

# The Effects of the Ecological Tax Reform in Germany

The ecological tax reform has been hotly debated since its introduction in Germany in 1999. Apart from the war of words between politicians, it is evident that there is still a large degree of public uncertainty about the actual effects of energy taxation and reduced social insurance contributions. The DIW, in cooperation with other researchers, has now carried out a first systematic impact analysis of the phases of the ecological tax reform that have been agreed upon. The analysis focuses on the consequences for economic growth, the labour market, energy consumption and CO<sub>2</sub> emissions, and the effects on income distribution.

The results point to mostly positive effects of the reform. The impact on economic growth will be minimal, employment will rise, and energy consumption and CO<sub>2</sub> emissions will decrease. The fear that the ecological tax reform might interfere with the goals of social and income-distribution policy is not justified in this blanket form. The ecological tax reform could play a more significant role in climate protection if the weaknesses in the current concept are gradually eliminated.

In passing a law introducing the Ecological Tax Reform<sup>1</sup> the German Bundestag resolved to increase and extend energy taxation. The first stage of the ecological tax reform entered into force on 1 April 1999, and the second and third stages followed at the beginning of 2000 and 2001 respectively. Two further stages will be launched by 2002 and 2003.<sup>2</sup>

The aim of the ecological tax reform is to reduce energy consumption and the resulting emissions, and to promote the development of environmentally sound production and technologies. The increased tax revenues are being used to reduce pension insurance contributions. The resulting reduction in non-wage labour costs is expected to lead to employment growth. In addition, funding is being provided for a programme to promote renewable energy sources.

---

<sup>1</sup> 'Gesetz zum Einstieg in die ökologische Steuerreform', (Bundesgesetzblatt I, p. 378, 1999).

<sup>2</sup> The first stage introduced an electricity tax of 2 pfennigs per kilowatt-hour and increased mineral oil tax (by 6 pf./litre for petrol and diesel, by 4 pf./litre for heating oil, and by 0.32 pf./kilowatt-hour for gas). In the following stages only the tax on petrol and diesel (transport fuels) will be increased, in both cases by 6 pf./litre, while the electricity tax will be increased by 0.5 pf./kilowatt-hour.

In the run-up to its introduction the reform was already the subject of heated debate from the ecological, economic and legal perspectives. The dispute became politically explosive when the price of mineral oil products increased drastically due to the high world-market prices for crude oil and the devaluation of the euro. These events increased the opposition in some parts of the business community, amongst the German public and in other European countries. As a result some governments reduced energy taxes again or introduced subsidies. The sense and the economic and social feasibility of the ecological tax reform were also questioned in Germany. Its opponents demanded that it should be postponed or even abolished, because they feared negative effects on economic development and believed that the reform was socially unjust. However, no-one in the field of economics research has yet carried out a systematic impact analysis on which such arguments might be based.

## The first systematic study of Germany's new ecological tax reform

The DIW, in cooperation with Prof. Bernd Meyer (Osnabrück), Prof. Heinz Welsch (Oldenburg University) and Dr. Christhart Bork (formerly Potsdam University), and on behalf of the German Ministry of Finance, used various approaches to examine the economic and ecological effects that can be expected from the reform. The study focused on the effects for national and sectoral growth, the labour market, income distribution, and energy consumption and the resulting CO<sub>2</sub> emissions in the period 1999 to 2010.<sup>3</sup>

The effects of the ecological tax reform were examined using two macroeconomic models and a micro-simulation model. The PANTA RHEI econometric simulation and forecast model represents the national economy in 58 production areas in accordance with the input-output system. The LEAN simulation model is an empirical, general equilibrium model of the German economy, which was developed with a particular emphasis on the representation of the energy and labour markets. The macroeconomic results were linked with a micro-simulation model so that detailed household data could be used to determine the effect of the ecological tax reform on personal income distribution.

---

<sup>3</sup> The full report is to be published in German. A shorter version is available, also in German, as DIW Discussion paper no. 248: [www.diw.de/deutsch/publikationen/diskussionspapiere/jahrgang01](http://www.diw.de/deutsch/publikationen/diskussionspapiere/jahrgang01)

The quantitative analysis was carried out using the scenario technique. First a reference scenario was drawn up, describing the trends in the absence of the ecological tax reform. This was then compared with a policy scenario, which differs from the reference scenario in that it takes account of the ecological tax reform. Differences in the findings (e.g. in employment or economic growth) are interpreted as effects of the ecological tax reform. The analysis is thus only concerned with the differences between the values found; the absolute values are only of subordinate significance. Sensitivity analyses with higher energy prices, different exchange rates and changed wage-setting behaviour were carried out in order to check the robustness of the findings and to estimate the effect of different assumptions and analytic methods on the results.

