# Taxation and Sustainability

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## 1. Introduction

Clearly, the question which is the workshop title permits of no single simple answer. This paper addresses it in the particular context of taxation. The argument is that in this context the sustainability debate seems to have had rather little effect on economists' thinking and policy advice. While it is true that taxation is looked upon more favourably than some alternative instruments for environmental policy implementation, there does not appear to have been much in the way of thinking about, or policy advice on, taxation per se in the context of concern for sustainability promotion.

## 2. Sustainability

> "sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (World Commission on Environment and Development 1987, p.40)

This is the basic definition of sustainable development given in the "Brundtland Report" which popularised the idea and was largely responsible for its recent impact on political agendas. The report's scope was global, and given that its proposition that for many now alive needs and aspirations are not being met is, presumably, not contentious. This proposition is the point of departure for the report's concern with intergenerational equity. Given an assessment that significant international redistribution is not politically feasible, ameliorating the condition of the currently and prospectively poor is taken to require continuing economic growth throughout the world. However, many, including Brundtland, are persuaded that current levels of economic activity are already seriously damaging the environmental basis for meeting human needs and aspirations. The question then arising is whether further growth in the global economy can be accommodated to preservation of that environmental base for future generations. Brundtland answers this question with a conditional affirmative, and calls the growth process that would be involved "sustainable development".

It has been widely noted that the Brundtland definition is somewhat imprecise. Disagreement exists over an operational definition of sustainable development. A related notion is that of sustainability, the term used in the title of this workshop. The relationship between sustainable development and sustainability could also be a matter for some debate. I have noted elsewhere (Common 1991) that given a very long time horizon and assuming the use of non-renewable resources there is really not much operational difference between sustainable development and sustainability, though there may be a large difference in terms of political acceptability. In terms of formal economic analysis, it is sustainability as indefinitely maintainable constant consumption that has been the major focus of interest (see, for example, Common 1991 for some discussion).

However, the basic nature of the problem is reasonably clear, and concerns threats to intergenerational equity arising from economy-environment interactions, which are set out schematically in Figure 1. In relation to the economic activities of production and consumption, the natural environment serves three functions - waste assimilator, resource base, and source of amenity services. In theFigure the boxes representing these functions intersect to highlight an important feature of the situation, often overlooked in economics, which is that the three functions interact. Waste flow in excess of assimilative capacity means pollution, which impacts adversely on the environment's capacity to provide resources and amenity services.

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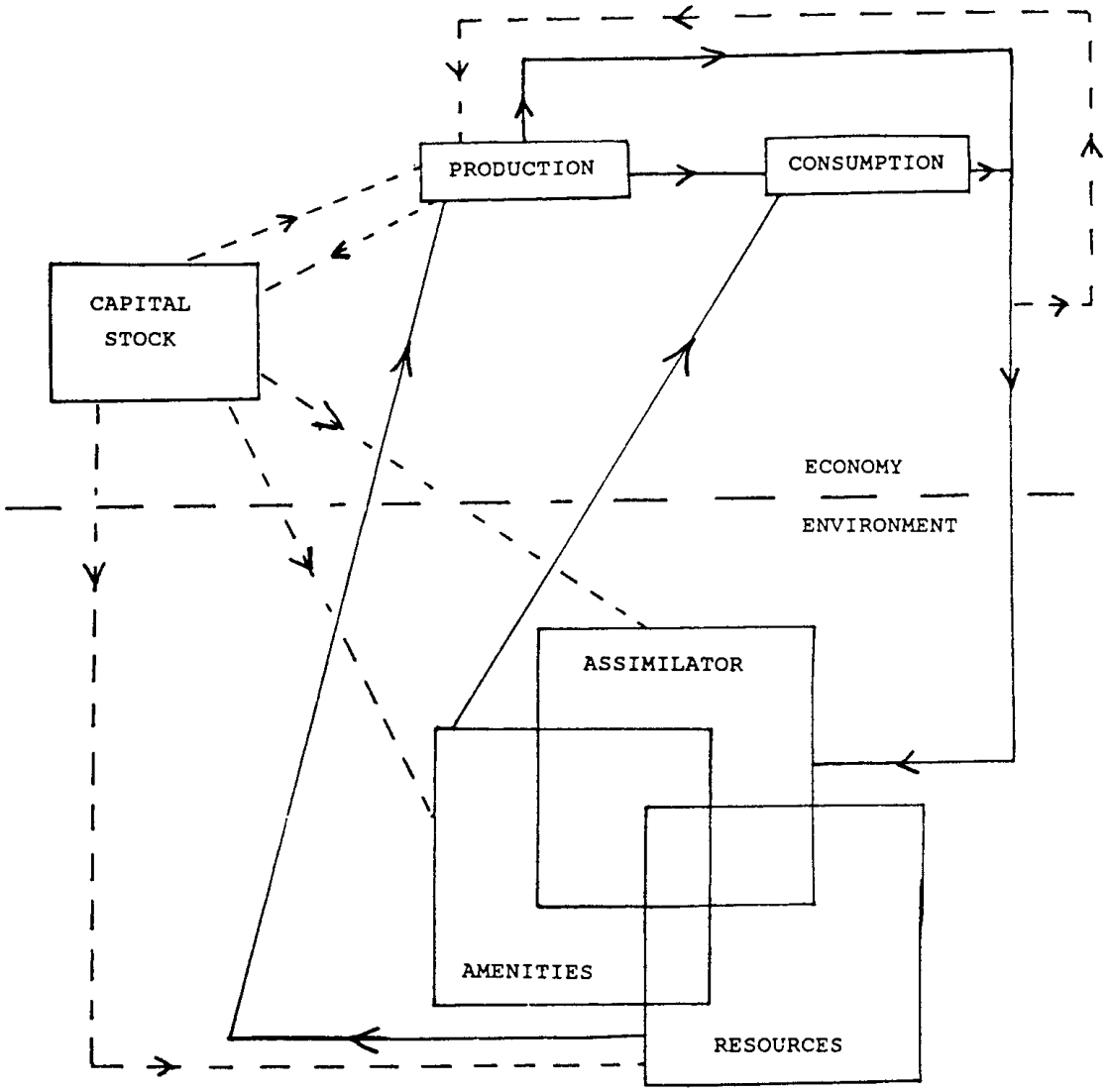
Current economic activity has the potential to reduce the future capacity of the environment to provide useful inputs to economic activity. Certainly in the case of non-renewables, and possibly in the case of renewables, current use reduces the resource base available to the future. Current resource use necessarily means, via the materials balance principle (mass conservation), waste discharge into the environment. Where this is at rates in excess of assimilative capacity there is additional depletion of the resource, and amenity service, base available to the future.

