Do 'green' taxes work?

Decoupling environmental pressures and economic growth

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This essay intends to shed light on whether environmental taxation can help to decouple environmental pressures from economic growth, a policy outcome widely desired and particularly pressing in the context of climate change where radical measures are needed to curb CO_2 build up.

Many believe that a concentration level of CO_2 at 440 ppm is a critical threshold that should not be exceeded and are concerned that with current emissions this threshold is likely to be passed in less than twenty years. Hence a decoupling between economic activities and environmental burdens needs to be attained. This has been acknowledged by the UK government which has set out a first set of *decoupling indicators* to measure progress on improvements in the efficiency of material and energy use.

The OECD, which uses decoupling as a success criterion in its environmental *performance reviews* for member states, distinguishes between 'absolute' and 'relative' decoupling (OECD, 2002). Absolute decoupling refers to a development where the environmentally relevant variable is stable or decreasing, while the economic driving force (for example GDP) is growing. Relative decoupling is said to occur where the growth rate of the environmentally relevant variable is positive, but less than the growth rate of the economic variable. In the case of climate policy it is absolute, rather than relative decoupling that is desired.

Some optimists assert that decoupling will result in any case due to internal transformation mechanisms in industrial society. The principles of environmental tax reform suggest that decoupling needs to be stimulated and supported via more specific policies and measures and, in particular, a shift from taxation of 'goods' such as labour and capital, to 'bads' such as pollution and resources.

Many conventional economists emphasise the importance of economic growth for protecting the environment and point to the existence of environmental Kuznet's curves. Kuznet's curve takes the shape of an inverted U. It implies that emissions in a country first increase with GDP, but then, after some time, decoupling occurs such that while GDP continues to increase, emissions decline. Much of the Kuznet's curve debate has focused on the implied relationship between 'getting rich' and 'getting clean': whether an increase in GDP is a precondition for environmental improvement. While Kuznet's curves can be identified for old-fashioned SO_2-pollution, there is little indication yet of such tendencies for the malicious CO_2 problem.

The double dividend

Supporters of environmental tax reform have underlined the necessity of 'getting the prices right'. As long as the market mechanism does not transmit the value of the environmental benefits, which the wider application of existing and new technologies can bring, there is little chance of achieving a decoupling. The gradual

improvement in efficiency falls short of the requirements for radical technology-shifts, necessary to prevent global warming from accelerating.

Once environmental taxes of sufficient scale are introduced, the induced requirements for more efficiency in the use of resources will spur the technological innovations that can pave the way for a process of decoupling. Eventually market opportunities for new products and processes will improve the competitiveness of firms and sectors which have been able to innovate (Porter, 1991). The notion of a 'double dividend' from environmental taxation (Pearce, 1991) forms the backbone of this approach. The argument is that a second more short-term dividend of increased employment and competitiveness will appear as environmental taxes encourage manufacturers to innovate. Hence, only an incentive-based environmental regulation, which internalises external costs within the market, is likely to become effective in achieving a decoupling from economic growth.

Whether there really is such a thing as a free lunch, as is implied by this hypothesis, is doubted by many economists. If such gains are worthwhile in the first place, why would firms not take advantage of them without regulation? What appears to be cost-savings in response to regulations will potentially be offset by full accounting of the transaction costs involved (for example for management, information gathering and reorganisation). There is also widespread scepticism as to whether it is really possible to achieve two targets with just one instrument, as such a possibility runs counter to established wisdom, that there needs to be one instrument for each target (cf. Tinbergen).

However, good suggestions have been put forward to explain how 'double dividend' situations might arise. Environmental performance may well be placed low in the attention hierarchy of firms and public policies may help overcome internal coordination failures that hinder them from reaping the full benefits from more efficient operation. In this case, even a small tax would serve as a 'reminder' to businesses to help shift some focus onto activities in the periphery of the conventional sphere of attention. That the double dividend may actually be in need of a double instrument is implied by that part of the literature which advocates the earmarking of tax revenue for revenue recycling operations in order to provide subsidies for installing new technologies.