### Ecological impact clearly evident

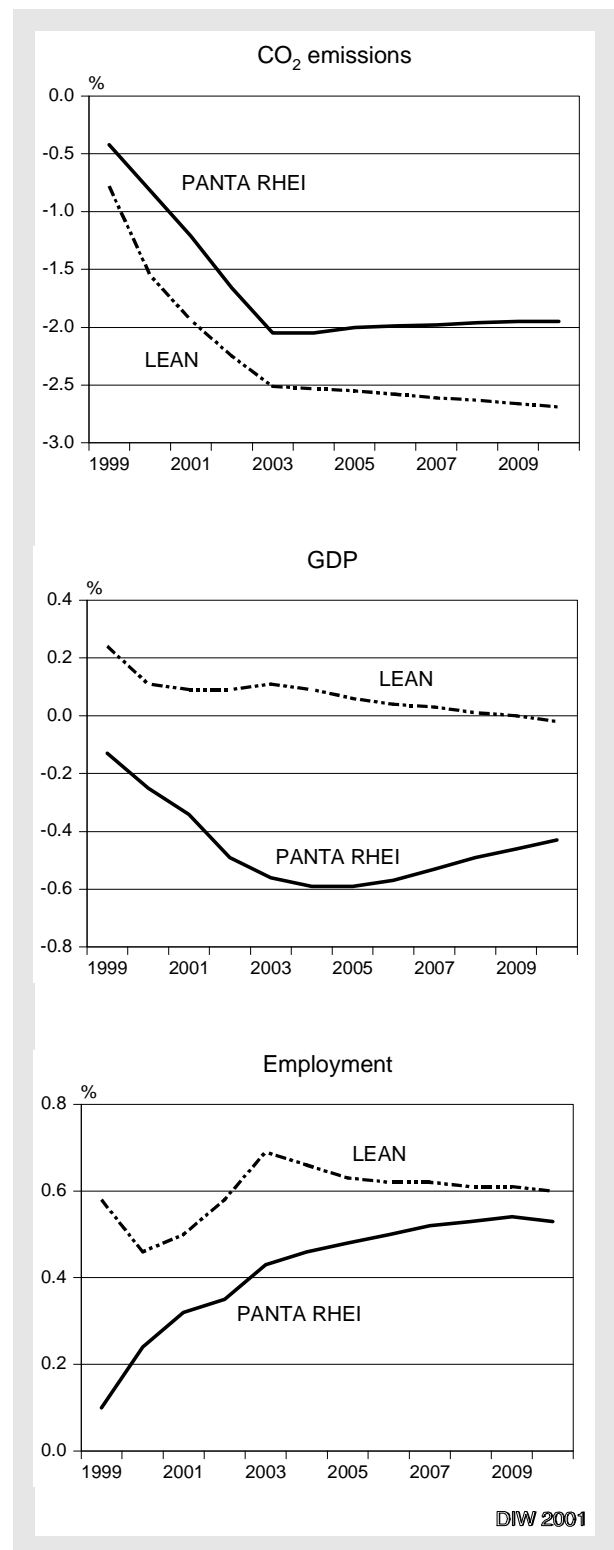
The simulation shows a 2% to 3% medium-term reduction of CO<sub>2</sub> emissions compared with the scenario without the ecological tax reform (cf. figure 1).<sup>4</sup> This amounts in absolute terms to no less than 20 to 25 million tonnes (cf. figure 2). Even so, the ecological tax reform alone cannot guarantee that the targets for reduction of CO<sub>2</sub> emissions agreed either nationally or under the European 'burden sharing' agreement will be achieved.<sup>5</sup> Neither can it remain the only measure in German climate protection policy; rather it should be integrated into a package of agreed measures to achieve these goals.

<sup>4</sup> This calculation does not take account of the potential reductions through new, highly efficient power-station techniques, which are to be promoted by the ecological tax reform:

- Combined heat and power plants with an energy utilisation ratio of 70% are entirely exempted from the existing mineral oil tax.
- Gas and steam turbine plants with an electrical net efficiency of at least 57.5% are to be exempted from the existing mineral oil tax for five years from the moment long-term electricity generation begins if they were built before 31.12.1999 and electricity generation first begins before 1.1.2004.

