The Use of Tax Allowances to Reduce Competitive Disadvantages Resulting from Ecological Tax Reform

In the spring of 1994 the DIW presented a scenario for an ecological tax reform.[1] It examined the impact of an energy tax, the revenue from which is returned to firms in the form of a cut in employer contributions to the social insurance system and to private households in the form of a per capita transfer ("eco bonus").

The debate since then has revealed, however, that an energy tax will meet opposition from large sections of industry, and for political reasons is therefore unlikely to be realised. Particularly if Germany were to play a pioneering role in introducing such a climate protection policy, many observers have pointed to the dangers for the competitiveness of various energy-intensive industries. In order to reduce such risks, a number of tax allowances are under discussion, granting reductions in the tax burden on firms whose competitiveness is threatened. Commissioned by six of Germany's state governments, the DIW has studied the scope for, and the problems of, such tax allowances in the context of an energy tax with compensation.[2]

The various tax allowance concepts

In order to avoid undesirable effects of an energy tax on competitiveness, various tax concession concepts are conceivable. In the case of general cuts in tax rates, some areas of the economy receiving support would be subject to a reduced rate of tax. This reduction can be applied to the firms as a whole (the business sector), industry, particular industrial sectors (such as the basic goods industry) or individual, particularly hard-hit branches (such as smelting).

More closely oriented towards the particularly hard-hit areas of production are tax cuts whose extent is based on energy intensity. The basic principle underlying such a concept is that a certain basic energy consumption would be subject to the standard rate of energy tax, but consumption in excess of this would be taxed degressively depending on the energy intensity of individual companies or establishments. This form of concession reduces the marginal tax burden, i.e. the tax on the last unit of energy consumed, on the companies or establishments benefiting, whereas the average rate of tax is reduced to a markedly lesser extent (cf. figures 1 and 2).

More efficient in both economic and ecological terms, but more difficult to implement, would be to grant tax-free allowances for a certain level of energy consumption; the level of the allowance could be based on past energy consumption of the firm or establishment, or the average consumption of the industry concerned. The marginal tax rate, and thus the incentive for technical and organisational improvements to raise energy efficiency would thus be maintained, whereas the average tax burden would be significantly reduced. What is very difficult, however, would be to determine the level of the allowance for each individual firm.

Also conceivable would be a product-related reduction in the tax burden. This could be measured on the basis of the average or standardised energy intensity of a product, i.e. the relative energy costs of energy taxes incurred for each unit of output given typical or modern production technology. In this case, too, the incentives to save energy would be maintained.

Finally, selected industries could be completely or partially compensated for the energy tax revenue generated by them within the framework of an industry-specific form of compensation.[3] These funds could then be distributed among the enterprises of the sectors receiving support on the basis of various criteria (value of output, turnover, value added or payroll). This would incur high administrative costs, however, and it must be questioned whether this is compatible with European Union competition laws. Moreover, this procedure would tie up funds and so reduce the scope for the general compensation, i.e. the reduction in existing taxes and contributions.

Impact of the tax allowances

The impact of alternative tax allowance concepts were analysed on the basis of three variants.[4]

– Variant I: reduction of the energy tax for the entire business sector to 30% of the rate applied to non-favoured energy consumers (standard rate of tax);

[1] Cf. S. Bach, M. Kohlhaas, B. Praetorius, Ecological Tax Reform even if Germany has to Go it Alone, in: *Economic Bulletin*, vol 31, no. 7, July 1994.

[2] The full report is available in German.

[3] This has been proposed by the working party on ecological-social tax reform of the German Greens (Bündnis 90/Die Grünen).

[4] Transport fuel was not incorporated into the tax concessions.

Figure 1

Reduction in the Burden of Energy Tax Depending on Energy Tax Intensity

Reduction scheme

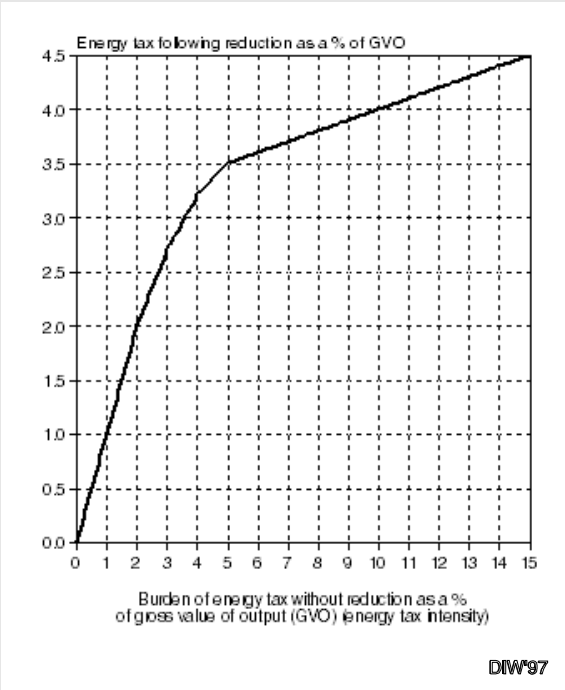
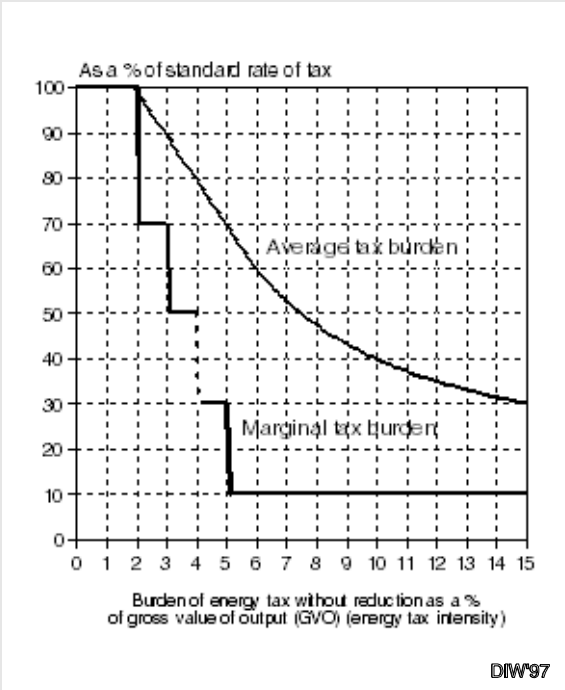