The point of departure for Brundtland was the judgement that in many parts of the world meeting current needs and aspirations requires increased activity levels per capita. If the reduction of per capita levels of economic activity in parts of the world now considered affluent is regarded as infeasible, meeting the needs and aspirations of the currently poor means an increase in the global per capita economic activity level. The size of the human population is everywhere growing. Given the sketch of economy-environment interactions above, global sustainability at a higher level of total economic activity appears impossible.

**Figure 1: Economy Environment Linkages**



As noted, Brundtland rejected this conclusion. Economists also typically reject it, effectively arguing that the story so far has overlooked three important substitution possibilities, indicated by the dashed lines in Figure 1:

(i) The composition of production and consumption aggregates can change, with less being substituted for more environmentally damaging activities, so reducing the impact of any given aggregate level;

(ii) Recycled wastes may be substitutable for newly withdrawn resources, reducing both input requirements and demands upon assimilative capacities; and

(iii) Part of the output from production can be accumulated as capital, rather than consumed, the services of which may be substitutable for resources and environmental services. Here capital is to be widely interpreted so as to include, for example, "human capital" and "know-how".

Noting these substitution possibilities raises two questions. First, what are the empirical dimensions of these substitution possibilities? How far, for example, can capital replace particular resources in production, or damaged biospheric processes. Very little is actually known about these matters.[1] Second, the existence of substitution possibilities does not of itself guarantee that they will be exploited. Presumably it would be generally agreed that exploitation is not guaranteed by market forces alone. It appears agreed that there is a need for deliberate policy interventions, particularly in regard to the protection of the environment's assimilative capacity.

An obvious threat to sustainability arises where non-renewable resources are essential in production. Hartwick (1977) showed that if the resource rents arising in intertemporally efficient depletion were invested in man made capital then constant consumption could be sustained forever. Common (1991) discusses subsequent generalisations and re-formulations of the Hartwick rule (see also Common and Perrings 1992). The rule is necessary but not sufficient in that following it gives sustainability as constant consumption only if there is enough substitutability between natural resources and capital. However, it does identify the key role of savings and capital formation in promoting sustainability. If savings are inadequate, sustainability is impossible.

## 3. Taxation

The standard way to think about taxation in economics is to ask the question: given that the government must raise some revenue, and given the feasible tax bases and systems, what is the least bad way to do it? The answer to this question depends on the objective function adopted and the constraint set assumed, and varies with changes in each of these. Most of what we think we know about "optimal taxation" arises from analysis where the objective function amounts to the minimisation of the deadweight burden evaluated according to individual consumer preferences. One could proceed by continuing in this way with a constraint set modified by the inclusion of sustainability constraints. A problem with a formal approach along these lines is that we don't really know in any precise way how those constraints should be modelled. As the existing optimal taxation literature indicates, results are very sensitive to the specification of the constraint set and the numerical properties of the objective function.

