

**STUDY ON ECONOMIC AND ENVIRONMENTAL IMPACTS OF ENERGY
TAXATION: SUMMARY AND CONCLUSIONS
DG TAXUD C5**

Background

The scope of the study was to update the impact assessment of the Commission 1997 energy tax proposal (COM (97) 30) with an EU-wide general equilibrium model. The study has also explored the impacts of environmentally more ambitious tax levels and the combination of the EU minimum energy tax rates with the EU-wide emissions trading scheme. The GEM-E3 model of KULeuven was chosen for this purpose.

Conclusions

The implementation of the EU minimum tax rates on energy products in accordance with the current energy tax proposal would have negligible macroeconomic impacts in the EU and the majority of the Member States. For a group of five countries (Austria, Belgium, France, Greece and Portugal) the impacts are slightly positive in the case the tax revenues are used to reduce the employers' social security contributions.

Also environmental impacts are small. CO₂ emissions decrease by 0,5% at the EU level, as a consequence of lower energy consumption (-0,2% at the EU level) and a lower share of coal in the energy system.

Of industrial sectors mainly ferrous and non-ferrous metals would be affected by higher energy (coal) prices. The level of output would decrease by 0,2% and exports by 0,3% at the EU level. Of individual countries Austria, Belgium and France experience somewhat bigger reductions.

If the level of EU minimum tax rates is increased to the level, which corresponds to 15€/ton of CO₂, and their structure changed accordingly, the increase of national energy taxes and prices is more important. In particular, coal prices would rise substantially in most Member States. In spite of this macroeconomic impacts would remain small.

Energy consumption would decrease by 1% at the EU level, and the move away from coal would be more pronounced. The reduction of CO₂ emissions in the EU would be now 2,7% in 2010, which is 20% of the reduction needed to reach the Kyoto target.

Sectoral impacts are similar as in the first scenario, although somewhat stronger.

The loss of output and exports would remain, however, moderate being less than 1% in all sectors at the EU level.

In the Kyoto scenario it is assumed that each Member State takes sufficient measures to fulfil its specific Kyoto target with respect to CO₂ emissions in 2010, and furthermore that an EU-wide allowance trading scheme is implemented from 2005 onwards. This policy has a negative impact on GDP in the EU and in most Member States, although employment impacts still remain positive. The results imply that the Kyoto target cannot be reached in the EU without some economic costs. Exempting the sectors, which participate in the allowance trading scheme, from EU minimum tax rates would have a very small positive effect on these sectors, as the decrease of energy taxes is nearly entirely compensated by higher allowance price and smaller reduction in social security contributions.

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The scope of the study

The study has been carried out in order to update the assessment, which was done by the Commission services in 1997, in connection of the adoption of the proposal or the directive restructuring the Community framework for the taxation of energy products (COM (97) 30). The update was needed to take into account the recent changes in the Member States' energy tax systems, and certain changes in the EU policy context, such as the possibility of enhanced co-operation and the implementation of the EU-wide trading scheme of CO₂ emissions. The study has also widen the focus of investigation from the existing Commission proposal towards more environmentally motivated carbon/energy taxation aiming at the internalisation of external costs. The combination of energy taxes with the EU-wide allowance trading scheme in accordance with the Commission proposal (COM (2001) 581) has been another area of the study.

The impacts of EU energy tax policies have been assessed from economic, energy and environmental perspectives. For this purpose the GEM-E3 model of KULeuven, which could incorporate these three spheres into a single framework and also deal with the policy instruments specific to energy/environmental systems, was chosen. The impacts are given both at the EU level, and separately for 14 Member States (Luxembourg exempted). Also the impacts on 15 different economic sectors are singled out.

All the results are expressed as %-change with respect to the reference scenario. The reference scenario represents the likely evolution of the EU economy up to 2010 under the condition that no policy change occurs. The exogenous assumptions underlying the reference scenario and the model projections of endogenous variables for 2000-2010 are explained in chapter 3 of the final report.

The summary of results

Binding EU minimum rates scenario

Scenario assumptions:

The EU minimum tax rates on energy products are implemented in all the Member States in 2005. The rates correspond to the current energy tax proposal (COM (97) final), in the form it is now discussed in the Council. They are displayed in table 3 of the final report. The rates apply only on the final energy use, and not on energy products used as inputs in industrial processes or in the production or transformation of energy. Specific reduced rates applied on energy-intensive industries under certain conditions, or transitory derogations accorded for certain countries, are not taken into account.