Figure 2

Reduction in the Burden of Energy Tax Depending on Energy Tax Intensity

Marginal and average tax burden



– Variant II: reduction of the energy tax for industry to 20% of the standard rate.
– Variant III: specific reduction of the energy tax for branches or production based on their "energy tax intensity" (energy tax as a proportion of gross value of output) using a uniform reduction scheme (cf. figures 1 and 2).[5]

The reform concept for the ecological tax reform was based on the DIW's scenario from 1994.[6] Unlike in the original DIW study, the non-energetic consumption of fossil fuels is exempt from tax, however. In order to avoid circumvention, waste incineration and dumping would have to be taxed in return. The structure of the revenue-neutral compensation system was also modified. Instead of a one-sided cut in employer social insurance contributions, in this study, employer and employee contributions are cut equally. The aim remains, however, of ensuring that firms and private households, in each case as a group, are not worse off from the net effect of energy tax and compensation. To the extent that more than 50% of the burden of the energy tax falls on the business sector, but given the equal reduction in social insurance contribution rates, this sector would be only compensated with 50% of the tax revenue so generated, a supplementary reduction in business taxation is incorporated into the model.

[5] The course of the progression used to calculate the reduction is as follows:
– up to an energy tax intensity of 2%, no reduction is granted (basic energy consumption subject to standard rate of energy tax);
– for an energy tax intensity of between 2% and 3%, the marginal tax burden is reduced to 70%;
– for an energy tax intensity of between 3% and 4%, the marginal tax burden is reduced to 50%;
– for an energy tax intensity of between 4% and 5%, the marginal tax burden is reduced to 30%;
– for an energy tax intensity of 5% and over, the marginal tax burden is reduced to 10%.

This means that the average tax burden (with respect to gross value of output), compared to the standard rate is 3.5% instead of 5%, 4% instead of 10%, 4.5% instead of 15%, 5% instead of 20% and 6% instead of 30%.

[6] The proposal was for a general tax on energy to which all forms of fossil fuel and electricity would be subjected according to their energy content; regenerable sources of energy remain tax-free. Under the proposal the rate of tax increases progressively over the long term. In the first year it amounts to DM 0.63 per gigajoule (gj) or DM 18.46 per tonne of coal equivalent (tce), in the fifth year DM 3.62 per gj or DM 106.18 tce and in the tenth year DM 8.70 per gj or DM 255.10 per tce. The average increase in the cost of energy consumption in the economy as a whole is thus 4.5% in the first year and by 58% in the tenth year.

As far as the empirical and model-analytical presentation of the economic effects are concerned, the approach taken was the same as that for the 1994 DIW study:

- The sectoral price effects were studied with the help of an input–output price model.
- On the basis of a sectorally disaggregated energy scenario, the trend of total energy consumption is estimated and the volume of energy tax revenue generated calculated.
- The medium-term macroeconomic effects of the tax reform are simulated in an econometric model that portrays the most important economic relationships between the sectors: private households, business, government and the rest of the world.

Sectoral price effects

The sectoral price effects of the base scenario (without tax allowances) and of the variants with tax allowances were studied with the help of a static input–output price model. Using this model, the direct and indirect (i.e. via trading relations) cost effects for the various sectors of the economy can be determined, under the assumption of constant supply and procurement relationships in the economy and the complete passing on of price effects at all stages of production. This ignores the effects of the adjustment of production technologies to the new relative prices and the – autonomous and induced – changes in economic structure. Thus a static input–output analysis of this type portrays only the initial, stimulatory price effects of the ecological tax reform scenario. This means that the price effects given will probably represent the "ceiling" of the cost increases that can be expected. The net price effects in the tenth year of the ecological tax reform scenario are summarised in figures 3 to 5 for the production sectors and for the areas of final demand.

The sectoral price effects of the base scenario are broadly in line with the results of the DIW study conducted in 1994. A general reduction of the burden of the energy tax to 30% for the entire business sector (variant I) leaves the sectoral rankings of net tax burden reductions and increases largely unchanged on the base scenario. There is, however, a reduction in the overall spread between the "winners" and "losers" (cf. figure 3); the standard deviation declines from 3.7 in the base scenario to 1.2. The price increase for private consumption declines slightly, whereas the extent of the reduction in the burden on public consumption and fixed capital formation is cut by around half; the price increase on exports is substantially lower (cf. figure 5).

