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Hybrid model of environmental taxation: Transition from European to Indian carbon tax to energy trade scheme

Tejas Mariswamy [1], Abdul Qayum [1], Akanksha Gupta [2] and Prajna G.S [3]

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Abstract

Rapacious exploitation of nature and natural resources by industrial economies in the 20th century has brought the world to the brink of environmental catastrophe. Realizing the gravity of crisis off late, growing environmental consciousness has pushed societies and governments worldwide to sustainably utilize resources and vigorously pursue nature conservation to mitigate the brimming disaster. One such attempt in the offing is the concept of Environmental Taxation, a tax intended to raise revenues to promote ecologically sustainable activities. This is a kind reinforcement of long-held ethical principle of polluter pays and it proves to be a major deterrent towards environmental degradation and brings sustainable growth. In the current work, a comparative analysis of the two economic approaches of tax and energy trade scheme (ETS) is studied, elaborated and discussed to achieve a low carbon intensive economy. European experience in carbon taxation is taken as a prime reference point. The sector-wise impact of the carbon tax in the European countries as well as the timeline, during which the taxes were imposed, provides an insight as to how such a tax can be internalized in the Indian context and its effectiveness was judged.

Key Words: Carbon tax, Development vs. conservation, Environmental taxation, European experience, Energy trade scheme, Hybrid model

Introduction

It is widely argued that developing nations are also required to adopt and adapt to environmental taxes to keep a check on the direct and indirect drivers of environment pollutions. Environmental/green taxation serves as deterrent tool towards curbing the impact on environment and climate change (Qayum and Gupta 2014). On the similar note, development versus conservation is also highly debated. Considering, growing population and its inherent bonafide needs, dependency on natural resources can't be compromised but a check in form of taxation may be imposed to mitigate the effect caused. The biggest carbon emitter is China, followed by the US, the EU and India at fourth position (Fig. 1) and it is anticipated that India is likely to beat Europe's CO_2 output by 2019 (McGrath, 2014). In India, some states such as Maharashtra and Tamilnadu have already initiated environmental taxation policy on old vehicles and the government expects to earn rupees 125 crore annually through green taxes (Singh and Deshwal, 2012). However, it is inadequate that taxation is restricted to vehicular pollution and not on the various industries which are major contributor to the carbon emission. Many other areas at present are not covered under the taxation policy such as effluent discharge to the water bodies, to the atmosphere or the losses to the biodiversity due to these drivers of pollution. Therefore, various industries engaged in hazardous waste generations shall be made liable for the taxation and amount generated shall be utilized for effective environment conservation monitoring programs (Srivastava and Rao, 2010). Carbon Tax and energy trade scheme (ETS) are two economic tools that are employed to enhance fuel efficiency and reduce fuel demand. Both have their own pros and cons. ETS was evolved after the Kyoto Protocol and the industries mostly prefer this system since there is minimal government interference and the certified emission reduction (CER) rates are determined by

Author's Address
[1]Indian Forest Service Probationer at Indira Gandhi National Forest Academy Dehradun, India
[2]School of International Studies Jawaharlal Nehru University, New Delhi
[3] Bachelor of Engineering from BTL Institute of Technology & Management Bangalore
E-mail:qayum.iitk@gmail.com

the market forces. However, a major concern remains is the carbon credits will be very cheaply priced if the demand is less, in that cases there will be little motivation to minimize the emission. Grandfathering of Credits is another lacuna where the new companies will be at competitive disadvantage compared to the older ones which would have accumulated credits when the market rates were low. However, the carbon tax overcomes the concerns expressed over the said lacuna. Apart from forcing various sectors to reduce their fuel consumption, it brings in additional revenue for the states. The carbon tax may also be imposed on sectors such as transportation, agriculture, households where ETS cannot be easily applied to. The centralized administration of the system ensures easy implementation of desired taxes. Further, a major concern of eco-taxation is regressive in nature. Carbon tax like the excise duty is likely to affect the poor household severely. This can be negated by using revenue recycling strategies discussed in the work, appropriately.

