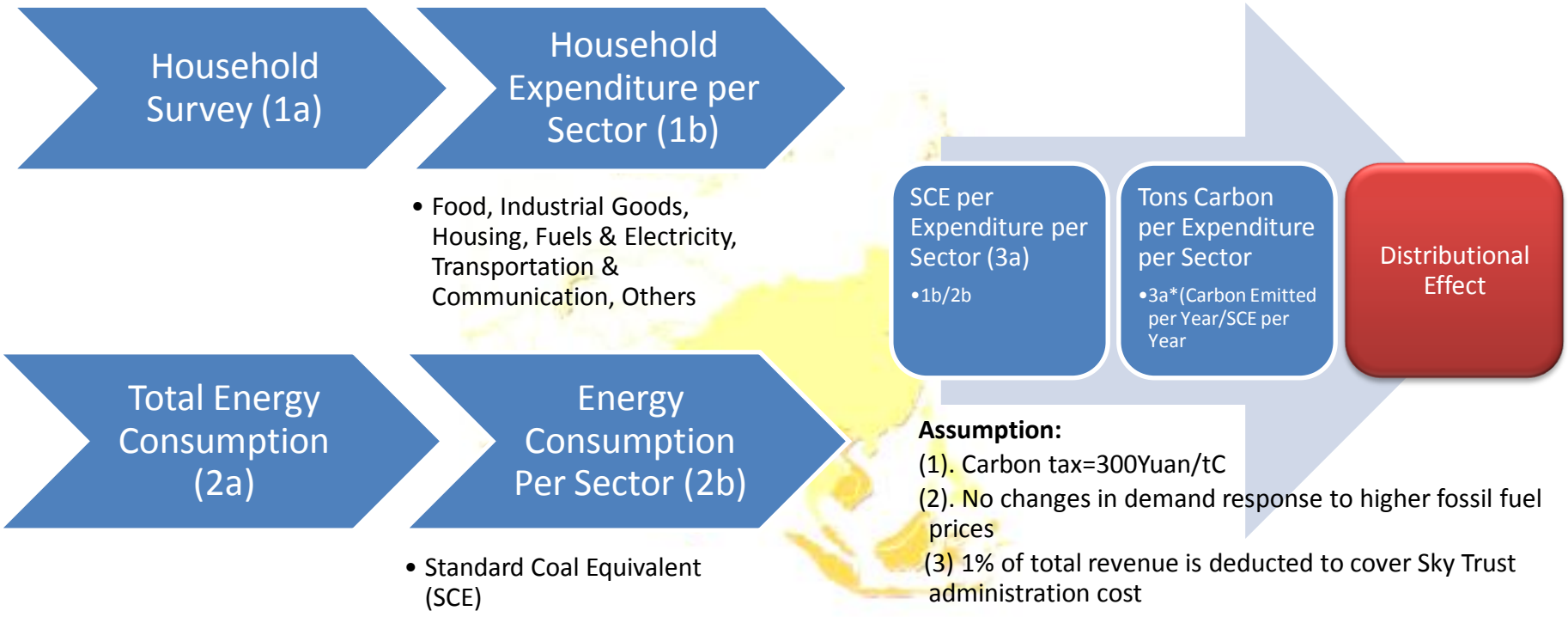
Note: All result show that carbon tax is progressive and able to reduce poverty as well as income discrepancy. SIM3 is more favorable since it shows highest significant effect .

Sources:

Azis & Resosudarmo (2007)**: "On the distributional effect of Carbon Tax in Developing Countries: The case of Indonesia".** The Australian National University.

Appendix - 2

Boyce et al. (2005): Data & Methodology



Sources:

Summarized from Boyce et al.(2005). "**A Chinese Sky Trust? Distributional Impacts of Carbon charges and Revenue Recycling in China".** Political Economy Research Institute, University of Massachusetts

Appendix - 3

Some Examples of Environment Tax Reform

Land (year)	*Use of Revenue*	*Land (year)*	*Use of Revenue*
Finland (1990)	General Budget (reduce Income Tax)	Netherland (1990)	General Budget (partly subsidy)
Sweden (1991)	General Budget (reduce Income Tax etc.)	Germany (1999)	Reduce SSC (90%) (partly subsidy)
Norway (1991)	General Budget	Italy (1999)	Reduce SSC (60%) Compensation 30% subsidy 10%
Denmark (1992)	General Budget (reduce SSC etc.)	UK (2001)	Reduce SSC

Sources: Park.(2007). "A Carbon Tax or an Environmental Tax Reform: Difficult Decision for Japan**".** The Eighth Global Conference on Environmental Taxation

In addition:

France will impose carbon tax in 2010 (http://www.earthtimes.org/articles/show/284014,france-to-impose-carbon-tax-in-2010.html). Retrieved: Nov 20, 2009