A tax allowance concept under which industry would be required to pay only 20% of the standard rate (variant II) induces more highly differentiated price effects. Industrial branches are considerably better off than the rest of the economy, due to the substantial reduction in the burden of energy tax, while continuing to benefit from the compensation mechanism. Basic-goods industries no longer suffer virtually any net increase in the tax burden. Many of the other areas of manufacturing industry benefit from marked net price reductions compared with the base scenario. By contrast, those areas of the economy not covered by the tax-reducing regulation, face a heavier tax burden, or the extent to which they benefit from ecological tax reform is reduced. Compared with the generalised reduction to 30% of the standard tax rate, the spread between branches is somewhat greater. Investment in machinery and equipment does particularly well from this regulation; exports, too, benefit.

In variant III selected areas of production in mining and industry in which the "energy tax intensity" is over 2% benefit from reductions in their tax burden. The following industries benefit from the concession: mining products, chemical products, rubber products, quarrying and building materials, fine ceramics, glass and glass goods, iron and steel, non-ferrous metals, foundry products, wood, pulp, paper and paperboard, and textiles. A specific concession defined in this way concentrates the reduction in the energy tax burden on a small number of energy-intensive areas of the economy. In this case the revenue from the business sector generated by the energy tax declines only slightly; the funds available for compensation for all areas of the economy remain correspondingly high. The areas of production benefiting from the measure enjoy a marked reduction in their tax burden, although not to the same extent as in the second scenario. Here too the cost of investment goods falls, but the price of exports rises slightly.

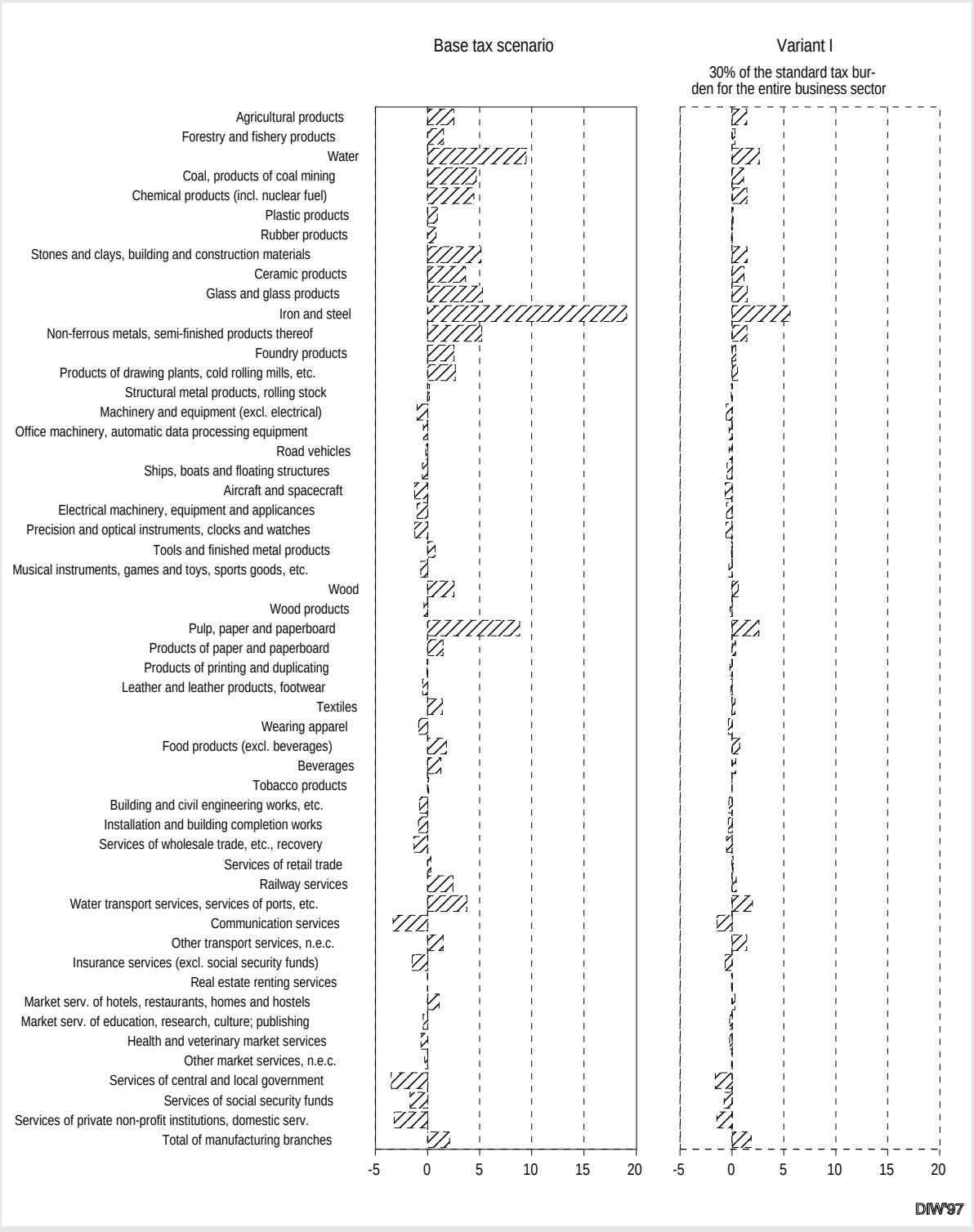
Impact on energy consumption

The reduction in the burden of energy tax is likely to lessen the incentive to make energy-saving investment or initiate other adjustment measures in the industries benefiting. Depending on the form taken by the reductions, the support offered to firms has very different effects on sectoral energy saving.

