Environmental Taxes: Dead or Alive?

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Abstract

Both theory and recent trends suggest some optimism for the future of environment-related taxes. While new research emphasizes the potentially significant distortions created by environmental taxes and appears to undermine the so-called "double dividend" theory, it also suggests that virtually *any* environmental policy, including regulations, taxes, and tradable permits, can compound existing distortions in the tax system. Currently, direct environmental taxes, such as per-unit charges on emissions, are only in limited use; however, indirect environmental levies, including taxes on fuels, vehicles, beverage containers, and fertilizers, are growing in importance across the OECD nations. Over the period 1990-1993, environmental taxes as a share of total revenue increased while taxes on personal and corporate income declined slightly, indicating a modest tax shift.

Key Words: environmental taxes, double dividend, distortions, tax shifts

JEL Classification No(s).: D62, H21, H23

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INTRODUCTION

With budget deficits looming in governments throughout the industrial world, the need to develop sound and politically acceptable tax policies has never been more pressing. In 1993, the Clinton Administration's proposed BTU tax crashed like a lead balloon. Yet, despite this inauspicious debut, many analysts and even some politicians are becoming convinced that taxing "bads," such as pollution, makes much more sense than continuing to tax "goods" (work, savings, investment). This idea was given impetus by the finding, supported by a number of prominent experts including Pearce, Repetto et al., and others, that such tax shifting might yield environmental gains at little or no cost, the so-called "double dividend" (Pearce, 1991, pp. 938-948; Repetto et al., 1992). The prospect of a zero-cost environmental policy is appealing on many grounds, not the least of which is that it reduces the need for rationalizing information on the relative benefits of any proposed policy. Now new research by Bovenberg, Goulder, Parry, and others is threatening to undermine this budding romance with environmental taxes (Bovenberg and de Mooij, 1994; Goulder, 1995; Parry, 1994). In its simplest form, the new literature -- which stresses the inefficiencies caused by the compounding effect of environmental taxes on top of an already distorting tax system -- undercuts the "free lunch" argument. That, in

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turn, may diminish the impetus to adopt environmental taxes.

Although not the favorite of policymakers, environmental taxes have rested on an academic pedestal since first proposed by Arthur Pigou in his *Economics of Welfare* (1920). Pigou argued that taxing emissions would reduce pollution in the most efficient manner possible. The idea that such taxes themselves would introduce new distortions into the economy was never seriously considered by Pigou or by anyone else writing in the field for almost three quarters of a century. To the surprise of most economists the new research concludes that the distortions associated with environmental taxes can be quite significant. As it turns out, other policy instruments, e.g., traditional regulations or tradable permits, cause similar distortions. However, unique among the other instruments currently in use, environmental taxes provide the revenues which can be used to reduce other (nonenvironmental) taxes and thereby reduce some of the distortions. The real implication of the new research is that while all policy instruments may be somewhat more costly than previously thought, alone among instruments currently in use environmental taxes have the potential to reduce some (probably not all) of those costs.

This article explores these new developments in the theory and examines recent experiences in implementing environmental taxes in industrial countries. The first section reviews the recent and generally arcane economic literature, including much of the ongoing debate of taxing "goods" and "bads." It traces the evolution of academic writings on environmental taxes from Pigou to those who contend that such taxes provide "double dividends," to those who more recently argue that there can be no free lunch. The second part

analyses new information generated by the International Monetary Fund (IMF) and the Organization for Economic Cooperation and Development (OECD) on different country practices with environmental taxes from 1990-1993. The conclusion is that environmental taxes -- whose share of total tax revenues rose by more than ten percent over the period 1990-1993 -- remain an attractive policy instrument which are likely to be relied upon increasingly to help ease fiscal pressures.