Different oil products are not treated separately in the model, but all the sectors use the same product 'oil'. Minimum rates for oil are, however, differentiated according to the sector, because different sectors typically use different oil products. For energy intensive industries the minimum rate of oil is that of heavy fuel oil, for other industries the average of gas oil and heavy fuel oil and for the household sector that of gas oil for heating purposes. Regarding transport fuels the recent Commission proposal on 'professional diesel' is implemented in such a way, that the minimum rate of oil in the transport service sector is that of 'professional diesel', that is 350€/1000 l, and the minimum rate of transport oil in the household sector is that of unleaded petrol, that is 360€/1000 l.

Impacts on national energy tax rates and prices

The changes of national energy tax rates, which the implementation of the minimum rates would imply, and the corresponding increases of energy prices are shown in tables 4 and 6 of the final report. As the tables indicate, in certain countries the implementation of minimum rates will have practically no impact (Denmark, Finland, Sweden, and UK except the household sector), while in certain others (notably Belgium, Greece, Ireland, Portugal, and Spain) some more price increases occur. The price of coal relative to other energy products increases in 10 Member States.

Macroeconomic impacts

EU level

The impact on GDP is practically zero, and also other impacts are very small (table 11). In the case tax revenues are used to reduce the employers' social security contributions (SS recycling) the impacts (employment, private consumption, real wage rate) usually have a positive sign, while without direct revenue recycling the positive sign disappears. Although the impacts are too tiny to have importance in this scenario, the comparison of the two cases indicates that the use of tax revenues can influence the macro economic impacts of energy tax policies.

Country level

The impacts for the majority of the MS's are negligible (detailed country results are shown in the annex tables of the final report). In certain countries (Austria, Belgium, France, Greece and Portugal) the rise of energy tax revenues (as a % of GDP) leaves some scope for the reduction of social security rates and has a favourable impact on employment, real wage rate and private consumption. These positive impacts more than offset the negative impact of the export reduction on GDP. Without tax revenues recycling case the positive impact on employment and domestic demand disappears.

Impacts on the energy system and emissions

At the EU level there is a decline of total energy consumption of 0,3%. The share of coal in energy consumption decreases, while the share of other energy products is somewhat increased. As a result of these changes the energy related emissions are

slightly reduced. The CO₂ emissions reduce by 0,5% in 2010 for the EU as a whole. On individual countries the CO₂ emissions reduce more substantially only in Belgium (4,2%) and in Austria (1,7%).

Sectoral impacts

At the EU level small negative impacts occur only on one industrial sector: ferrous and non-ferrous metals. The EU export price relative to the world market price in this sector increases by 0,15% in 2005 (country tables, last column), which reduces export by 0,3% and output by 0,2% compared with the reference scenario. The impacts are slightly more negative in Belgium (output -0,4%, export -0,5%), Austria (output -0,4%, export -0,5%) and France (output -0,6%, export -0,9%).

Environmentally friendly tax harmonisation scenario

Scenario assumptions

The minimum rates are higher and their structure is changed so that the rate of each energy product corresponds to 15€/ton of CO₂ (the rates are displayed in table 13, first column). The rate of electricity is computed on the basis of the EU average share of fuels used in electricity production. Taxes are output taxes, i.e. no tax is imposed on the inputs of electricity production. No changes are imposed on transport fuels, as the existing taxes already exceed the level of 15€/tCO₂.

In all cases it is assumed that the tax revenues are recycled through the reductions in social security contributions.

Impacts on energy taxes and prices

The impact of this policy on the national tax rates in the Member States is shown in table 13 and the corresponding increases in energy prices in table 14. All impacts are now stronger, but remain relatively small in Sweden, Finland and the Netherlands. In particular, the price of coal would increase substantially in the majority of the Member States.

Macroeconomic impacts

EU level

Although energy taxes and prices increase more strongly than in the first scenario, the impact on GDP is very small (table 16, first column). There is a slightly more positive impact on employment, private consumption and real wages, and slightly more negative impact on exports to the rest of the world (RW). Imports from the rest of the world decrease, however, more than exports and the current account improves. The level of consumer prices relative to world prices decreases slightly.

Country level

All countries benefit from SS revenue recycling and are able to increase their employment, private consumption and real wage rate, but suffer some losses in their export markets (with the exception of France and Greece, which actually increase their exports). The increase of domestic demand more than offsets the export loss, and GDP increases in all countries, with the exception of Austria and the Netherlands. The results indicate that a revenue-neutral green tax reform usually is beneficial to a country.