Energy consumption scenarios were calculated for the period 1996 to 2010 (cf. table 1). The smallest losses in the "steering effect" of the new tax are suffered in variant III, in which taxation is reduced in accordance with energy intensity. In the base scenario (without tax allowances) primary energy consumption after ten years (2005) is 16.5% lower than in 1990, and 21.7% lower in the fifteenth year. A special regulation as in variant III would reduce these energy saving figures by 0.4 and 0.8

Figure 3

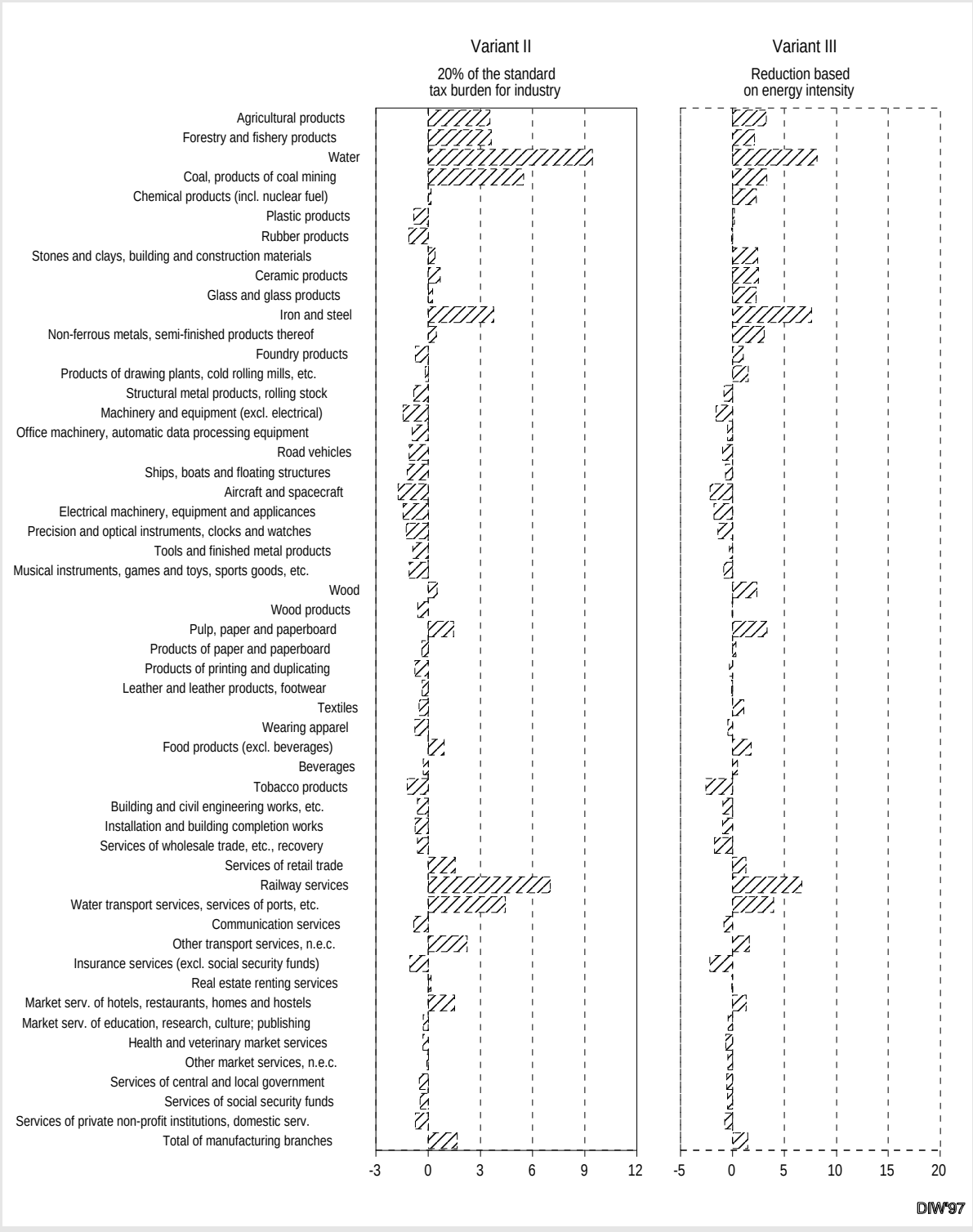
Sectoral Net Price Effects of the Ecological Tax Reform in the Tenth Year in % Compared with the Base Year[1)]



1) Results of the static input–output price model, i.e. assuming unchanged structures on the base year and complete passing on of price changes. Business sector excluding mining, energy and financial institutes.
Sources: Federal Statistical Office, Input–Output Table 1988; DIW calculations.

