

SHARING THE BURDEN OF
SAVING THE PLANET:
*GLOBAL SOCIAL JUSTICE FOR
SUSTAINABLE DEVELOPMENT*

Lessons from the Theory of Public Finance

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Broad Consensus

- Global warming is a global problem, and need to be addressed globally.
 - Unless all countries participate, there is a danger of leakage; reductions in one country may be more than offset by increases elsewhere.
- Global warming is a long run problem.
 - We are concerned not so much with the level of emissions in any particular year, as with the long run levels of atmospheric concentrations of greenhouse gases.
- The costs of reducing the level of emissions (limiting the increases in atmospheric concentration of greenhouse gases) will be much lower if it is done efficiently.
 - Efficiency implies *comprehensiveness*—
 - all sources of emissions
 - All countries
 - all ways of reducing atmospheric carbon concentrations, including carbon storage and carbon sequestration

- There is considerable uncertainty, both about the level of “tolerable” increases in greenhouse gas concentrations and the impact of particular policy interventions.
- Global warming is a public good problem, so there is a risk of *free riding*
 - there will have to be some system of credible enforcement

two important corollaries

- We need a global agreement, and a global agreement will require equitable burden sharing
- The shadow price of carbon should be approximately the same *in all uses, in all countries, and at all dates.*

Current policies deviate from this principle

- The (shadow) price of carbon in those countries that have signed on to the Kyoto protocol is higher than in other countries
- The (shadow) price of carbon associated with deforestation is lower than in other uses
- In many countries, the price of carbon associated with renewables, and especially ethanol, is higher than in other uses.

This can be viewed as a standard problem in public finance

- There is a global public good, global warming.
- It has to be financed.
- Standard theories of public finance provide clear formulations concerning equitable and efficient taxation
 - Importance of transactions (enforcement) costs
 - Importance of compliance
 - Importance of second best considerations
 - Complexities of incidence analysis
 - Equity concerns are of first order importance

- These concerns affect
 - Choice of instruments (taxation, regulation)
 - Design
 - And what is appropriate for one country, one situation may not be for others
 - VAT is a distortionary tax in most developing countries, because enforcement is incomplete
 - VAT is inequitable
 - But in developed countries, VAT has some advantages in transactions costs, compliance

Bio-fuels: an example

- One of the responses in many parts of the world to the threat of global warming is to increase the production of bio-fuels
 - in some parts of the world, makes extensive use of already very limited supplies of water—which are unpriced: this distortion is increased
 - in the United States have taken advantage of global warming concerns to increase the magnitude of their subsidies
 - the increase in bio-fuels has contributed to the increase in the price of food
 - the *incidence* of the (hidden and implicit) tax on carbon is borne disproportionately by the poor in the world, since they spend a larger fraction of their income on food, while the rich bio-fuel producers and corn producers in the U.S. are actually better off
 - Problem exacerbated by inflation targeting central banks.
- Global warming would have disproportionately affected the poor in the world, but this response puts the burden of adjustment disproportionately on the poor.

Standard Tax Theory

- In competitive models, it makes no difference whether one taxes the consumption of a good or the production of a good
 - But there may be different transactions costs, compliance
- Current Carbon regime focuses on production
 - But does it make sense to “credit” developing countries with carbon content of goods that are consumed in developed countries?
 - With incomplete enforcement, leads to shifting of production

Alternative proposals

- Carbon Added Tax—could be implemented in a way similar to a VAT
 - Double check—at production and at final point of sale
 - Way of implementing cross-border adjustments, ensuring compliance
 - But higher transactions costs than just imposing a tax on oil, gas, and coal

Cap and Trade

- Easy to implement for major sources of emissions
- But harder to implement for multitude of small sources
 - Giving rise to distortions, transactions costs

Allocating Emission Rights

- Key problem: how to allocate emission rights
 - Valuable asset—worth perhaps \$2 trillion annually (5% of global GDP)
 - Within countries—subject to corruption
 - Major stumbling block in reaching global agreement
 - And attempt to avoid taking on full implications one of reasons for distortionary policies (carbon in different uses priced differently)

Allocation of emission rights

- Kyoto principle fatally flawed
 - More emission rights to those that emitted more in the past
 - Violates principle of polluter pay
 - Won't be accepted by developing countries
 - Not consistent with any ethical principle
 - Which should allocate more pollution rights to those that are poor
- Delay complicates
 - Implies increasing fraction of “commons” goes to the rich countries

- So far, only serious defensible principle is equal emission rights per capita
 - Adjusted for past emissions
 - Important not to have a process of slowly phasing in emission rights—increases inequities associated with past emissions
 - But this may entail large redistributions
 - Larger than are politically acceptable
 - Though not clear why this should be treated differently than other property rights

- Argument that cap and trade is better than tax system because of uncertainty is flawed, in the context of long run problem
 - In any case, there will have to be adjustments
 - In targets (caps)
 - In taxes

A common carbon tax

- Better to tax bad things than good
 - Double dividend
- More limited distributive consequences
 - Impact on each country is difference in harberger triangles of two taxes
 - Differences in impacts are related to differences in these differences
 - Likely to be small