Carbon taxation in Europe

Finland introduced the world's first carbon tax in 1990. In 2010 the tax was 20€ /t-CO_2. Sweden implemented carbon tax on fossil fuel and had witnessed highest reduction in fuel demand/CO_2 emission of 9% during 1990 to 2006 while, UK introduced carbon tax in transport sector in 1993. Various other sectors were covered by 2001. UK has also made it mandatory for all new buildings to have zero emission for heating, cooling and lighting by 2016. Switzerland introduced tax in 2008, but gave exemptions to companies coming under the ETS scheme (SBS, 2013). Although many EU countries have individually enacted legislation relating to eco-tax, the attempt by European Commission to have a common tax framework across EU has failed. The Kyoto protocol initiative of energy trading has remained quite popular in the region. EU-ETS had begun its operations in 2005. All 27 EU countries and 3 non EU- Iceland, Liechtenstein and Norway are party to it. The current target for EU in concurrence to its commitment to reduce carbon footprint is to reduce GHG emission level by 21% of the 2005 level by 2015.With increasing industrial demands of natural resources and enhanced thrust on environment degrading factors, it would be strategic to adopt a hybrid model based on carbon tax and ETS, where and complementing each other. The hybrid model both the instruments are operating simultaneously is illustrated through example of United Kingdom (UK) and its eco-tax strategies in the region.In UK, top two green house gases (GHG) emitting sectors are industries and transport (European commission, 2012). Industries are covered under the European Union (EU) ETS scheme while the transport sector is uncovered. Apart from cap and trade provision under ETS Scheme, the industries are subjected to consumption based carbon tax with a floor rate of €26/t-CO_2 (Vivid Economics, 2012) (Fig. 2). On the contrary, transport sector is heavily taxed at €248/t-CO_2 (as per 2011 prices) (Fig. 3). Here, vertical line indicates the tax rates (in Euros) and the horizontal line is the amount of CO_2 emission in metric ton.

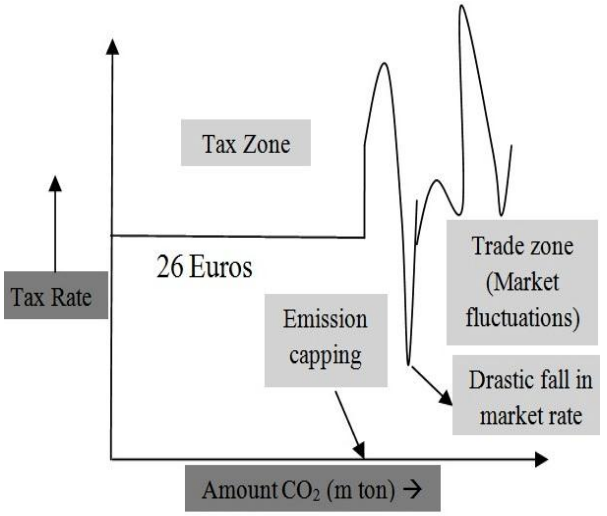

Fig. 2: Taxation rates in industrial sector

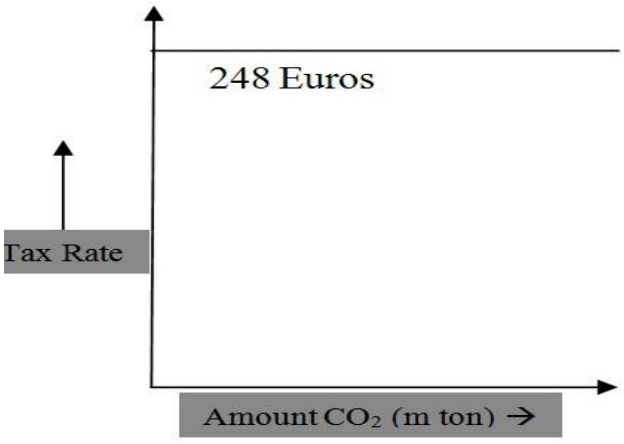

Fig. 3: Taxation rates in transport sector

In the tax zone a flat rate is applied to the industries. Once the total emission surpasses the capped level, industry has to buy carbon allocations from the carbon markets. The trade zone, however is suseptable to market forces. Further, it is observed that at one point carbon credits were cheaper than the tax imposed. Within the tax zone since the tax rates are flat there is no incentive for the industries to improve its efficiency.