I. THE ACADEMIC LITERATURE ON ENVIRONMENTAL TAXES

A. From Pigou to the "Double Dividend"

In the "Tragedy of the Commons," Garrett Hardin observed that overgrazing unrestricted commonlands was a metaphor for the exploitation of all the earth's land, air, and water resources. Because private and social costs diverged, private profit-maximizing decisions were not socially efficient. The cause of the overgrazing was the absence of a mechanism to force herdsmen to take into account the harmful effects of their own herds' grazing on other herdsmen. Similarly, the causes of pollution stem from the failure of markets to incorporate the full costs or benefits of economic activities. Government intervention in one form or another, including taxes, can often lead to more socially desirable outcomes.

Economists have long advocated an emissions tax levied on each unit of pollution that is discharged, where the tax is set equal to the value of the pollution damages, as a suitable means of equating private and social cost. By raising the price of polluting to reflect social cost, environmental taxes ensure that polluters face both the private and the social costs of their actions. In the absence of taxes or other control mechanisms, for example, traditional

regulations or marketable permits, environmentally damaging activities tend to be carried to excess. The fact that environmental taxes rely on a price mechanism rather than the administrative prices associated with command-and-control regulations increases their efficiency and lowers overall compliance costs. They also encourage the greatest pollution abatement by firms able to adjust at the lowest cost and they encourage deployment of new technologies.

In truth, virtually all taxes create incentives or, more precisely, disincentives which have the effect of re-allocating activities away from their pre-tax activities. A tax on any good or service raises its cost to the buyer, thereby creating an added incentive to search for cheaper alternatives. Similarly, it lowers the net after-tax receipts to the seller, discouraging production or sale of the good or service. It is because of these tax-induced economic pressures to alter behavior, e.g., the incentive to buy the untaxed and presumably less desirable goods and services that would not have been purchased in the absence of the tax, that every $100 in revenue collected typically makes individuals worse off by more than $100. This effect is referred to as a loss in economic welfare. The larger the incentive effects of individual taxes, the larger the welfare losses.

Estimates for the U.S. economy have found that the disincentives to work and invest from our current tax system are considerable. **Table 1** displays estimates of the disincentive effects of U.S. taxes on social security, individual income and investment income. Since some of these estimates were made before the tax cuts of the 1980s, which lowered marginal tax rates

Table 1. ESTIMATES OF TAX-INDUCED DISTORTIONS

TAX	RANGE	AVERAGE VALUE
Social Security Payroll	$0.31 to $0.48	$0.40
Individual Income	$0.40 to $0.60	$0.50
Investment Income	$0.58 to $1.18	$0.88

Sources:

Summarized by Repetto, Robert, Roger C. Dower, Robin Jenckins, and Jacqueline Geoghegan, *Green Fees*, World Resources Institute, Washington, D.C., 1992.

Original sources as follows:

Ballard, Charles L. "Marginal Efficiency Cost Calculations for Different Types of Government Expenditure: A Review," paper presented at the Australian Conference in Applied General Equilibrium, Melbourne, Australia, May 27 - 28, 1991.

Jorgenson, Dale and Kun-Young Yun. "The Excess Burden of Taxation in the United States," Harvard Institute for Economic Research, Cambridge, MA., November 1990.

Trostel, Philip A. "Taxation in a Dynamic General Equilibrium Model with Human Capital," Ph.D. Dissertation, Department of Economics, Texas A & M University, 1991.

on many forms of income, the lower end of the ranges are probably more applicable today. The median of estimates of the disincentive effect of the individual income tax is 0.5. Thus, substituting $100 billion of (ideal) non-distorting taxes for the current income tax is estimated to yield an additional $50 billion in consumer welfare. For taxes on social security and investment income, the comparable estimates are $40 billion and $92 billion, respectively. Like taxes on labor and investment, environmental taxes have disincentive effects. However, for the per-unit emission taxes of the type advocated by Pigou, it would appear at first blush that the only disincentive effects are to discourage pollution.