Economics has devoted a lot of attention to taxation as an instrument for environmental policy, and to natural resource rent taxation. In the literature arising, it is taken that efficiency losses as assessed according to exogenously given individual preferences are to be minimised. I am not aware of any work that has taken sustainability criteria into account in formal optimal taxation analysis. It seems to me that if sustainability is admitted as a policy objective, given individual preferences can no longer be the sole measure of value.[2] The analytical framework would, that is, need revision in terms of

[1] These are not entirely empirical questions amenable, in principle, to resolution on a technical basis. For some, they involve questions of ethics in that some substitutions would be regarded as morally un-acceptable.

[2] For discussion of the role of consumer sovereignty in sustainability see Common and Perrings (1992) or Daly and Cobb (1989).

objective function and constraint set.

Formal analysis of the taxation problem in the sustainability context will be subject to the same problem of model dependent results as noted above for the standard approach to the problem. There is, and never will be, a uniquely correct set of stylised facts for the sustainability problem. This is not to say that there is no place for formal analysis. In terms of obvious and simple considerations arising from the sketch of sustainability of the previous section, a tax base/system consistent with it would have the following general desiderata:

a. It would protect critical environmental resources and processes;

b. It would encourage saving and investment;

c. It would channel investment into projects providing substitutes for environmental resources and processes;

d. It would discourage population growth; and

e. It would promote intragenerational equity.

This is, of course, in the nature of a list of motherhood statements. The problem is in large part, for example, the fact noted above that we do not know with any precision which are the "critical environmental resources and processes". However, one has to start somewhere. It should be noted explicitly that what is at issue is not a tax panacea for the sustainability problem. It is not a problem that can be addressed by a single instrument. What is at issue is the question of whether a concern to promote sustainability has any implications for tax base/system choice. I think that this list has some usefulness in regard to that question, as illustrated in the next section of the paper.

## 4. A Case for Carbon Taxation

Consider some switch from income to carbon dioxide emissions from fossil fuel combustion as tax base, working through the desiderata listed in section 3 above.

### a. Environmental Protection

A major perceived threat to sustainability is the enhanced greenhouse effect. This exemplifies the uncertainties which attend economy-environment interactions, and the lack of knowledge concerning substitution possibilities as between capital and resource/environmental services. There is now a considerable literature on carbon taxation in relation to the enhanced greenhouse problem: for references, see Pearce (1991) or Industry Commission (1991). This literature treats carbon taxation as an instrument of environmental policy, an alternative to command and control or tradeable permits, rather than as a revenue source.

Fossil fuel combustion's contribution to environmental damage is not confined to atmospheric releases of carbon dioxide. Other atmospheric wastes arising are: particulates, sulphur dioxide, nitrogen oxides, hydrocarbons, and carbon monoxide. Fossil fuel combustion is generally regarded as the major source of atmospheric pollution, and the costs arising have been shown to be substantial: see, for example, Fisher and Smith (1982).

It should also be noted that the environmental impact of fossil fuel combustion is not limited to the emissions from that process itself. Waste discharges arise from the moving and transforming of matter found in the natural environment. The ability to move and transform matter in the absence of extrasomatic energy sources is limited, and waste generation in total has grown in line with fossil fuel use (see Boyden *et al.* 1990, for example). Higher energy prices are generally understood to increase the incentive to many kinds of recycling.

On the criterion of environmental protection, taxing fossil fuel combustion according to the carbon content of the fuel, rather than taxing income, looks good. It directly addresses a major threat to sustainability, as well as other environmental damages. But nothing is all good. Carbon taxation would encourage the substitution for fossil fuel combustion of other energy sources with environmental impacts, such as nuclear fission. It may be that the widespread use of nuclear fission would pose a greater environmental threat to sustainability than global climate change. This point is made here

to illustrate the uncertainties that attend the sustainability debate, and the consequent need for judgement as opposed to definitive technical resolution. I think it is a reasonable judgement that, on balance, a switch from income to carbon as a tax base would reduce environmental threats to sustainability. Also, as noted above, carbon taxation is not the only available instrument, and its use does not preclude future developments such as the taxation of energy use from other sources.