Results of environmental taxation

The conceptual thinking on environmental tax reform dates back to the late '80s and to various working reports and discussion papers published in a number of European countries at about the same time in response to the growing recognition of the seriousness of environmental problems. The idea to shift taxation from goods to bads – from labour to pollution – was as compelling as it was simple, and starting with Sweden's tax reform in 1989, a number of European countries began cautiously to alter their tax systems in this direction. Sweden is currently implementing a ten-year plan to further shift taxes of 30 billion SKR from labour to pollution and energy consumption.

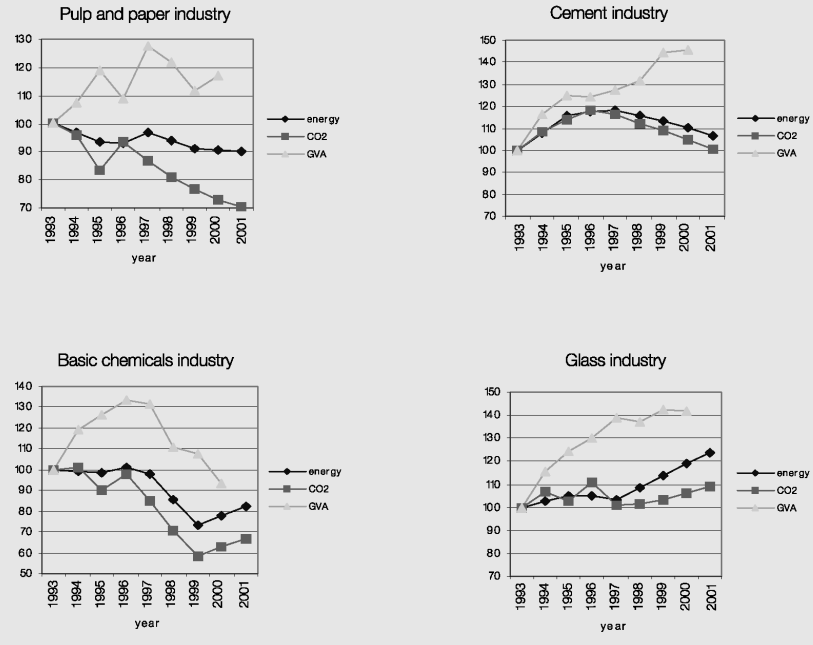
Denmark introduced an environmental tax reform in 1993 and extended it in 1996 and 1998, so that tax revenues at a level of 1.7 per cent of GDP were shifted from labour income to pollution and energy consumption. Denmark's environmental tax reforms were as ambitious as Sweden's and affected both households and industries. As a result, today more than ten per cent of all tax revenue is generated by means of environmental taxes: Denmark has the highest ratio of environmental taxes to GDP: 4.75 per cent (compared to 3.5 per cent in Sweden and the UK).

In many countries concerns about industrial competitiveness and distributional impacts precluded such policy measures, or caused them to become more modest. Such concerns were also voiced in Denmark. In order to mitigate competitiveness effects industries are not taxed at the same rate as households. Whereas the effective CO_2-tax rate of households is 80 euro/tCO_2, industrial processes are taxed with 12 euro/tCO_2. For certain energy intensive industries a lower rate of 3 euro/tCO_2 applies, with exemptions down to just 40 eurocent applicable if obligatory agreements are concluded on energy savings. However, energy used for heating purposes in businesses became subject to the same tax rate as households. This multi-tiered approach was not applauded by economists, who favoured a uniform tax rate for all CO_2-emissions, but it was seen as a political necessity in a small country with high export ratios in industries regarded as trade-sensitive.

Despite the second-best approach to CO_2-taxation, a review of achievements in Danish industry unveils considerable decreases in CO_2-emissions, both in absolute and relative terms, for several industrial sectors since the introduction of CO_2-taxes in 1993, as shown by Martin Enevoldsen in his recent book (Enevoldsen, 2005). While economic growth continued in most sectors (see figure 1), the consumption of energy and the emissions of CO_2 decoupled during the '90s from gross value added (GVA). CO_2-emissions decoupled more than energy consumption, indicating that in addition to energy savings a fuel shift towards less carbon-intensive sources also played a role. Overall, Denmark's industry reduced its CO_2-emissions with twenty five per cent per produced unit in just seven years from 1993 to 2000.