In the early 1990s, a number of economists argued that there would be a "double dividend" associated with substituting environmental taxes for other, distorting taxes. Not

only would the former reduce pollution and thereby generate health, ecological and other benefits, but when substituted for the latter they could eliminate the losses associated with the distorting taxes. Given the magnitude of the disincentive effects associated with our current tax system, many believed the "dividend" could be sizable. A 1992 study by Shackelton et al. compared the results of four large models of the U.S. economy on the consequences of mitigating carbon dioxide emissions by imposing carbon taxes while recycling the revenues in various ways. It concluded that "the costs of a carbon tax may be largely and perhaps even fully offset by taking advantage of its efficiency value and using the revenues to cut existing taxes that discourage capital formation or labor supply."[2] This gave succor to those who believed all along that taxing "bads," such as carbon, would be inherently beneficial, and, indeed, yield a bonus, or "double dividend."

B. The Critique of the "Double Dividend"

Just as physicists have continued to discover new elementary particles, economists develop more complete understanding of the operation of the economic system. Recent research has found that the "double dividend" theory oversimplifies a number of key points.[3]

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[2] Of course if the tradable permits were sold or auctioned off (like the Federal Communications Commission does with new radio frequencies), there would be revenues equivalent to taxes.

[3] The "double dividend" argument referred to throughout refers to what is technically referred to in the literature as the "strong" version. There is also a "weak" version of the double dividend theory which simply states that returning tax revenues through tax cuts in distortionary taxes leads to cost savings relative to the case where revenues are returned in a lump sum or equiproportional amount to everyone. This claim is easily defended on theoretical (and empirical) grounds and is of little policy interest. Accordingly, it is not discussed herein.

Specifically, the proponents of the "double dividend" theory have assumed that the distortions caused by existing (nonenvironmental) taxes which, as noted, are sizable, are only affected by changes in tax laws and that they cannot be exacerbated by environmental policies. The new research disputes that point by demonstrating that environmental policies -- which include regulations, tradable permits and taxes -- can increase the distortions caused by pre-existing (nonenvironmental) taxes.

The following case illustrates how this might occur. If an individual earns $10 per hour in the absence of any taxes it would take exactly one hour of labor to earn enough to purchase a new compact disc (CD) costing $10. If marginal tax rates, including both income and social security payments, are one third, then it would take an hour and a half of labor to purchase the same CD. Various studies have shown that many people, including second or third earners in a family, individuals with young children, and others, may be discouraged from entering the labor force or may work fewer hours as a result of these (high) marginal tax rates. Thus, in this example, taxes discourage work and reduce consumer welfare.

Now consider an environmental policy that reduces toxic emissions from the manufacture of plastics and solvents used in the production of CDs. Whether the policy is in the form of a regulation, a tradable permit or a tax, the cost of producing the CD is likely to rise. If it rises by 2 percent, or 20 cents, it will take the same worker in the no-tax world an additional 72 seconds (2 percent of 60 minutes) of labor to earn enough to purchase the CD. In the presence of the (existing) marginal tax rates, assumed to be one third, the new environmental policy will raise the required work time by 108 seconds (2 percent of 90 minutes).

The new research has shown that the additional required work time to purchase a given set of consumer products, 108 seconds in the hypothetical example, will further discourage certain people from entering the labor force or working long hours and thereby further reduce consumer welfare. If a tax on toxic emissions from CDs is the policy of choice then the revenues can be used to reduce other taxes. Yet the new research suggests that these rebates are unlikely to fully offset the distortions caused by the initial tax on CD emissions. Of course, if the environmental policy used to achieve the environmental objective is in the form of a regulation or a tradable permit that is given away without cost to the polluter, then there is no revenue available to offset any of the newly created distortions. Thus, one clear conclusion of this new research is that while the existing (nonenvironmental) taxes may add to society's costs of making virtually any environmental gains, alone among the policy instruments environmental taxes have the potential to offset at least some of these costs (Shackelton et al., 1995).