Materials and Method

In the tax zone instead of a flat rate we shall impose linearly increasing rate from say a lower tax limit(T_a) to say a upper tax limit(T_b), such that the average of these tax limits is original flat rate (x) i.e. $x = ½ x (T_a + T_b)$. Such initiation will encourage the stake holders to increase their fuel efficiency and will develop a check on maximum consumption of fuel as it provides more tax benfits and an indirect incentive. Also in the traded zone, a minimum traded price(T_c) may be imposed as a protection against drastic market fluctuations (Fig. 4).

Revenue Recycling Strategies

The carbon tax is indirect in nature. The revenue recycling is essential and important to ensure that people of lower socio-economy are not unfairly affected. Few such strategies to address demands of lower strata of society may include:

Increasing the income tax exemption amount to provide benefits to the poor section of the society i.e. to increase the tax slab.

For people bearing below poverty line (BPL) cards some amount may be transferred to counter balance the eco-tax effect. This transfer shall be linked to their AADHAR (Nationally accessible) cards.

Modification of the VAT structure: Currently, a common VAT rate is applicable to all people. Instead, a new VAT system may be introduced based on the monthly expenditures of family e.g.

S. No.	Total Expenditure/ Month (INR)	VAT Rate (%)
1.	< 1000	a
2.	1,000 to 10,000	a + d
3.	> 10,000	a + nd

Where, INR is Indian National Rupee; 'a' is Base VAT rate (less than the existing rate); d is some differenential applicable and n is some number >1.0. Parameters d and n have to be calculated by the finance ministry as per the standard procedures. These initiatives are likely to greatly help in reducing the inflationary impact of carbon tax. The only bottleneck as perceived in implementing this taxation is that we already have many type of taxes therefore the public will perceive carbon tax as another burden. Later, this tax may be adequately merged with upcoming good and service tax (GST), which will subsume almost all indirect taxes and will facilitate easy administration for the taxation policy.

Results and Discussion

The integrated hybrid model of taxation may be represented as (Fig. 4):

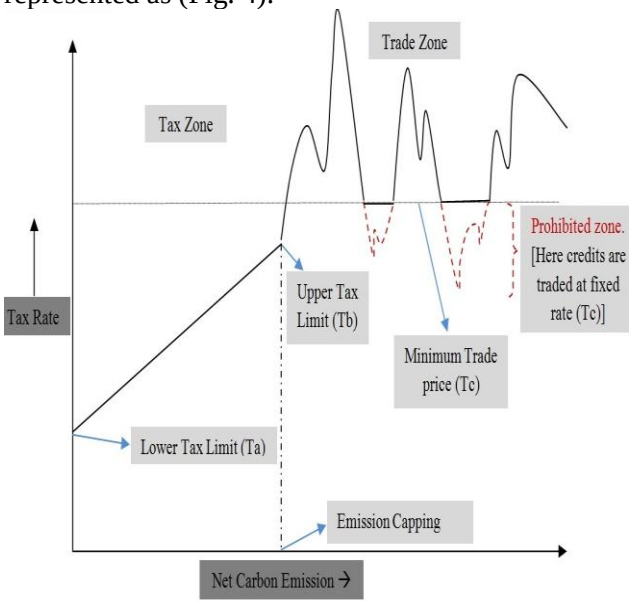

Fig. 4: Hybrid taxation model

For industrial sectors which prevails in India, there can't be a flat rate of taxation but a progressive model of taxation may be adopted (Fig. 4). However, before its incorporation it is needed to assess the impact of this tax on the society and economy comprehensively. And, therefore European case may be taken as the reference point since it is highly successful in carbon taxation, and it generates huge possibility of visualizing similar taxation policy in India.