<sup>5</sup> Following the 3rd Conference of Parties to the Framework Convention on Climate Change in December 1997 in Kyoto, Germany committed itself at international level and under the terms of the European burden-sharing agreement to reducing the emissions of six greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFC, HFC and SF<sub>6</sub>) by 21% within the target period of 2008 to 2012. Independently of this commitment, the German government still intends to meet the national target announced at the beginning of the 1990s of reducing CO<sub>2</sub> emissions in Germany to 25% below 1990 levels by 2005.

Figure 1  
Comparison of the Modelled Effects  
of the Ecological Tax Reform  
% deviation from reference scenario<sup>1</sup>



<sup>1</sup> Reference scenario with high energy prices.  
Sources: Calculated using LEAN and PANTA RHEI.

## Positive employment effects

According to the calculations, the ecological tax reform could lead to the creation of 250 000 new jobs by 2010. The repercussions for overall economic growth are minor. PANTA RHEI reveals a decline in growth of up to 0.6% compared with the reference scenario by 2005, which will be slightly smaller after the year 2005. LEAN even shows a slight increase in growth initially, which, however, is lost again by the end of the observation period (cf. figure 1).

However, these findings are highly dependent on certain assumptions. Thus, a sensitivity analysis with LEAN shows the effect of wages policy: if the trade unions react to employment growth by increasing their wage demands, this could significantly dampen economic growth and nullify the positive employment effects. On the one hand, this result reveals the problem with model calculations because the political decisions of important actors are impossible to represent using statistical methods. On the other hand, it reveals the importance of the reaction of social groups to the ecological tax reform. Social consensus on the ecological tax reform could, therefore, improve the economic effects and facilitate the adjustment process. The employment findings also show that the ecological tax reform can ease the situation on the labour market, but cannot put an end to Germany's continued high unemployment. Thus, it cannot be seen as a substitute for employment-promoting policies.

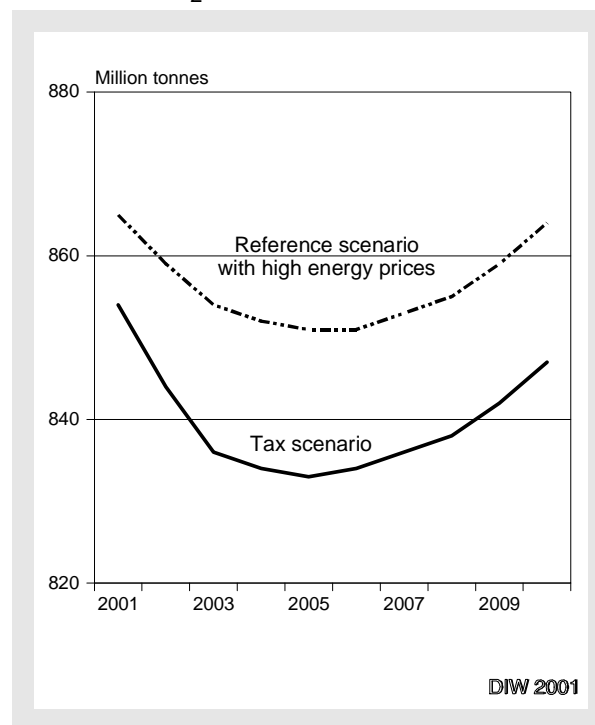
## Minor distribution effects

A detailed analysis of the distribution effects by socio-economic characteristics, using the Potsdam micro-simulation model, shows that the ecological tax reform in itself leads to a net burden for most households. However, as a share of household income this burden is low (cf. figures 3 and 4).

All in all, the ecological tax reform is not neutral in its effects on private households: they bear around 60% of the tax burden, but benefit from only half of the reductions in pension contributions. Households with lower incomes will bear a somewhat heavier burden as a share of net household income. The main reason are the higher prices for electricity, heating oil and natural gas. By contrast, medium-income households will bear the greater burden as regards the increased fuel taxes.