Figure 4

Sectoral Net Price Effects of the Ecological Tax Reform in the Tenth Year in % Compared with the Base Year[1)]

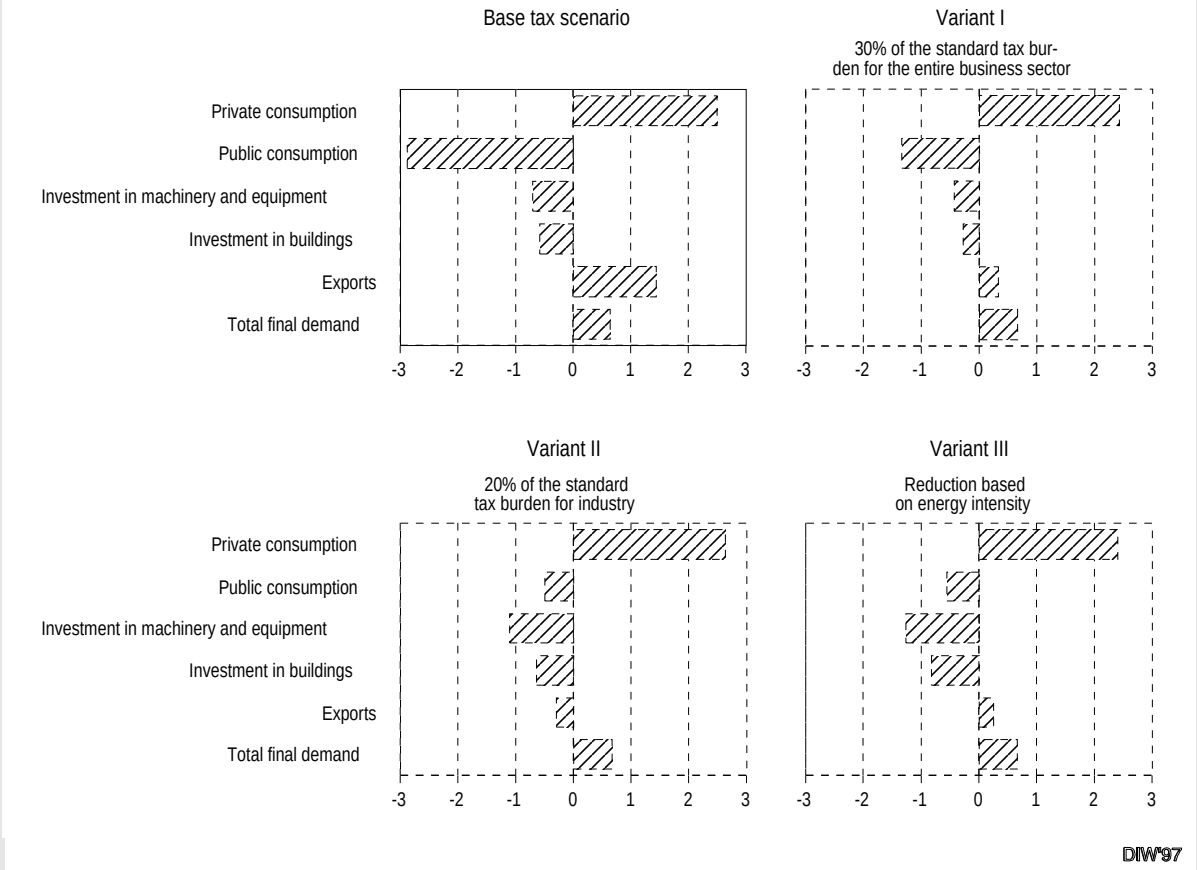


1) Results of the static input–output price model, i.e. assuming unchanged structures on the base year and complete passing on of price changes. Business sector excluding mining, energy and financial institutes.

Sources: Federal Statistical Office, Input–Output Table 1988; DIW calculations.

Figure 5

Net Price Effects of the Ecological Tax Reform for the Components of Final Demand[1)] in the Tenth Year in % Compared with the Base Year



1) Allowing for imports and non-deductible value-added tax and given unchanged economic structures on the base year (1988) and complete passing on of price changes
Sources: Federal Statistical Office, Input–Output Table 1988; DIW calculations.

percentage points respectively. A reduction in the tax burden to 20% for industry (variant II), on the other hand, would cut the energy saving on 1990 to just under 14% in the tenth and just over 17% in the fifteenth year. The ecological steering effect is even lower in variant I in which the tax rate is reduced to 30% for the entire business sector: the energy saving effect compared with 1990 would be just 11.4% in 2005 and 14.4% in 2010.

The reduction in carbon dioxide emissions associated with the cut in primary energy consumption depends largely on the way in which the structure of the energy sources consumed changes. Since it is likely that the less carboniferous natural gas will expand its market share and the usually low-emission renewable sources of energy will be increasingly used – not least due to the incentives created by the energy tax – carbon dioxide emissions are likely to decline somewhat faster than primary energy consumption in all the tax scenarios.

The model calculations clearly show that, if a tax were imposed on energy consumption, industry could make a significant contribution to saving energy (cf. table 2). Compared with the same year in the reference scenario, its energy consumption in the base tax scenario is 7.3% lower in the tenth and 12.5% lower in the fifteenth year. Given a tax concession on the basis of energy intensity, the expected energy saving is somewhat lower at 5.6 and 9.3% respectively. The reduction in the tax burden on the entire business sector or industry, on the other hand, would mean that the energy savings induced by the tax would be very minor (between 1.1% and 2.6%).