**b. Saving and Investment**

It is widely believed that some switch from income to consumption as tax base would encourage saving and investment. In Australia this belief is now part of the case for the Liberal/National coalition's tax reform package (Hewson and Fisher 1991). A switch from income to carbon as tax base would be very similar to a switch from income to consumption in this respect. This is because a tax on fossil fuel production or consumption would be passed forward through to the prices of all commodities. The production of all commodities in a modern economy involves the use of energy directly and indirectly: see Common and Salma (1992) for Australian data. A carbon tax would work like a consumption tax with differential rates across commodities according to their carbon intensities and the extent to which the tax could be passed forward. It can be noted here that standard optimal tax theory does not endorse uniform rate commodity taxation, environmental considerations aside. And, that those considerations would call for non-uniform rates. The argument above regarding the environmental impacts of fossil fuel use suggest that carbon taxation would be a straightforward way of implementing a non-uniform rate system of commodity taxation with some desirable characteristics. As already noted, the search for strict optimality is probably futile generally, and particularly where sustainability is a consideration. Administration costs would be low if fossil fuel production were adopted as the tax base.

**c. Project Selection**

Clearly, from a sustainability perspective, the composition of aggregate investment is as important as the level of the aggregate. A switch from income to carbon as tax base would alter the structure of input and output prices, thus impacting on project appraisals. Arguments already advanced here would suggest a general tendency to favour less environmentally damaging projects, and projects making smaller demands on the subset of nonrenewable resources which are the fossil fuels. In regard to the former, what can be claimed is a tendency not a guarantee. Particular carbon emission-reducing projects could well involve increased damage to some environmental services, and higher depletion rates for some resource stocks. A dimension of the sustainability problem which is insufficiently recognised is our lack of knowledge about what are critical environmental services and resources in relation to future production and substitution possibilities. But, to repeat, the argument is about some switch of tax base, not about the choice of a unique instrument for sustainability promotion.

**d. Population Growth**

It seems at first sight that a switch of tax base would of itself be neutral in regard to family size incentives. However, it is possible that the commodity impact of carbon taxation could have some influence. This would repay investigation. Leaving this aside, what does appear to be the case is that the income tax system can be set, via child allowances, to influence family size incentives in a way that a carbon tax could not. However, a switch from income to carbon as tax base would itself leave unaffected the welfare payments system which presumably does affect these incentives. A problem is, of course, that tax/welfare payment changes designed to discourage population growth could conflict with intragenerational equity enhancement.

**e. Intragenerational Equity**

It is widely believed that increasing prices for fossil fuels would be regressive in impact, given that the poor spend larger proportions of total expenditure on fuel. This would imply that a switch from income to carbon as tax base would be regressive in impact.

## 5. The Cost of Carbon Taxation

In this section I look at some of the studies which

have attempted to get some insight into the costs that would be associated with the use of carbon taxation as an instrument for the reduction of carbon dioxide emissions according to some arbitrary standard. The studies reviewed here are not, that is, studies motivated by the question: would a concern for sustainability have any implications for tax base choice?

As noted at the beginning of this paper, sustainability is essentially a global problem, and so is the prospect of global climate change. Whalley and Wigle (1990) used an applied general equilibrium model of the world economy to examine the implications of alternative carbon tax regimes to secure a 50 per cent reduction in global carbon dioxide emissions arising in fossil fuel combustion. Some of their results in terms of the costs measured as percentage GDP changes are reported in Table 1. For present purposes, there are two important features shown. First, world total costs vary little according to the tax option, and are minimised (as standard instrument choice theory suggests) under option 3, which involves a globally uniform tax rate. Minimised costs are 4.2 per cent of GDP. Second, it turns out that the least total cost option also has what many would regard as desirable distributional implications. After tax revenue is allocated to nations on an equal per capita basis, the Developing/Centrally Planned group is a net gainer. Other tax revenue allocation rules could of course be adopted. But, with a simple one the global distributional implications of the least cost approach are not obviously un-appealing.

In its report on the costs and benefits for Australia of action to reduce greenhouse gas emissions, the Industry Commission (1991) used two applied general equilibrium models. WEDGE was used to examine international cooperative action, ORANI

**Table 1: Global Carbon Taxation: Percentage GDP Changes**

| Region | Tax Option 1 | 2 | 3 |
|---|---|---|---|
| EC | -4.0 | -1.0 | -3.8 |
| N. America | -4.3 | -3.6 | -9.8 |
| Japan | -3.7 | +0.5 | -0.9 |
| Other OECD | -2.3 | -2.1 | -4.4 |
| Oil Exporters | +4.5 | -18.7 | -13.0 |
| Developing/Centrally Planned | -7.1 | -6.8 | +1.8 |
| World | -4.4 | -4.4 | -4.2 |