In assessing the income distribution effects it must be borne in mind that the ecological tax reform is an integral part of the German government's comprehensive tax reform package. Thus, if we also look at the

Figure 2  
Trends for CO<sub>2</sub> emissions



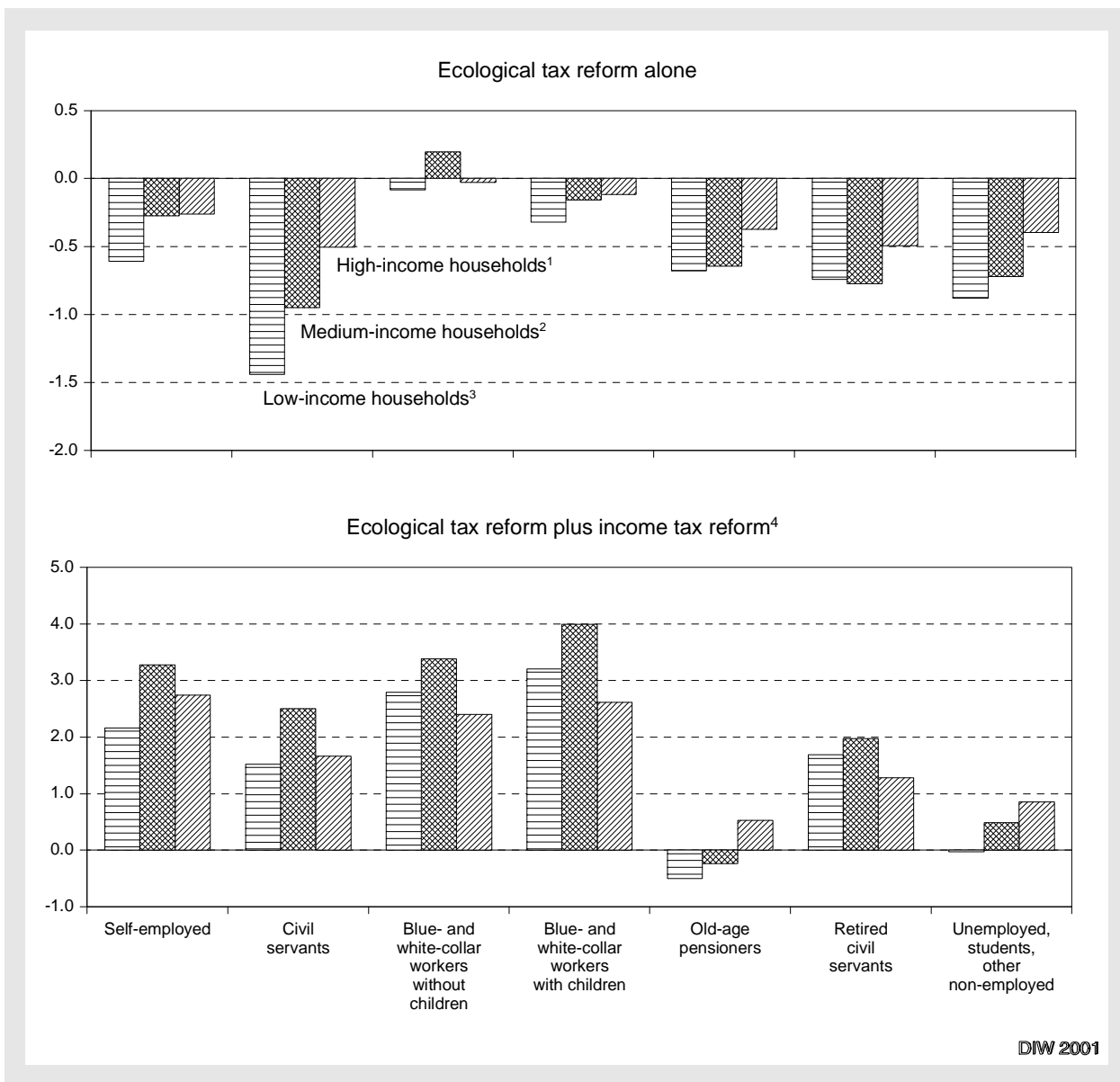
Source: Calculated using PANTA RHEI.

reductions in income tax and the increases in child allowance that will be introduced by 2003, most households will be better off on balance. Even most commuting workers can expect a reduced overall tax burden.<sup>6</sup> In addition to workers, households with children, especially, will be favoured to a relatively considerable extent; only a small number of singles and couples without children and with low gross incomes will be disadvantaged.