In all three variants the tax allowances lead to a reduced volume of energy tax revenue compared with

Table 1

Energy Consumption Scenarios in Germany

	Base year	Base tax scenario		Variant I		Variant II		Variant III	
	1990	2005	2010	2005	2010	2005	2010	2005	2010
					petajoules				
Households	2 380	1 861	1 596	1 861	1 596	1 861	1 596	1 861	1 596
"Small consumers"	1 565	1 276	1 189	1 538	1 546	1 276	1 189	1 276	1 189
Transport	2 379	2 842	2 706	2 842	2 706	2 842	2 706	2 842	2 706
Industry	2 997	2 329	2 265	2 468	2 521	2 484	2 545	2 372	2 346
Military	139	64	61	64	61	64	61	64	61
Final energy consumption (FEC)	9 460	8 372	7 817	8 773	8 430	8 527	8 097	8 415	7 898
Consumption and losses in the energy sector and statistical discrepancies	4 377	3 017	2 819	3 375	3 285	3 280	3 188	3 041	2 860
Non-energetic consumption	958	958	950	958	950	958	950	958	950
Primary energy consumption (PEC)	14 795	12 347	11 586	13 105	12 665	12 764	12 234	12 414	11 708
By way of comparison: PEC without energy tax		14 256	14 167	14 256	14 167	14 256	14 167	14 256	14 167
					% change				
Reduction in primary energy consumption									
– compared with 1990		–16.5	–21.7	–11.4	–14.4	–13.7	–17.3	–16.1	–20.9
– compared with trend without energy tax		–13.4	–18.2	–8.1	–10.6	–10.5	–13.6	–12.9	–17.4
Annual average decline in consumption									
– compared with 1990		–1.2	–1.2	–0.8	–0.8	–1.0	–0.9	–1.2	–1.2
– in the five previous years		–1.5	–1.3	–0.9	–0.7	–1.0	–0.8	–1.5	–1.2

Sources: Prognos; Federal Ministry of the Economy; DIW calculations.

the original model (cf. table 3). In the case of the specific reduction for energy-intensive branches (variant III) the decline in revenue is only slight, whereas the general reductions for the entire economy or for industry have the effect of substantially reducing energy tax revenue.

Macroeconomic effects

The macroeconomic effects of the various scenarios were estimated for west Germany using a macroeconomic model, the DIW version of the econometric busi-

Table 2

Change in Final Energy Consumption Compared with Trend without Energy Tax[1)]

in %

Sector	2000	2005	2010
		Base tax scenario	
Households	–13.2	–24.5	–33.0
Transport	–2.2	–5.3	–9.4
Small consumers	–13.7	–21.2	–27.5
Industry	–3.1	–7.3	–12.5
Final energy consumption	–7.2	–13.3	–19.1
		Variant I	
Households	–13.2	–24.5	–33.0
Transport	–2.2	–5.3	–9.4
Small consumers	–3.7	–5.1	–5.7
Industry	–0.9	–1.7	–2.6
Final energy consumption	–5.0	–9.2	–12.7
		Variant II	
Households	–13.2	–24.5	–33.0
Transport	–2.2	–5.3	–9.4
Small consumers	–13.7	–21.2	–27.5
Industry	–0.6	–1.1	–1.6
Final energy consumption	–6.6	–11.7	–16.2
		Variant III	
Households	–13.2	–24.5	–33.0
Transport	–2.2	–5.3	–9.4
Small consumers	–13.7	–21.2	–27.5
Industry	–2.4	–5.6	–9.3
Final energy consumption	–7.1	–12.9	–18.2

1) Repercussions of changes in relative prices for households and transport were not considered.
Source: DIW calculations.

Table 3

Revenue from the Energy Tax

in DM billions at 1993 prices,
incl. additional VAT on energy tax revenue

	2005	2010
Base scenario without tax allowances	109.3	185.5
Variant I: reduction for the entire private sector to 30% of standard tax burden	72.9	121.0
Variant II: reduction to 20% of the standard tax burden for industry	84.1	141.4
Variant III: reduction based on energy intensity	100.9	170.5

Source: DIW calculations.

ness cycle model developed by Germany's six leading economic research institutes. The following assumptions were made:

– the monetary authorities permit a rise in nominal interest rates only to the extent of the price effects arising in the wake of the increase in energy tax, i.e. real interest rates remain at the same level as in the simulation without an ecological tax reform;
– any loss in price competitiveness compared with Germany's leading trading partners, as measured by the price index for exports of goods and services, is offset by exchange rate changes;
– the parties to collective bargaining orient wage determination towards (expected) changes in the price level, labour productivity and the level of unemployment.

The macroeconomic effects of the various tax concession variants differ only slightly from the results of the original 1994 study (cf. table 4). Economic growth differs only marginally from both the trend without an energy tax and the energy tax scenario in the absence of tax allowances. The price index of private consumption in the tenth year of energy price increases is between 2.7% and 4.5% above the level in the reference scenario; in other words each year inflation is between 0.3% and 0.4% higher (cf. table 4). Significant employment effects can still be expected. At up to 390 000 the employment effects are, however, lower than in the 1994 DIW study, because the cut in employer labour costs is not as great.[7] After ten years, an ecological tax reform designed in this way could reduce unemployment by around 200 000, around 7% of the current west German level;[8] this amounts to a fall of 0.6 percentage points in the unemployment rate. Quite clearly, an energy tax in all its variants cannot replace an autonomous labour market policy, but may support such a policy.

[7] This estimate is cautious to the extent that no additional investment in housing construction (insulation, heating systems) were taken into account. It is difficult to estimate the order of magnitude of such investment. On the other hand there is the danger that if energy taxes are introduced, some investment projects in energy-intensive areas will not be implemented.

[8] Just less than half the additional jobs are filled by people previously not registered as unemployed.