A more careful econometric ex-post analysis shows that CO_2-taxes on industry in the seven years in the '90s caused CO_2-emissions to decline

Figure 1: **Energy use, CO2 emissions and GVA in different sectors, 1993–2005**

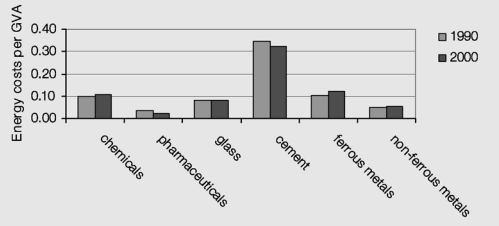


an additional ten per cent, compared to a business-as-usual development. Half of this reduction has been found to be due to fuel-switches towards less carbon intensive fuels, and the other half of the reduction due to energy-savings per se (Enevoldsen, 2005).

Although CO_2-taxes caused industry's expenditures for energy to increase with about ten per cent at the outset, many industries were capable of reducing their energy costs. At the end of the '90s the unit energy costs had been brought down to the initial level, or in some instances even further, bringing energy costs per unit of value added to a lower level than before the introduction of CO_2-taxes. An overview of unit energy costs in 1990 and 2000 for a number of industrial sectors shows that only the glass industry experienced rising unit energy costs, whereas cement and pharmaceuticals managed to decrease their unit energy costs (see figure 2). The other sectors were able to maintain the level of unit energy costs, despite the increase of energy prices caused by CO_2-taxes.

The Danish experience has been carefully compared with experience in the Netherlands and Austria. Both of these two countries first adopted a more voluntary approach towards reducing industry's CO_2-emissions. In the seven years where Danish industry reduced its CO_2-emissions drastically per produced unit, Dutch and Austrian industry managed to reduce their CO_2-emissions by ten to eleven per cent. These figures allow for direct comparison in that account is taken of differences in industrial structure and energy intensity between the three countries. Most of these reductions appeared only after the two countries began to increase their energy taxes from 1997. In fact, the direct impact of the voluntary energy agreements in the Netherlands were rather small, and the detailed econometric analysis of the effectiveness unveils an impact three to four times higher for the tax instrument than for agreements.

Figure 2: **Unit energy costs**



Distributional implications of environmental taxation

As indicated above, the rate of CO_2-taxation for Danish households is rather high by international comparison. While the CO_2-tax rate for industry is lower than in other Nordic countries, Denmark takes the prize for the toughest tax regime on households. Energy taxes on households were introduced already in the '80s, partly for reasons relating to promotion of energy savings, partly for reasons relating to fiscal policies. They were further increased as part of the environmental tax reforms in 1993, 1995 and 1998.

Their impact on energy efficiency is broadly acknowledged, although less econometric scrutiny has been undertaken. During the '80s they contributed to an improvement in heating efficiency of forty five per cent per dwelling m^2 in the Danish housing stock. Other measures, such as insulation-subsidies and programmes for double-glazed windows played a role as well in this period. Distributional impacts were only to some extent a concern during the decision-making processes on environmental tax reform. Fuel poverty is not a phenomenon in Denmark, where egalitarian principles in the tax system assure a higher degree of redistribution than in other parts of Europe. Yet, towards the end of the '90s the distributional impacts of environmental tax reform was an issue to emerge on the agenda.

In a detailed investigation of the distributive issues related broadly to energy, transport and environment taxes, it was found that while

transport taxes generally are progressive, taxes on energy and pollution are regressive (Klinge Jacobsen *et al*, 2001:75). The reason that transport taxes are progressive is due to the circumstance that higher income groups drive more cars, with higher registration fees and higher petrol consumption. Taxes on energy and pollution, such as the CO_2 tax are falling disproportionately more on low income households. The degree of regressivity of energy taxes is found to be close to the regressivity of VAT, while pollution taxes are almost neutral, but slightly regressive.

The total burden of the CO_2-tax, considering both direct payments and indirect price increases on consumer goods, was about 80 euro per person or 0.75 per cent of disposable income for the lowest decile income group (Wier *et al* 2005). The average was about 0.5 per cent of disposable income, which is rather low considering the suggestion by several US economists that environmental taxation would cause a tax interaction effect, lowering labour supply.