Results are for a global 50 per cent reduction achieved by:
Option 1 is national fossil fuel production taxation
Option 2 is national fossil fuel consumption taxation
Option 3 is uniform global taxation.
**Source**: Whalley and Wigle (1990)

to examine unilateral action. Some results arising are given in Table 2. While there is some difficulty in comparing the results from the two models, overall the results suggest, perhaps surprisingly, that the costs to Australia of participation in an international agreement would be dominated by domestic costs rather than costs arising because of action by other parties to an agreement. Commentary on the Industry Commission report has focussed on the 1.5 per cent figure for a 40 per cent global cut, describing it variously as "massive", "significant", "very great", "high". The Industry Commission itself eschewed the use of such adjectives. It did emphasize that the cost estimates it reported were tentative "ball park" figures only. I return to this in the final section of the paper. Note that in both the WEDGE and ORANI models, the carbon tax revenue is used to reduce income tax collections in a revenue neutral way. In the case of the ORANI simulation the carbon tax revenue is $4.7 billions.

The cost figures reported in Tables 1 and 2 come from comparative statics models. Their structure is such that they cannot pick up any effects on aggregate saving and investment arising from the tax base movement modelled. Also, no credit can be given for any non-greenhouse environmental benefits arising from the reduced fossil fuel use. The models do allow for capital-energy substitution, labour-energy substitution, and inter-fuel substitution (somewhat crudely) but the technology is fixed, so that changes in relative prices cannot force technological change. On these grounds one may say that the model results are likely to overstate the costs of meeting the carbon dioxide emissions reductions targets.[3] On the other hand the models do not capture adjustment cost effects, do assume a

[3] There is also some question about the appropriateness of the percentage cut targets adopted in the Industry Commission report, where the terms of reference specify a 20 per cent cut on 1988 levels, by 2005. The rationale for 40 and 44 per cent cut modelling is the anticipated growth of emissions to 2005 under "business as usual". However, the data bases for these comparative statics models are 1988 in the case of WEDGE and 1980-81 in the case of ORANI.

**Table 2: Industry Commission Carbon Tax Results for Australia**

| | Output Loss | Tax Rate |
|---|---|---|
| 40% Global Cut[a] | 1.5% | 34[b] |
| 40% OECD Cut[a] | 1.47% | na |
| 40% OECD less Australia Cut[a] | 0.06% | na |
| 44% Unilateral Australia Cut[c] | 2.1% | 21.75[d] |

a. WEDGE result for Real Net Domestic Product, data base 1988
b. US$1988 per tonne carbon dioxide
c. ORANI result for Real Gross Domestic Product, data base 1980-1
d. A$1988 per tonne carbon dioxide:revenue $4.7 billion
**Source**: Industry Commission (1991).

highly flexible economy, and do not capture distributional effects within nations.

There is a widespread view that carbon taxes would, via higher energy prices, be regressive in impact, which can be regarded as a cost attributable to such taxes. Some results relevant to this for Australia are reported in Table 3, arising from some work I have done with Umme Salma.[4] We used Australian input-output and energy data for 1986-7 to figure the impact of carbon taxation at $20 per tonne of carbon dioxide (approximately the Industry Commission rate for a 44 per cent emissions cut, see Table 2) on the prices facing households, and Household Expenditure Survey data for 1984 to map this into consumer price index increases for households by decile (1984 HES data is used because it is the most recent year for which expenditure patterns are available by decile). In Table 3 the left column shows CPI results when the effect of carbon taxation on the prices of all (27) commodities are accounted for, while the right column shows CPI results when only the effects on the three fuel commodities are accounted for. The results show that carbon taxation in Australia would be regressive, but less so than much commentary would suggest. They also show that regressivity is overstated if only the effects of carbon taxation on fuel commodities are considered.

The results reported in Table 3 do not allow for any substitution responses in production or consumption, nor do they allow for any effects arising from the use to which the carbon tax revenue is put. In regard to the first point, we would presumably want to assume that substitution responses in consumption could only reduce the impact on any household group, though they could conceivably increase regressivity as measured in Table 3. The distributional implications of allowing substitution responses in production are more complex. Some relevant applied general equilibrium results are noted in the next section. Here it can be noted that the empirical literature generally reports labour

[4] This work is financed by a one year grant from the Energy Research and Development Council. The final report to that body is currently being written and will contain details on data and methodology, as well as further results.