Table 4

Macroeconomic Effects of an Energy Tax

Deviations from the situation without energy tax after 10 years in %

	Variant I	Variant II	Variant IIIa	Variant IIIb
Employment	1.1	1.3	1.4	1.4
Productivity (per employee)	–1.2	–1.5	–1.3	–1.3
GDP, real	–0.1	–0.2	0.0	0.0
Private consumption, real	–0.5	–0.6	–0.1	–0.1
Public consumption, real	0.0	0.0	0.1	0.1
Fixed capital formation, real	–0.5	–0.6	–0.4	–0.4
Investment in equipment, real	–0.7	–0.8	–0.3	–0.3
Investment in buildings, real	–0.3	–0.4	–0.5	–0.5
Exports, real	0.0	0.0	0.0	0.0
Imports, real	–0.6	–0.7	–0.5	–0.5
GDP, nominal	2.2	2.7	1.7	1.7
Price index of imports	1.8	2.1	0.7	0.7
Price index of private consumption	3.7	4.5	2.7	2.7
Price index of GDP	2.3	2.9	1.6	1.6
Gross wage and salary income[1)]	0.1	0.2	–0.8	–0.8
Gross business income	–2.6	–2.2	–4.8	–4.8
National income	–0.7	–0.4	–1.9	–1.9
Net business income	–2.9	–2.5	–5.3	–5.3
Net wages and salaries	5.7	6.5	5.7	5.7
Hourly collectively agreed wage rates	1.0	1.2	0.0	0.0
Unit labour costs	0.2	0.4	–0.8	–0.8
memo item:				
Nominal interest rates (in percentage points)	0.6	0.7	0.4	0.4
Employment (in thousands)	330	380	390	390
Government deficit[2)] (DM billions)	+4.5	+3.7	–1.1	–1.1

Assumptions: Constant real interest rates and unchanged real external value of the D-Mark, no change in behaviour of collective bargainers and monetary authorities.
Variant I: Reduction for the entire private sector to 30% of standard tax burden
Variant II: Reduction to 20% of the standard tax burden for industry
Variant IIIa: Reduction based on energy intensity
Variant IIIb: As variant IIIa, but exogenous collectively agreed wage trend
1) Include employer social insurance contributions. — 2) +: decline in deficit, -: increase in deficit, at 1991 prices.
Source: Simulation using the DIW version of the econometric business cycle model of the six leading German economic research institutes.

Changes compared with the base tax scenario do emerge with respect to income distribution. Compensation by means of a cut in employee contributions to the social insurance system eases the burden primarily on socially insured employees. Civil servants and the self-employed benefit only marginally, as they pay no – or only very limited – social insurance contributions. Recipients of transfer incomes (pensioners, the unemployed, social benefit recipients etc.) will in some cases experience higher incomes due to the adjustment of benefit levels in accordance with net wages and to other such regulations which make up partially for the higher tax burden.

In the tenth year of the energy tax, public revenues and spending are around 2% higher than the level that would be expected without an energy tax. On the revenue side government benefits from higher VAT receipts and, due to higher employment, from increased social insurance revenues; on the spending side government benefits from lower wage costs for public sector employees and reduced payments of unemployment assistance. The assumed upward adjustment of transfer payments to private households, on the other hand, serves to increase spending.

Administrative and legal aspects

Besides the ecological steering effects and the impact on macroeconomic developments, an evaluation of the special tax concession concepts must also consider legal, administrative and competition-related aspects.

As far as the legal and administrative–technical scope for implementing the tax allowances is concerned, there is the fundamental problem of distinguishing between the branches that are to benefit and those that are not. The demands made here differ between the various concepts. If merely sections of the economy are to be incorporated into the tax allowances, the problem is that of classifying firms, enterprises or parts of enterprises to the areas to be supported. A definition on the basis of the legal unity of the company has the advantage that a firm's trading and tax accounts can be used to determine classification. It must be borne in mind, however, that a firm may well be active in both branches in which the energy tax burden is intended to be reduced and those in which it has not. If the special regulation is based on the legal entity of the company, incentives will be created to circumvent the tax by changing the legal status (merging or splitting up) of firms. This may well lead to deadweight effects and competitive distortion. In order to avoid this as far as possible, the areas of the economy chosen to benefit would have to be defined at the level of local productive establishments, ideally on the basis of product-related functional divisions of enterprises. Energy consumption would then have to be calculated at enterprise level; if the reduction is to be granted in accordance with energy intensity, the reference values used (production value/turnover or value added) would also have to be calculated at the level of the individual establishment. This would be costly in administrative terms, particularly for the tax authorities which would frequently find themselves unable to verify the figures submitted by firms. Such procedures are thus prone to manipulation and legal disputes.

These definitional problems do not arise if the reduction is applied to the business sector as a whole. Given the difficulty of precisely defining the business sector in practice among the countless very small firms with their proximity to their owners' living environment, a number of administrative–technical problems arise even with this form of concession. On the other hand, in this case recourse can be made to the existing taxation legislation, as applying to value-added tax and the taxes on profits, so that the supplementary administrative costs involved are likely to be limited.