Households that mainly depend on income transfers (pensioners and the unemployed) will be affected negatively. However, the disadvantages will be eased by adjustment mechanisms which could not be taken into account in the distribution analyses presented here: the ecological tax reform will lead after a one-year delay to increases in social security pensions and unemployment benefit and assistance. The latter two benefits are adjusted in accordance with net wage growth. In other words, they will increase at a higher rate than in the absence of the ecological tax reform. Pensions were adjusted in 2000 in accordance with the inflation rate. Thus, in 1999 there was an additional increase in pen-

<sup>6</sup> Without taking the increase as of 2001 in the flat-rate commuter allowance into account.

Figure 3  
**Income Effects of the Ecological Tax Reform in 2003 by Social Status of Private Households**  
 in % of disposable income



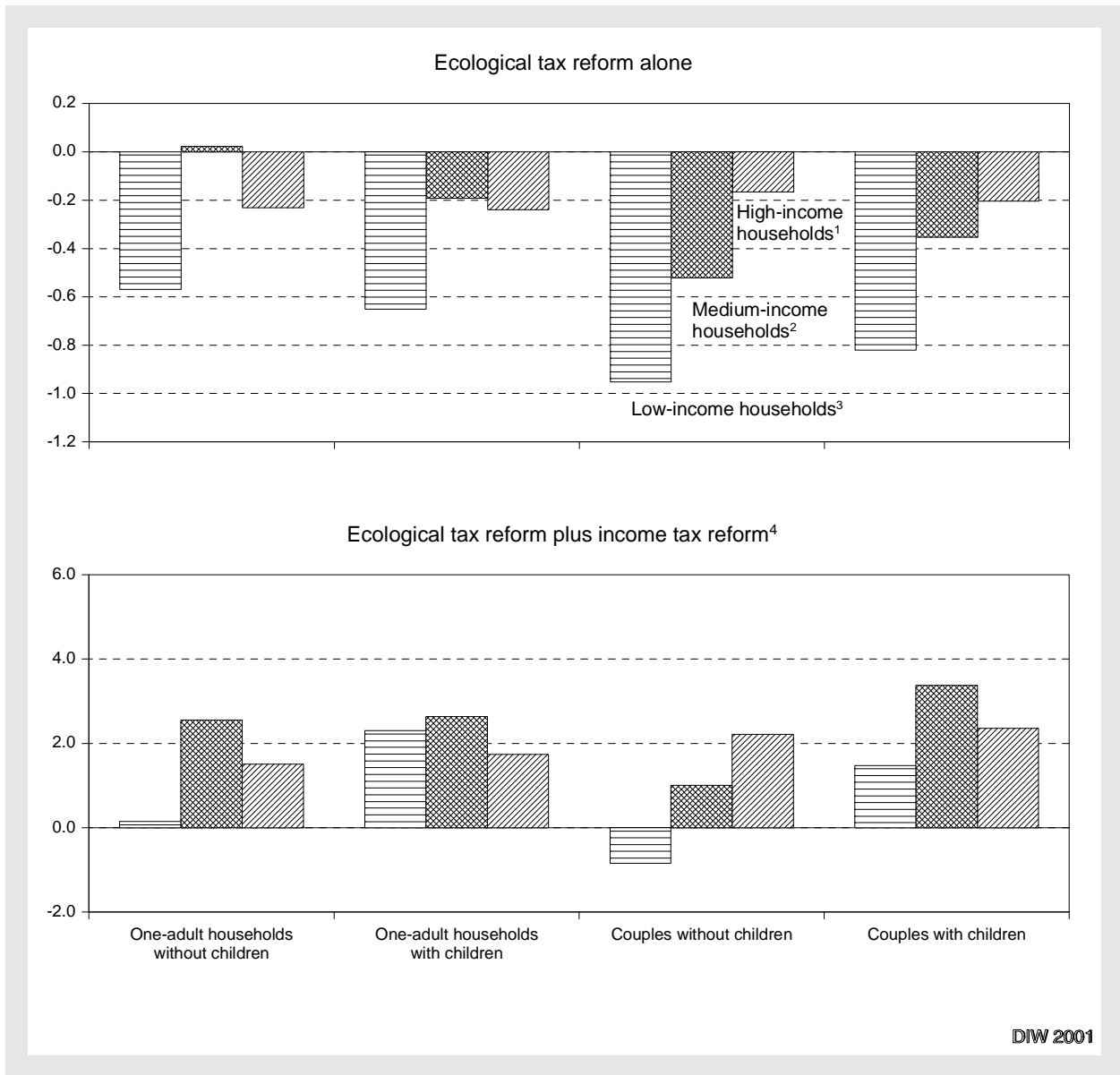
1 Households with an annual gross income (earned income and income transfers) of DM 100 000 or more. – 2 Households with an annual gross income of DM 50 000 to under DM 100 000. – 3 Households with an annual gross income of under DM 50 000. – 4 Including increase in children's allowance and family taxation reform.  
 Source: Calculated using Potsdam micro-simulation model.