**Table 3: CPI Increases by Decile for Tax of $20 per tonne $CO_2$**

| | Accounting for All Commodity Price Increase % | Three Fuel Commodity Price Increases Only % |
|---|---|---|
| | 2.885 | 1.534 |
| | 2.995(h) | 1.657(h) |
| | 2.974 | 1.604 |
| | 2.850 | 1.444 |
| | 2.876 | 1.452 |
| | 2.774 | 1.353 |
| | 2.804 | 1.313 |
| | 2.774 | 1.278 |
| | 2.666 | 1.164 |
| | 2.621(l) | 1.097(l) |
| All Households | 2.785 | 1.311 |
| h/l | 1.14 | 1.51 |

and energy as substitutes in production, which would imply a presumption that carbon taxation would increase employment for a given level of output.

Symons *et al.* (1991) have done some work for the United Kingdom which is similar in nature to that reported in Table 3, but allows for substitution responses in consumption and for the use of the carbon tax revenue to modify the carbon tax impact on households. They use 1987 input-output and 1990 energy data to simulate the price impacts on all commodities of carbon dioxide taxation. The impact of the price changes is computed using a demand system estimated on Family Expenditure Survey data for 1970-86. The welfare measure used is Disposable Expenditure, ie expenditure net of indirect tax payments. Some of their results are reported in Table 4. The point is to show that it is possible to design revenue neutral introductions of carbon taxation which achieve substantial reductions in emissions and reduce inequality across the income distribution. Symons *et al* do this by substituting carbon tax revenue for indirect tax revenue and increasing welfare payments, rather than reducing income tax revenue. This means that in terms of the desiderata set out above their packages would not be expected to encourage saving and would not shift family size incentives toward smaller families.

## 6. Has Thinking Been Affected?

In order to provide some kind of answer to this question, it is useful to distinguish three classes of potential "thinkers": academic economists, policy commentators, and policy process participants.

### Academic Economists

I am not aware of any papers that specifically examine the implications of the full range of issues arising in the sustainability debate for tax design. As noted earlier, there is a substantial literature on

**Table 4: Welfare Changes by Decile for Tax Packages**

| | Option 1 % | Option 2 % |
|---|---|---|
| | +39 | +38 |
| | +13 | +14 |
| | -2 | 0 |
| | -5 | -3 |
| | -7 | -7 |
| | -7 | -7 |
| | -7 | -7 |
| | -7 | -7 |
| | -7 | -7 |
| | -5 | -6 |
| % $CO_2$ Reduction | -16.6 | -17.8 |
| % Revenue Change | -0.7 | -1.4 |

Option 1: $CO_2$ tax at 11p per kg used to cut VAT and Petroleum Excise and to increase welfare benefits.

Option 2: $CO_2$ tax at 12p per kg and smaller Petroleum Excise cut with larger increase in welfare benefits.

**Source:** Symons *et al.* (1991).

the use of taxes as an instrument for pollution control, and also on the taxation of rents arising in natural resource exploitation. In both cases the framework is that of conventional welfare economics.

This is also true of two papers which use applied general equilibrium models with households differentiated by income level to consider some implications of using energy as the base for increasing tax revenues in the United States. Boyd and Uri (1990) analyse the imposition of a tax of 10 cents per Btu x $10^6$ across all energy, as either a production or a consumption tax. They find that welfare, as household utility, declines by "almost one and one-half to two times the amount of the gain in revenue" (p.271). With neither tax base is the impact regressive. Boyd and Uri's model is static, and environmental arguments do not appear in utility functions, so that environmental benefits are un-accounted for. The welfare cost should, that is, be regarded as an upper limit on a quantity that could be negative. Boyd and Krutilla (1991) compare the costs of raising a target amount of revenue by income taxation and by coal and oil consumption taxation where the rates are differentiated (in the ratio 1.6/1) to reflect "the relatively high environmental cost associated with coal production and consumption" (p.9). It is assumed that the additional revenue is used to increase government spending. For additional revenue of $100 billion, they find that the impact of the energy tax is to reduce carbon dioxide emissions by 52 per cent, for a welfare cost some two and a half times that of the income tax. Distributionally, the energy tax impact is found to be mildly regressive. Again, the model is static and no environmental benefits are accounted for.

Pearce (1991) notes what he calls the "double dividend" feature of carbon taxes in that revenues may be used "to finance reduction in incentive-distorting taxes such as income tax, or corporation tax" (p.940). On the basis of estimates of estimates of deadweight losses of 20-50 per cent for taxes on effort and enterprise, Pearce states that a fiscally neutral carbon tax of $1 would amount to an effective tax of 50-80 cents. This appears to overlook conventionally evaluated deadweight losses associated with carbon taxation itself, as reported in the two studies considered immediately above. Boskin and Robinson (1985) consider energy taxation within the framework of conventional (static) optimal taxation theory, leaving aside all environmental considerations, and conclude that it is not possible to say whether energy should be differentially taxed. However, Pearce is undoubtedly correct in insisting that the costs of carbon taxation as an instrument for greenhouse policy be computed on the basis of revenue neutrality (as they are in the report by the Industry Commission (1991) for example).