The distributional problem can be viewed both from actual income and from life-time income. The less regressive effect of environmental taxes, when viewed in a lifetime perspective, suggests that compensation measures should be targeted at those groups which will not be able to offset lower incomes in one part of their life with higher incomes in other parts, in particular single unskilled parents and retired persons without additional pension schemes. In Denmark the distributional issues were mitigated using environmental tax reforms, which made provisions for specific compensations to old-age pensioners and families with children.

How could a double dividend arise ?

The Porter hypothesis generally states that on the longer term there will be innovation offsets from environmental regulations, which will outweigh the costs imposed (Porter, 1991). Such innovation offsets can be both process and product oriented, the latter regarded as the most promising in terms of radical shifts which improve competitiveness.

There was controversy in the '90s over Porter's claims, that low-hanging £10 notes had not been picked up by businesses. Palmer, Oates and Portney (1995) took strong issue with the view held by Porter and associates, in their opinion based too extensively on case-studies and anecdotal evidence, rather than on theoretical rigour. While the critics did not deny the existence of innovation offsets, they found them to be several orders of magnitude lower than the imposed costs of environmental regulation. The critics preferred to subject regulations to conventional cost-benefit analysis, where innovation offsets would constitute only a portion of the involved social benefits, and more generally they favoured a social contingency approach rather than one related to competitiveness.

Yet in response to the neoclassical critics, many supporters of the Porter hypothesis pointed to the circumstance that organisational slack in company performance is in fact the object of a large body of research literature, and that in real company management the challenge remains to identify and harvest the low-hanging £10 notes (Goodstein, 2003).

The problem with much of the debate on the double dividend hypothesis is that it narrows the debate on efficiency down to one of simply allocative efficiency. The proposal in the Delors whitepaper (1993) to shift taxation from labour to pollution and natural resources was conceived within a conceptual framework of improved allocative efficiency resulting from a change in input factors. However, what Porter and others seem to be addressing may be regarded rather as incentive efficiency.

The scope for improvements in energy efficiency would normally be assumed away by

neoclassical theory's assumption of optimality and rationality in the management of firms. However, in a landmark article Berkeley economist Leibenstein (1966) questions whether labour is always used optimally, citing extensive evidence for productivity improvements achieved in the use of labour. Leibenstein provides a number of reasons why managers and employees would prefer *not* to produce at the outermost bound of optimality, for example to avoid the required effort and pain of full efficiency. 'It is one thing to purchase or hire inputs in a given combination, it is something else to get a predetermined output out of them' (Leibenstein, 1966:408).

Much of the anecdotal evidence on inoptimal energy use in the management of firms cited in support of the Porter hypothesis is similar to the evidence on the use of labour that accumulated in the literature following Leibenstein's hypothesis.

There are several good reasons why companies would not be rational and optimal in their use of energy as an input factor, and these reasons go beyond simple transaction costs of gathering the necessary information and undertaking the required technical changes. They relate to the degree of slack in human behaviour and in company operations, and the failure to mobilise all the knowledge which is embedded in an organisation. Energy will be squandered away as long as prices are relatively modest compared with other input factors such as labour and capital, but once outside pressure is introduced the companies will be motivated to mobilise the knowledge and technology available so as to control unit costs. Out of such a process the innovations may evolve which may improve economic efficiency and competitiveness.

The way forward for Europe

So far 7 EU member states have introduced carbon-energy taxes on industry. These member states include the UK, which introduced a climate change levy. Before the UK also Finland, Sweden, Denmark, Netherlands, Germany and Slovenia introduced such taxes at varying rates. However, the EU was so far unable to introduce a carbon-energy tax, but agreed on minimum excise taxes for mineral oil products.

The experience obtained in Denmark suggests that carbon energy taxes can be introduced without negative effects on industry competitiveness. In fact, it could be argued that some sectors managed to improve their competitiveness by lowering their unit energy costs, as a result of the increased management focus on energy consumption. This is good news for a Europe in search of ways to implement the Kyoto protocol while at the same time safeguarding its competitiveness. As oil prices continue to increase, the relative advantage of having improved energy efficiency grows.

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