Feasibility of Carbon Tax in India

India is the third largest emitter of GHG emission after China and United States. Acknowledging the need to reduce its carbon footprints, India has voluntarily set a target to reduce carbon intensity by 25% by 2020 compared to its 2005 levels. However, in the area of green taxation India is laggard. This is understandable since it has to cater to its much needed developmental needs and to the growing needs of the growing population. Eco-tax was first introduced in India in the form of coal tax in 2010, which charges Rupee 50 per metric ton of coal both produced and imported into India. The taxes collected will go into the 'National Clean Energy Fund' which will fund research and innovative project under clean energy technology. Such hypothecation of fund for a specific purpose will ensure political legitimacy of such a tax. Given the vulnerability of India to any subsequent climate consequences the initiatives need to be multiplied manifolds. The EU model has shown that, such taxes will be effective in reducing fuel demand and increasing fuel efficiency.

Impact of carbon tax in Europe

It was found that overall impact of the carbon tax is positive in the EU region under the COMETR project (Andersen, 2007). The project employed 'economy-energy-environment macro-econometric' (E3ME) model of Cambridge econometrics (Andersen, 2010). The model does a comparative assessment between seven countries which had implemented environmental tax reforms during period of 1994-2004 and rest of the EU nations. The seven countries include Denmark, Netherland, U K, Finland, Sweden, Slovenia, and Germany. The effect of environmental tax rates (ETR) on the percentage reduction in fuel demand and reduction in GHGs emission was studied. Percentage difference refers to the difference between the base case and the reference case. The zero line is the base line that represents the situation if the environmental tax or the carbon taxes were not imposed. Evidently there is sharp decrease in the carbon emission in these countries, with Sweden showing the highest decrease in fuel demand as well as GHG emission followed by Finland (Fig. 5 and Fig. 6). The impact of carbon tax in Europe is clearly seen across major European economies of UK and Germany. It is evident that the reduction of fuel demand and reduction of GHGs emission in Germany is higher than UK, in general. However, the mean carbon energy tax rates at market exchange rate in 2011 per metric ton of CO_2 in Germany is 66 Euros which is less than that in UK which is around 71 Euros (Table 1). This indicates that the reduction of fuel demand does not have direct correlation with the tax rates. Reduction depends on internal dynamics of economy as well.

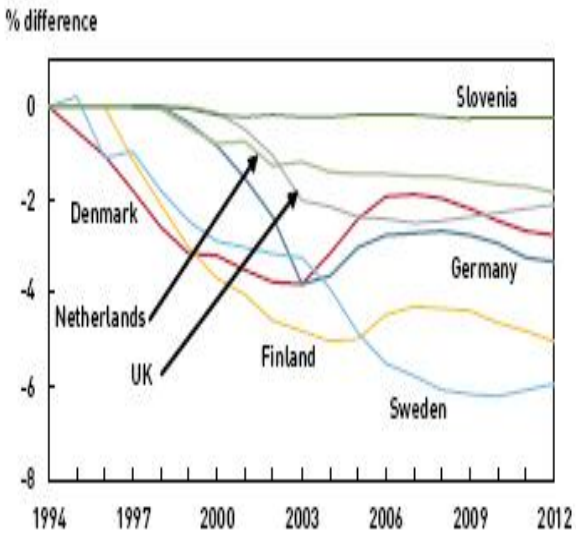

Fig. 5: Effect of ETR on fuel demand (Source: Andersen, 2010)