Clearly, academic thinking has considered energy and carbon as a tax base. It does not yet appear to have done so taking account of all of the issues raised by the sustainability debate.

**Policy Commentators**

In Australia it appears that the sustainability debate itself has had no impact on the way policy commentators - think tanks, pressure groups, editorial and feature writers - think about taxation. In regard to the more limited issue of carbon taxation to meet emissions abatement standards, there has been some noticeable impact. However, both those of the green and the anti-green persuasions appear to react against carbon taxation, though for somewhat different reasons. In caricature terms, the situation appears to be as follows.

The greens want to cut emissions but are basically against using price incentives for that purpose, preferring moral suasion and regulation. Some do see some role for taxes/charges, but with the revenue arising hypothecated for environmental purposes such as alternative energy research and development funding.

The anti-greens have a general predisposition in favour of price incentives as opposed to regulatory controls. However, since they don't want policies adopted to cut carbon dioxide emissions (yet ?), they have not devoted much thought to the application of their general predispositions in this particular area. Commentary from this direction on assessments of carbon taxation (e.g. Industry Commission 1991) appears to have ignored the revenue raising and tax base switching possibilities arising.

This is not universally true. While *The Economist* might not properly be described as "anti-green", having discovered the environment in the last few years, it is equally the case that many would regard it as representative of economically rational thinking. The issue for 21st July 1990 carried a leader, "Red Ink, Green Taxes" on page 11, which argued that the United States should raise revenue to cut the deficit by using carbon taxes rather than taxes on income and capital.

**Policy Process Participants**

Most advanced economies use some taxation of energy consumption, notably petroleum excise taxation, to raise revenue, including Australia (see Appendix B, Industry Commission 1991). Some have adopted carbon taxation, proposals have been before the United States Congress, and the European Commission has carbon taxation under consideration (see Poterba 1990 and Pearce 1991). In Australia, carbon taxation does not appear now to be on the policy agenda. However, there have been two recent exercises directly relevant to the subject of this paper - the Ecologically Sustainable Development (ESD) policy development process set in train by the government in June 1990, and the opposition's recently announced tax/spending proposals.

Taxation as an instrument of environmental policy was considered by several of the ESD working groups, most notably those dealing with energy production and use in relation to greenhouse issues. These two groups recommended that the relative merits of carbon/energy taxation and alternative instruments be further investigated in Australia. In the report on intersectoral issues, Ecological Sustainable Development Working Group Chairs (1992), it is noted that: "It cannot be assumed that the present taxation system is optimal for ESD purposes" (p.210). This report notes that

> "Interest overseas is being shown in structuring tax systems less on taxes on labour (income, payroll taxes and the like), and more on environmental resources as a means of improving tax system efficiency as well, perhaps, of encouraging job creation and greater care for environmental resources. Similarly, any basket of economic policy measures that lifted savings and reduced overall consumption levels would be likely to contribute to greater sustainability" (p.210).

The report does not specify the tax base that could be a sustainability promoting alternative to labour.

The centre-piece of the Liberal-National party coalition's "Fightback" package (Hewson and Fisher 1991) is a movement away from income as tax base. The attention that this policy announcement generated has put the question of tax base switching on the Australian policy agenda again. A primary motivation stated for the tax proposals of the opposition is the enhancement of incentives to save and invest, to be brought about by a switch from income to consumption taxation, using a uniform rate General Sales Tax (or Value Added Tax). As noted above, a concern for sustainability implies the enhancement of incentives for saving, and carbon taxation acts like consumption taxation at non-uniform rates. Australia has non-uniform rate wholesale taxes in place now, and the opposition package would abolish these, substituting revenue from the GST (or VAT). Whether or not this is consistent with sustainability promotion is not clear: an answer would require analysis of the wholesale rate structure in relation to environmental impacts, among other things. An additional central feature of the package is the abolition of payroll tax, with a view to promoting employment, the revenue being replaced by GST revenue. This is not inconsistent with promoting sustainability. The package also has GST revenue, together with expenditure reductions, replacing customs duties, export taxes, and petroleum excise duties. As a result of the last of these the consumer price of gasoline would fall sharply. It is very difficult to see this as other than inconsistent with sustainability[5]. The package also contains proposals for increases in the family allowances payable in respect of all children. It is also very difficult to see this as other than inconsistent with sustainability.