Short of having controlled experiments -- an unlikely prospect -- research in this area is dependent on the use of large computer simulations of these complex effects. Of course, different experts have different models and the arguments get arcane very fast. Notwithstanding these challenges, one of the new areas being explored is whether using environmental taxes to reduce taxes on capital as opposed to taxes on labor may revive the "double dividend" theory. As shown in Table 1, taxes on capital have been estimated to be more distorting than taxes on labor. Thus, reducing taxes on capital is likely to more easily offset the distortions created by any new environmental taxes. However, while the jury is still out, few experts believe the differences will be large enough to overturn the basic conclusion:

while revenue neutral environmental tax swaps do not make environmental gains a free lunch, they may substantially reduce the costs when compared to other policy mechanisms.

II. RECENT DEVELOPMENTS IN OECD COUNTRIES

Coincident with these raging academic debates, the IMF has recently completed a survey of tax laws in 42 nations -- industrial and developing countries, and economies in transition. They found that Pigouvian taxes were used in one or more instances in ten of the 19 OECD countries surveyed (mostly on hazardous wastes and aircraft noise). None was used in the U.S. and none was used outside the OECD except in the economies in transition where all four countries surveyed were found to use them. However, as the authors note, "it is easy to exaggerate the role of Pigouvian taxes because the rates rarely reflect environmental damages and, particularly in economies in transition, there is reason to believe that actual practices diverge sharply from legislated provisions" (McMorran and Nellor, 1994, page 8).

In contrast, indirect environmental taxes, including levies on fuels, energy, fertilizers, and beverage containers are widely used. The IMF found them in 20 of the 23 non OECD nations and in all 19 of the OECD countries surveyed. Unfortunately, definitional issues abound once you depart from pure Pigouvian taxes, and it is difficult to know exactly when a tax is properly labeled an environmental tax. The IMF survey addressed the issue from a strictly legal perspective. However, they did not attempt to develop revenue estimates. Fortunately, the OECD has attempted to develop consistent definitions for the purpose of estimating revenues. All revenue estimates presented below are for the period 1990-1993 and are derived from published OECD sources. 1990 is chosen as the base year since the share of

revenues from environment-related taxes began rising significantly in that year.

Certainly the largest source of environment-related taxes across all OECD countries are those on automobile fuels (gasoline and diesel) and on vehicles themselves. However, other taxes are of growing importance. As an example of different nations' use of environment-related taxes it is useful to examine the experience of several of the Nordic countries which have been generally aggressive in adopting such taxes. Denmark has sixteen separately reported taxes with environmental implications -- the most of any country -- while Norway relies on environment-related taxes more heavily than any of its Northern European neighbors for its revenues. In 1993, 7.30 percent of Denmark's total tax revenues were derived from environmental related taxes, up from 7.08 percent in 1990 (**Table 2**). The composition of these revenues changed somewhat over this period, with the introduction of a CO2 tax and an increase in the tax on certain oil products offsetting decreases in duties on petrol, motor vehicle registration, coal and electricity. Over the period 1990-1993, environmental taxes in Norway rose by more than one percentage point, from 9.40 to 10.75 percent of total tax revenue. Like Denmark, Norway introduced a CO2 tax in the early 1990s. This accounted for the bulk of the increase in revenue while most other taxes increased slightly or not at all as a source of revenue during this period.

Table 3 presents the share of revenue derived from taxes with environmental implications for 20 OECD countries for 1990 and 1993. Overall, these revenues rose from 6.02 percent of the total in 1990 to 6.67 percent in 1993, an increase in tax share of more than

Table 2. ENVIRONMENT-RELATED TAXES IN DENMARK AND NORWAY

(as a percent of total tax revenue)