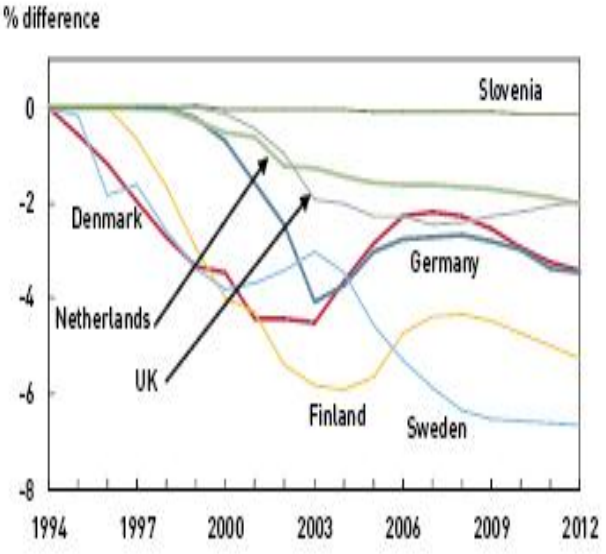

Fig. 6: Effect of ETR on GHG emission (Source: Andersen, 2010

The impact of carbon tax depends on the profile of an economy including the existence of energy intensive industries, dependence on traded sectors (exports industries which are prone to international competitiveness), and technological advancement and so on. Also, a government cannot impose tax merely on economic impact perspective; it has to take into account the impacts on general public/households etc. The rates should be in accordance to the bearable capacity of the sector.

Table 1: Carbon tax rates in European Countries, 2011, €/tCO_2 (Source: Vivid Economics, 2012)

Country	Mean	Residential	Transport	Industry, Public and Commerce
France	66	12	149	15
Germany	66	34	199	23
Greece	58	5	213	5
Hungary	44	-4	144	13
Italy	78	70	179	24
Poland	35	9	126	18
Portugal	72	10	151	15
Spain	56	20	115	17
UK	71	-31	248	26

It is evident that the carbon tax rate is dominated by the transport sector since it is the second largest GHG contributor in Europe (Table 1) and not covered under the ETS scheme (Vivid Economics, 2012). Industries, although are the major contributor to the GHG emission, the tax imposed is drastically less compared to transport industry. This is primarily due to two reasons. One, the industries are primarily energy intensive and a high tax will reduce their competitiveness given they have to compete with economy growing countries such as China and India which are not bound by international deliberations such as Kyoto protocol. Two, the industries are covered under the 'Cap and Trade scheme' of EU-ETS. The most prominent observation is the large fuel subsidy provided by UK to its households. This was a part of its scheme to reduce the occurrence of fuel poverty amongst its poor household.

Why progressive rate of taxation?

Progressive rate of taxation (Method 2) or uniformly increasing rate of taxation has inherent trait of motivation for industries and other sectors to reduce its carbon emission while net revenue incurred to the enforcing agencies remain same. If a sector emits less, it will be taxed less in comparison of constant/flat rate of taxation (Method 1) and therefore, it gets reason to decrease the carbon emission leading to better environmental conservation. Mathematically, it can be proven also that for a fixed quantity of carbon emission say 'q' metric ton, revenue collection shall be same. Revenue collection (RC) is area bounded in the curve (Fig. 7), which is product of net carbon emission and tax rate.

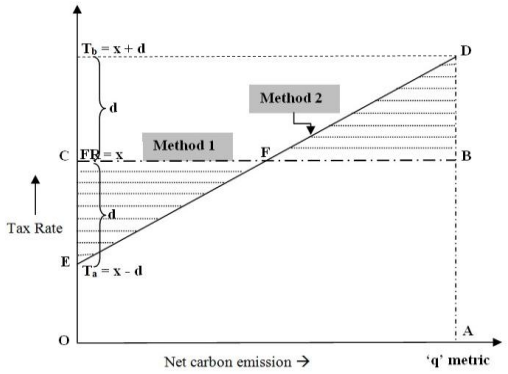

Fig. 7: Progressive model of carbon taxation

Method 1 (Flat rate): If flat rate (FR) of taxation is and quantity is q,

RC = Area of rectangle OABC = q X x.

Method 2 (Progressive rate): For uniform rate, increment from lower tax rate (Ta) to FR and FR to maximum rate (Tb) be same (say d).

Then, Ta = x-d, Tb = x+d and RC = Area of trapezium OADE = 1/2 X (Ta + Tb) X q = 1/2 X (x-d + x+d) X q = x X q (Same as method 1).