Highly differentiated tax allowances for individual industries also contravene the principle that exceptions should be based on general rules and not on discretionary decisions. Case-by-case decisions require an evaluation of the impact on the competitiveness of individual branches. The government does not have the necessary information on current and future avoidance costs, the scope for adjustment, the scope for price setting and the incidence of the tax on individual firms and citizens at its disposal. Given the numerous methodological and empirical problems, it will be difficult to come up with a definition of competitiveness that can be operationalised for day-to-day administrative activity. International competitiveness is influenced by a whole range of highly heterogeneous factors. These cannot be established on the basis of rough statistical indicators. This would require case studies – at the most detailed, product-related level possible – of market and branch-level trends.

Last but not least, the greater the extent to which tax concession concepts move away from general exceptions to discretionary case-by-case decisions, the more obvious it is that they are a form of subsidisation. Case-by-case decisions require regular monitoring of the conditions of entitlement and, necessarily, a significant degree of discretion on the part of the executive regulatory institutions and administrative offices. For firms, this tends to reduce the clarity, and planning and legal security of the measures. Clearly, this also creates substantial incentives for political lobbying.

Conclusion

The central finding of this analysis is that there is no single best-practice design for tax allowances within the context of an energy tax. In selecting concrete models, it is necessary to weigh the partly conflicting demands against each other: reducing the adjustment pressure for energy-intensive areas, ecological effectiveness, economic efficiency, compatibility with market principles, and, above all, issues of administrative feasibility. Such a weighing up cannot be derived from scientific principles but must, finally, be determined politically. Scientific analysis can merely prepare the ground for political decision-making by describing goal conformity and goal conflict for the various types of concept.

In principle all the tax allowances discussed effectively reduce the spread of the spectrum of "winners" and "losers" and thus the pressure for structural change. This occurs, however, at the cost of the ecological steering impact, a reduction in the volume of revenue generated by the energy tax and higher administrative costs.

The macroeconomic effects do not differ fundamentally from those of an ecological tax reform in the absence of tax allowances, although the employment effects are somewhat lower. Tax allowances can therefore be justified in terms of reduced costs of adjustment and greater political acceptance.

The greater the extent to which tax allowances can be focused on problem areas, the less the steering effect and energy tax revenues are negatively affected. Thus if the short- to medium-term steering effect or tax revenues are given priority, highly differentiated tax allowances have advantages as they concentrate reductions on the branches particularly hard hit. At the same time, however, the information costs of defining in practice the branches to be favoured and collating the required data and the costs of administering the energy tax all rise.

Moreover, fundamental reservations against state intervention in economic structures need to be borne in mind. Highly differentiated tax allowances are based on the spirit of discretionary industrial policy, whereas environmental taxes, as economic instruments of environmental policy, are based precisely on the discovery and innovation functions of markets by setting general price signals.

Such considerations constitute arguments in favour of a general exception under which industry, or manufacturing or the entire business sector is taxed at a reduced rate (20 or 30% of the standard rate of tax). The disadvantage here is that the ecological steering effects are weakened. This is accompanied by a substantial reduction in tax revenue. Moreover, the number of firms benefiting is very high, and definitional problems arise between small craft enterprises and housing rental and private consumption.

Taking all this into consideration, there is much to support the view that highly differentiated concepts should be dispensed with altogether. Otherwise the energy tax scenario will become burdened with a form of subsidisation that is worrying in terms of market principles and costly in administrative terms. To the extent that tax allowances in favour of energy-intensive areas of production appear indispensable for the political realisation of the energy tax reform scenario, the reduced burden should, where possible, apply to the business sector as a whole. Whatever the tax allowances introduced, they should be evaluated at regular intervals with a view to comparable measures in other countries.

In the final analysis tax allowances should not aim to prevent the necessary ecological structural change, but merely to slow it down. Rapid structural change can cause substantial economic and social adjustment costs. The benefits obtained by easing adjustment pressure must, however, be set against the costs incurred by such tax allowances. Such a consideration is difficult as many of the relevant influencing factors cannot be precisely quantified.

What is vital is that a start is made on introducing an ecological tax reform, even if the overall level of taxation is lower. There is still an urgent need for action to protect against climate change, and this need is likely to increase further in future.[9] If ecological structural change towards a sustainable form of economic activity is to be brought about, economic instruments of environmental policy will have to be deployed. Voluntary commitments as currently propounded by German business and the federal government do not constitute a promising alternative.[10]

Ecological tax reform offers a chance of restructuring the economic system to face the challenges of the future. It offers incentives to develop environmentally friendly and low-resource-input products and production processes. The earlier a start is made along this path, the lower the social and economic costs involved. A successful ecological modernisation will provide an important stimulus to innovation, which in the medium term will strengthen the competitiveness of the German economy and open up new fields of activity and export

[9] H.-J. Ziesing, Climate Change Policies in the Wake of the First UN Conference of the Parties in Berlin, in: *Economic Bulletin*, vol 32, no. 7, July 1995; H.-J. Ziesing, Energy Consumption and CO_2 Emissions in Germany in the First Half of the 1990s, in: *Economic Bulletin*, vol 33, no. 4, April 1996

[10] M. Kohlhaas, B. Praetorius, H.-J. Ziesing, German Industry's Voluntary Commitment to Reduce CO_2 Emissions – No Substitute for an Active Policy Against Climate Change, in: *Economic Bulletin*, vol 32, no. 5, May 1995.

opportunities for business. Last but not least, if a large industrialised country such as Germany were to embark on an ecological tax reform, this would be of great symbolic importance, serving as a role model for other countries, and could be expected to accelerate international decisions on effective global environmental protection measures.

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