TAX	1990	1991	1992	1993
DENMARK				
Duty on petrol	1.45	1.36	1.36	1.29
Motor vehicle registration duty	2.03	2.07	2.02	1.91
Sales on vehicle number plates	0.07	0.07	0.07	0.06
Duty on electricity	1.11	1.10	0.95	0.81
Duty on certain oil products	0.81	0.93	0.97	1.09
Duty on certain retail containers	0.10	0.11	0.11	0.08
Duty on gas	0.01	0.01	0.01	0.01
Duty on extraction/import of raw materials	0.03	0.03	0.03	0.03
Duty on disposable tableware	0.02	0.02	0.01	0.01
Duty on insecticides in small containers	0.00	0.00	0.00	0.00
Duty on coal	0.22	0.22	0.18	0.17
Duty on waste	0.10	0.12	0.11	0.12
Duty on CFC	0.01	0.00	0.00	0.00
Duty on CO2	–	–	0.36	0.76
Weight duty on autos paid by households	0.71	0.82	0.73	0.70
Weight duty on autos paid by others	0.41	0.30	0.27	0.26
TOTAL	**7.08**	**7.16**	**7.19**	**7.30**
NORWAY				
Excise on petrol	2.31	2.47	2.86	2.78
Vehicles transfer tax	1.49	1.28	1.54	1.54
Electric energy	1.12	1.05	1.06	1.12
Oil and gas products	2.87	2.96	2.64	2.52
Mineral oil	0.36	0.64	0.61	0.52
CO2 tax	–	0.25	0.59	0.68
Motor vehicles tax paid by households	0.58	0.67	0.79	0.83
Motor vehicles tax paid by others	0.68	0.69	0.77	0.76
TOTAL	**9.40**	**9.99**	**10.86**	**10.75**

Source: OECD, *Environmental Taxes in OECD Countries*, Paris, 1995.

ten percent. Looking at the individual countries, the 1993 environment-related tax shares range from a low of 3.24 percent (U.S.) to a high of 11.85 (Greece). Of the twenty nations, only Ireland, Italy, and New Zealand failed to register an increase over the period. Of the seventeen nations showing increases in environment tax shares, ten rose by more than one-half a percentage point, a common measure of significance used by tax experts. Thus by virtually any measure, it is hard to escape the conclusion that environment-related taxes are rising and are becoming an increasingly important part of the financing system of OECD nations.

Table 3. ENVIRONMENTAL TAXES IN 20 OECD COUNTRIES, 1990-1993
(as a percent of total tax revenues)

COUNTRY	1990	1993	CHANGE
Austria	4.00	4.35	+0.35
Belgium	3.83	4.49	+0.66
Canada	2.87	3.44	+0.56
Denmark	7.08	7.30	+0.22
Finland	4.72	5.40	+0.68
France	4.88	4.92	+0.04
Germany	5.46	6.12	+0.66
Greece	7.43	11.85	+4.42
Ireland	10.35	8.98	*-1.37*
Italy	7.82	6.52	*-1.30*
Japan	5.11	5.49	+0.38
Netherlands	5.12	6.12	+1.00
New Zealand	5.08	4.76	*-0.32*
Norway	9.40	10.75	+1.35
Portugal	10.63	11.52	+0.89
Spain	5.82	7.54	+1.72
Sweden	5.77	6.34	+0.57
Switzerland	4.26	4.65	+0.38
United Kingdom	7.35	8.23	+0.88
United States	2.88	3.24	+0.36
Average *(unweighted)*	**6.02**	**6.67**	**+0.65**

Source: Calculated from *Revenue Statistics in OECD Member Countries*, OECD, Paris, 1995.

Table 4. OVERALL COMPOSITION OF TAX STRUCTURE, 1990-1993

	U.S.			Other OECD Countries		
	1990	**1993**	**Change**	**1990**	**1993**	**Change**
Environmental taxes/ total revenues	2.88	3.24	+0.36	6.18	6.85	+0.67
Pers and Corp Income Taxes/ total revenues	43.16	42.37	*-0.79*	37.25	35.93	-1.32
Social security contributions/ total revenues	29.53	29.15	*-0.38*	27.06	28.62	+1.56
Consumption taxes/ total revenues	16.47	17.18	+0.71	30.19	29.86	*-0.33*
Total tax revenues/GDP	**28.94**	**28.79**	**-0.15**	**40.13**	**41.90**	**+1.77**

Source: Calculated from *Revenue Statistics in OECD Member Countries*, OECD, Paris, 1995.