- If permits are auctioned, then, except for enforcement costs, compliance (ensuring that each polluter actually has requisite permit) two systems can both achieve efficient emission reductions
 - Auctioning brings to the fore the distributional questions—how are proceeds to be divided
 - Standard welfare theories provide clear guidance—should be distributed to poorest individuals in poorest countries
 - Large pool of money to be used to finance global public goods
 - Including financing research to reduce emissions and for carbon sequestration

Carbon Conservation Equation

$$(1) \quad CA + CF + CS + CT + CO = C^*$$

Total carbon is equal to atmospheric carbon, carbon stored in fossil fuels below the ground, carbon stored in other forms below the ground, carbon stored in terrestrial carbon, and carbon stored in the ocean

Ignoring, for the moment, carbon stored in the ocean and below the ground in other ways

$$(1') \quad CF^* = C^* - CA^* - CT^*$$

If there is a limit to the atmospheric carbon, then the more carbon we store in terrestrial carbon, the more energy we can extract from fossil fuels

Eventually, there needs to be reliance on renewables

Pricing Carbon Sequestration

In long term equilibrium,

$$(2a) \quad e_i = s_i,$$

Emissions from a forest equal carbon sequestration

Land use determined to maximize

$$(4) \quad rcV + \alpha_1 p_1 L + \alpha_2 p_2 L - z$$

Flow lumber of L of which $\alpha_1 L$ is used for energy, with a value of $\alpha_1 p_1 L$; α_2 is used for “furniture” (or other decaying uses) with a value of $\alpha_2 p_2 L$

V total stored carbon, rc flow value of storage.

Different uses have different growth rates

$$(5) \quad L = gkV$$

So

$$(6) \quad rcV + \alpha_1 p_1 gkV + \alpha_2 p_2 gkV - z$$

Currently, private sector only focuses on private returns

$$(7) \quad \pi_i = \alpha_{1i} L_i p_1 + \alpha_{2i} L_i p_2 - z_i$$

- Social return exceeds private returns as a result of value of carbon sequestration

$$(8) S_i = rcV_i + \pi_i$$

When land is shifted from use i to use j ,

$$\Delta S_{ij} = rc \Delta V_{ij} + \Delta \pi_{ij}$$

- $$= rc \int \delta V_{ijt} + \Delta \pi_{ij}$$

Must look not only at change in private profitability, but in carbon stored

Can solve for long run equilibrium, and then solve backwards for pricing and tax (or equivalent, emission target) path

$$D(p1^*) = \sum_i \alpha_i V_i = \varsigma(p1^*, p2^*, t^*, \dots)$$

Where ς is the aggregate supply of energy

$$\xi^{-1}(p1^* - t^*) = C^* - CA^* - \chi(p1^*, t^*).$$

Incidence Theory

- Incidence theory calculates change in welfare of each country (individual) as a result of a particular {tax, allocation} scheme

$$(17) B(t^*) = E(\mathbf{p}(t^*), t^*, U_0, G(t^*)) + \Pi(t, \mathbf{p}(t), G(t)) - [E(\mathbf{p}(0), 0, U_0, G(0)) + \Pi(0, \mathbf{p}(0), G(0))]$$

$\mathbf{p}(t)$ is the general equilibrium price vector that emerges when the price of carbon is t , U_0 is the initial level of utility, and $G(t)$ is the “climate” associated with carbon tax t —a global public good

Fact that intervention is welfare enhancing means
that there exists some allocation such that

$$(18) B_i(t^*) + T_i(t^*) > 0$$

For all countries

Agreed carbon tax:

$$(22) T_i(t) = t e(\mathbf{p}(t), t)$$

Where e is emission levels

Deviations from Efficiency

Most countries have deviated from relying on a single price by subsidizing (e.g. renewables) or regulations

How do we explain this?

- (a) Reducing distributive burden—can be large changes in prices for small allocative effects
- (b) Correcting other market failures
 - (i) coordination failures
 - (ii) induced innovation
 - (iii) changing preferences? (consumption externalities)

Access to Technology

- Important determinant both of efficiency and equity
 - Patent system restricts the use of knowledge
 - Could lead to large transfers of wealth from developing to developed countries
 - Impediment to reaching a global agreement
 - Knowledge is a global public good
 - And like other public goods, should be financed equitably
 - Burden lying on richer countries

National Security

- Borders still make a difference
- Implying countries with large coal deposits will want to rely on coal—own energy supplies (energy independence)
- Major impediment to reaching a global agreement
- Value of security should be part of incidence analysis
- Illustrates the relationship between different global public goods: the global public good of international security (peace) and the global public good of global warming

Concluding Remarks

- World is engaged on risky experiment
- Imperative that there be reductions in emission levels
- But imperative that it be done in ways where the burden of adjustment is equitably shared
- Will require new economic model—changed patterns of consumption and innovation
 - We have treated two scarce goods (air and water) as if they were free
 - Charging for them will lead to large changes in prices
 - Only through changes in patterns of demand will adverse effects on developing countries be mitigated
 - Increasing reliance on renewables threatens increasing costs of energy and food—particularly hard for the poor

- Global Warming is a long run problem
- But it is a problem which needs to be attacked now
- Delay will increase the costs
- Delay in agreeing on equitable burden sharing will increase the likely inequities which will arise.