sions in proportion to the increase in the inflation rate resulting from the eco-taxes. From 2001 onwards a modified gross wage adjustment will be carried out which takes changes in pension insurance contributions into account, but not changes in other social security contributions and taxes. Persons in receipt of social transfers will thus benefit from the reduction in pension contributions introduced by the ecological tax reform. Social wel-

fare recipients will also automatically receive higher benefits because their heating costs will be paid by the social welfare offices.

Although taken on its own the ecological tax reform has, to a small extent, undesired distribution effects, these can be compensated by income-distribution measures. This becomes evident if we look at the ecological tax reform and the income tax reform together (cf. fig-

Figure 4  
**Income Effects of Ecological Tax Reform in 2003 by Type of Private Households**  
 in % of disposable income



1 Households with an annual gross income (earned income and income transfers) of DM 100 000 or more. – 2 Households with an annual gross income of DM 50 000 to under DM 100 000. – 3 Households with an annual gross income of under DM 50 000. – 4 Including increase in children's allowance and family taxation reform.  
 Source: Calculated using Potsdam micro-simulation model.

ures 3 and 4). If unacceptable hardship ensures nonetheless for individual groups, and compensation measures are considered, these should be designed such that problem groups are consciously spared, without reducing the energy saving incentives of the ecological tax reform. For example, further increases in child allowance could compensate for undesired burdens on families.

### High world-market prices for crude oil not a reason for suspending the ecological tax reform

The sharp increases in crude-oil prices are repeatedly cited as an argument against continuing the ecological tax reform. A sensitivity analysis with different

assumptions concerning crude-oil prices and the exchange rate shows, however, that the effects of the reform on growth are weak and remain largely constant. In a scenario with higher energy prices, the employment effects are even more favourable. In this case CO<sub>2</sub> emissions are lower, but they remain significantly above the climate policy targets, so that there is still a need for policy action.

The results of the simulation thus give no cause to question the ecological tax reform on the basis of the higher import prices for crude oil and mineral oil products. The economic interpretation of the effects of this price increase must be entirely different from the interpretation of the effects of the ecological tax reform, because the tax increase is offset by cuts in pension insurance contributions which in macroeconomic terms are almost of the same dimension.

## Ecological tax reform can play a greater role in climate protection

Germany's ecological tax reform helps to reduce energy consumption and the associated environmental damage without having a substantial adverse effect on overall economic growth. It could even initiate a slightly positive trend on the labour market via the reductions in pension insurance contributions. The effects on economic structure are less clear, however. If the burden of contributions for the production factor of labour is transferred to energy, this might be expected to stimulate an ecological structural change in favour of the less energy-intensive sectors. The special regulations on relief for energy-intensive economic sectors weaken this effect, though. All in all, the sectoral consequences of the ecological tax reform are likely to be much less strong than those resulting from changes in oil prices or the exchange rate.<sup>7</sup>

All in all, the findings of the impact analysis suggest that the phases of the ecological tax reform which have been implemented or are planned are economically and socially acceptable. The ecological tax reform could thus play a greater role in climate protection than to date without any need to fear economic or social problems.

Further elaboration of the ecological tax reform for the period after 2003 should be decided as far as possible in agreement with Germany's European partners. This would increase the ecological impact and reduce

the risk of effects that could distort competition. A further very gradual increase in energy taxation without coordinated action on the part of the European Union would also be both possible and sensible, however, given that other European countries have already taken this route.

In the course of the further development of the reform, the weaknesses of the current concept should be gradually eliminated. Thus, all non-renewable energy sources should be included in the taxation measures and taxed more in accordance with their contribution to environmental pollution. The special regulations should be abolished as far as possible. Any remaining regulations must be designed such that the incentive to save on energy is not lost.

Stefan Bach, Michael Kohlhaas and Barbara Praetorius

---

<sup>7</sup> Cf. 'Higher Import Prices for Oil, Natural Gas and Mineral Oil Products: the Potential Price Effects in Individual Sectors of German Industry'. By Joachim Schintke, Reiner Stäglin and Jörg-Peter Weiß. In: *Economic Bulletin* vol. 37, no. 12, December 2000.