But is this growth in environmental taxes evidence of tax shifting? Certainly a number of countries have been quite explicit about substituting environmental levies for taxes on both personal and corporate income. A recent OECD report has noted that, particularly in Northern Europe, "a shift in tax structure away from income taxation towards . . . indirect taxes including environmental taxes is often seen as beneficial because it can help reduce structural problems in the economy" (OECD, 1995, page 13). But how about the countries outside of Northern Europe? Lines (1) and (2) of **Table 4** present information on changes in environment-related taxes as well as taxes on personal and corporate income for the U.S. and other OECD countries over the 1990-1993 period. While some of these tax ratios may vary for cyclical reasons, the findings are clear: during the period 1990-1993, the share of tax revenues derived from environmental taxes rose by a little more than 10 percent in the U.S. and by a comparable percentage in other OECD countries. Personal and corporate income

taxes decreased as a share of total revenue in both the U.S. (about 2 percent) as well as in other OECD countries (almost 4 percent). Thus, despite the lack of elaborate political announcements outside of Northern Europe, it appears that at least a small tax substitution of environment-related taxes for individual and corporate income taxes is actually taking place throughout the OECD.

Does this mean that OECD countries are embracing the double-dividend type theories as a means of reducing tax distortions in their economies? Probably not. Recall that most of the so-called environmental taxes are of the indirect rather than the Pigouvian type discussed above. Thus, they are less efficient means of abating pollution than Pigouvian taxes. In addition, consider the other tax shifts taking place simultaneous with the changing importance of environment and income taxes (lines (3)-(5) of Table 4). Outside the U.S., social security taxes increased significantly.[4] While this may be a reflection of the need to fund current pension commitments, nonetheless, it reflects an increase in a type of taxation which is thought to be quite distorting. Similarly, taxes as a percent of GDP rose significantly in OECD countries outside the U.S., indicating that despite the rhetoric, environmental tax increases may be as much a part of an overall revenue raising strategy as they are an attempt to reduce tax distortions.

[4] Although the share of revenues derived from social security taxes declined slightly in the U.S. during the period 1990-1993, the longer trend is for an increasing share.

III. CONCLUSIONS

A number of conclusions seem clear from this review:

1. The widely embraced "double dividend" theory, that a revenue-neutral tax shift may yield environmental gains at virtually no cost, is not holding up to further analysis. While there are significant environmental benefits associated with a tax shift -- which may well exceed the costs for many policy choices -- these gains are not generally costless: we'll need to do our homework to determine the benefits of new policies.

2. Whereas the new research in this field has been interpreted as undermining the theoretical basis for taxes as an important environmental policy tool, nothing is further from the truth. Our present tax system creates significant disincentives for work, saving and investment. The new research shows that virtually *any* environmental policy can compound these existing distortions. Unlike regulations or tradable permits (as currently administered), the revenues generated by environmental taxes can help offset some of the distortions. Thus, while each of the policy instruments has its distinctive pros and cons, environmental taxes, even though they do not provide a free lunch, are still relatively more efficient from an economic standpoint.

3. Although the ideal per unit taxes on emissions or discharges, so-called Pigouvian taxes, are only in limited use, and not at all outside of Europe, indirect environment levies, including taxes on fuels, vehicles, beverage containers, fertilizers, and others, are growing in importance across the OECD nations. Several Northern European countries have even imposed small CO2 taxes. Overall, environmental taxes as a

share of total revenue have increased by more than ten percent over the period 1990-1993.

4. Taxes on personal and corporate income have declined over the same time period, suggesting a modest tax shift. However, this shift probably does not mean that OECD nations are embracing the "double dividend" type theories as a means of reducing tax distortions in their economies. As noted, rises in social security taxes and an increase in the overall rate of taxation cloud the picture.

Despite the mixed signals, both theoretical developments and recent trends suggest some optimism for the future of environment-related taxes. In democratic societies there is a natural resistance to all taxes -- environmental or any other type. Yet, with growing fiscal pressures and rising demands for a cleaner environment, many countries are turning to environmental taxes. While the new research suggests that the cost of the cleaner environment may be somewhat higher than previously thought, taxation still looks like the least cost way to get there.

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