[5] The authors of Hewson and Fisher (1991) are clearly aware of the environmental implications of this element of the package, and offer two comments. The first is to the effect that tariff reductions will speed up the turnover of the Australian car fleet, thus bringing in more fuel efficient cars more quickly. The second is: "A more appropriate means of addressing the pollution issue is to regulate exhaust emissions directly rather than using the environment issue to disguise the milking of fuel excise for general revenue" (p.61).

The sustainability debate does not appear to have had any impact on the proposals contained in the "Fightback" package. An interesting question is whether key elements of the package could be combined with sustainability considerations. Given previous discussion here, one possibility which it is interesting to explore is the substitution of carbon taxation for GST. As a way of indicating that this can be put on the agenda, I asked the Industry Commission to do for me an ORANI simulation which involved eliminating payroll taxation and reducing income taxation by $6.5 billions, using carbon taxation to maintain revenue neutrality. The figure of $6.5 billion is the "Fightback" income tax revenue reduction in 1980/81 prices, 1980/81 being the year of the ORANI database. The Industry Commission kindly agreed to use the ORANI version developed for the greenhouse inquiry to do this, and supplied me with the following results. The tax rate required is $195 per tonne of carbon dioxide; GDP falls by 12.2 per cent and consumption by 10 per cent; carbon dioxide emissions fall by 81 per cent and methane emissions by 21 per cent.

The point of reporting this is not to argue this as an alternative package. It is to illustrate that one can pose sensible questions about taxation from a sustainability perspective, and get partial answers. The answer is partial because, as already noted, ORANI is a static model and cannot pick up any consequences of enhanced saving arising from the switch away from income taxation, or any technology forcing arising from changed relative prices. Also, as already noted, there is no accounting for environmental benefits. Clearly, to explore these sorts of questions more fully models are required which are dynamic and which do include the environment. The development of such models would indicate that the sustainability debate had impacted on thinking.

## 7. Putting Carbon Tax Costs in Perspective

The nature of the question addressed in this paper does not permit of conclusions, so I will finish with some remarks on one aspect of the issues it has looked at. This is the assessment of the costs of using carbon taxation to meet some target reduction in carbon dioxide emissions, and reactions to those assessments here in Australia. As noted above, the Industry Commission (1991) put the costs of participation in an international consensus at 1.5 per cent of national income. Leave aside all the caveats which should be, and to large extent were by the Industry Commission, attached to such an estimate. Indeed, double it and take it that participation in an international consensus would cost Australia 3 per cent of national income per annum for the foreseeable future (which gets us into the range of the Whalley and Wigle figures for "Other OECD", see Table 1). Can such a cost reasonably be described as "large"? As noted above, more loaded descriptions of the smaller figure have been used recently.

The first obvious point is that such a cost cannot reasonably be described as large or small except in relation to the benefit that incurring it entails. Much commentary appears to be based on the implicit assumption that this benefit is small, in relation to the cost, or non-existent. In actuality, it is of unknown size, and is likely to remain so for the foreseeable future. Inherent uncertainty is an essential feature of the sustainability debate. Given this what can be said about the operative question, which is whether the cost should be incurred, not whether it alone is in some absolute sense large. As the Industry Commission report was at some pains to point out, what we are dealing with here is a problem of social decision making in the face of uncertainty, to which there is no technical resolution.

Rather than going into an analysis of this problem, I would just like to make two simple points. First, in the sustainability context many have questioned the connection between national income levels and human satisfactions. Unless the connection is pretty tight, changes of 3 per cent either way in national income do not tell us much about what is really interesting. It seems to me that if the political will existed Australia could accommodate to a 3 per cent reduction in national income with little real hardship. The situation could reasonably be argued to be very different in, for example, Bangladesh.

Second, suppose that there is a very tight connection between national income and human

satisfactions that holds over the full range of income variation. If national income grows at 2.5 per cent it takes approximately 30 years for it to double. If Australians took a once and for all loss of 3 per cent now, in 30 years time they would be 97 per cent rather than 100 per cent better off, assuming no benefits arising and no enhanced greenhouse effect. If, as well as the once and for all output loss the growth rate were reduced from 2.5 to 2.0 per cent, in 30 years Australians would be 76 per cent rather than 100 per cent better off. This is one way of looking at the size of the insurance premium that might be being asked for. A very different perspective is that of a coal miner in the Hunter region. But, in different contexts some of those who regard 1.5 per cent as a large cost regard the sort of problems that the miner would face as precisely the necessary social costs of achieving national income growth.

This is, of course, all rather superficial. But, in the light of the issues raised in the sustainability debate it seems to me that the same description applies to a lot of the commentary on the assessment of the costs of carbon taxation. To this extent, the impact of that debate on lots of thinking appears to have been rather small.

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