It is estimated that the carbon taxes will generate to the tune of 10 billion Euros per annum by 2020, approximately 1% of Spain's projected GDP, greatly improving its fiscal health. As per the 'Double dividend hypothesis', if the same amount of money was raised through either direct or other indirect taxes, there would be greater detrimental macroeconomic impact (Vivid Economics, 2012). The hypothesis suggests to the double benefit accrued by imposition of carbon tax. The first dividend is an improvement in the environment, and the second dividend is the reduction of tax burden on the poor from the use of environmental tax revenues to reduce other taxes such as VAT

using tax recycling strategies. It can be said that carbon tax has not just a positive environmental impact but also ensures in good macro-economic outcomes and it is a potential alternative tax. Power, industry and transport sectors are major contributors of GHG emissions (Mohan, 2009). The trade sectors are highly sensitive to carbon tax since the impact on the competitiveness can be detrimental. In such cases, there can be schemes where an industry will be given a target to increase its energy contribution from clean energy source by say a %. In case the Industry fails to achieve the target it will have to pay a penalty. Alternatively, we can gradually increase the coal tax. In non trade sectors such as transport, stringent tax can be imposed on vehicle which shall be periodic (annual) in nature. This tax rate will be proportional to the price of the vehicle and in commensurate with the paying capacity of the user.

Conclusion

Scientifically designed and rigorously executed study can be useful for the policy formulations. Adoption of modification of carbon tax in India needs a comprehensive and much elaborated study. More case studies may be needed to find out microscopic details of the taxation policy. Therefore, as a strategy to minimize the emission of GHGs we would recommend a hybrid policy instrument where the carbon taxes and the Energy Trade Scheme operate complementing each other, preferably the progressive carbon taxation model.

Although, carbon tax is indirect in nature, the inflationary aspect can be negated by the revenue recycling strategies. One such strategy is to have a varying VAT rates as explained in the current work. Carbon taxation has been very successful in EU where it has shown the apprehension about eco-tax is not true and in fact it has positive impacts on the economy. Thus, it is time for India to initiate the carbon tax regime in the country without any further delay. Carbon tax should not be seen as just another tax, rather it should be seen as an alternate to indirect taxes and to some extent it may be a direct tax. Taxes alone however will not serve the purpose of environment sustainability; we sooner or later need to adopt cleaner technologies. Hence, the revenue generated from carbon tax should be earmarked for research and development in clean technologies. Such hypothecation also increases the legitimacy of carbon tax and wider application may be envisaged.

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References

Andersen, M.S., 2010. *Europe's experience with carbon-energy taxation*. *SAPIENS*, 3.2. Available at: http://sapiens.revues.org/1072

Andersen, M.S., Barker, T., Christie, E., Ekins, P., Gerald, J.F., Jilkova, J.,Junankar,S.,Landesmann,M.,Pollitt, H., Salmons, R., Scott, S., and Speck, S., 2007. *Competitiveness effects of environmental tax reforms (COMETR).* Final report to the European Commission, DG Research and DG TAXUD. National Environmental Research Institute, Aarhus University, 512 p.

European Commission, 2012. *Climate Action Policies: Reducing Emission from Transport*. Available at: http://ec.europa.eu/clima/policies/transport/index_en.htm

McGrath, M., 2014. *China's per capita carbon emissions overtake EU's*. *Environment correspondent, BBC News*, New York. http://www.bbc.com/news/science-environment-29239194

Mohan, K., 2009. *Rural Electrification and Decentralised Distributed Generation.* Report on *Energy and Climate Change: Focus on India*, Ministry of Power, Government of India, New Delhi, Issue-6: pg-6.

Qayum, A. and Gupta, A., 2014. Environmental Taxation as a Mitigation Tool: A De-novo Approach. ***Environmental Policy and Law***, 44(3):312-321.

SBS Article, 2013. *Fact box Carbon Tax around the World*. Available at: www.sbs.com.au/news/article/2013

Sing, S. and Deshwal, M., 2012. *Green Tax and its effectuation in India*. *Social Science Research Network.*

Srivastava, D.K. and Rao, B.C., 2010. *Reforming Indirect Taxes in India: Role of Environmental Taxes*. Madras School of Economics, Chennai 50.

Vivid Economics, 2012. *Carbon taxation and fiscal consolidation: the potential of carbon pricing to reduce Europe's fiscal deficits.* Report prepared for the European Climate Foundation and Green Budget Europe, Pg-21,29,51.