Impact on the energy system and emissions

Energy consumption decreases by 1,4% at the EU level. The move away from coal is a bit more pronounced: its share in energy consumption decreases by 0,6% on average, varying from -2,5% in Austria to +0,4% in Finland. The share of electricity increases on average by 0,15%, varying from 1,5% in Belgium to 0% in Finland.

CO₂ emissions for the whole EU reduce by 2,7%, which is 21% of the reduction needed to reach the EU Kyoto target (12,7% relative to the scenario 2010 for the whole EU). However, differences between individual countries are quite considerable. Belgium reaches 80% of its Kyoto target with this policy. In contrast, the impact on emissions is very small in the countries, which already had the energy tax rates nearly at the level implemented in the scenario (Finland, Sweden).

Sectoral impacts

The results are as similar as in the first scenario, but somewhat stronger. The sector of ferrous and non ferrous metals loses some of its market shares, as the EU export price increases by 0,5% relative to the world price (EU export volume decreases by 0.9% and output volume by 0,6% in 2010). The impacts are the stronger than the EU average in Belgium, Austria, France, Portugal and UK. The other industrial sectors are not much affected: the output and exports of the chemical sector, for instance, would remain practically unchanged at the EU level, and would slightly increase in France.

Enhanced co-operation

For the core group of countries, which participate in the policy in the scenario (the three Nordic countries, Benelux, Germany, Austria, France and Italy) the results, are very similar as in the EU-wide implementation. They gain in terms of GDP growth, private consumption and employment, and they are also able to reduce their emissions about the same amount. There is a slight evidence that the countries in the core group would marginally lose their export market shares within the EU trade compared to the tax co-ordination case, and the countries outside the core group gain. Tax co-ordination would somewhat level the playing field in the EU. However, the countries participating in the scheme benefit from the reduced labour costs because of SS revenue recycling and from the higher export demand of non participating countries, which factors largely outweigh the negative consequences of higher energy prices. These benefits prevail even in the case a country (a simulation was run separately for

Germany and France) increases its energy taxes unilaterally and uses the tax revenues to reduce its labour costs (in other words, implements a green tax reform).

The Kyoto scenario

Scenario assumptions

The Kyoto target is imposed as a binding emission constraint to the Member States and the EU as a whole. Since the model only deals with CO₂ emissions (and not other greenhouse gases), the Kyoto target is redefined in terms of CO₂ emissions. The figures are taken from the ECOFYS study and are displayed in table 18.

The scenario also assumes that an emissions trading scenario is implemented in the EU from 2005 onwards in accordance with the Commission proposal (COM(2001) 581)¹. The scheme covers the following sectors of the model: electricity and heat generation, ferrous and non ferrous metals and other energy intensive (which include non metallic mineral products, metal products, paper and printing, for more details, see ch.4.3.2 of the final report).

As a complementary measure, a domestic carbon tax is implemented in all the sectors not covered by the emission allowance scheme in 2010. The level of carbon tax determined in such a way that the national Kyoto target is achieved in each country. This tax represents all the revenue-generating measures the country takes to reduce its CO₂ emissions also in the scenario.

Two versions of the scenario are implemented.

1. In addition to emissions trading scheme and domestic carbon tax in 2010, the EU minimum rates (of the first scenario) are implemented in all sectors in 2005 and 2010.
2. Otherwise the same, but trading sectors are exempted from EU minimum rates.

Macroeconomic impacts

Since the emission reduction effort is stronger than in the previous scenarios, it also entails higher costs and the policy has a negative impact on GDP in all except one country (France) and also in all the EU in 2010 (table 19, second and fourth column). Because of revenue recycling employment impacts are still positive in most countries. EU exports to the rest of the world (RW) would also be reduced more than in the tax scenarios.

The level of allowance prices and domestic taxes

The price of allowances in the EU market for trading sectors is around 15€/t CO₂ in the first version of the scenario and 0.4 %-points higher in the second (see, country tables, row “CO₂ allowance price”). The higher allowance price in the latter case, jointly with smaller reduction in social security contributions, would nearly entirely compensate the positive effect of tax exemptions on the trading sectors, leaving the overall economic impact of the policy very small.

¹ The amended proposal CO(2002)680 final) has been adopted in the Council the 9 December 2002.

The level of domestic carbon tax (see country tables, row 'CO2 domestic tax') indicates the emission reduction effort, which is needed from non-trading sectors to reach the national Kyoto target in 2010, after the implementation of emissions trading scheme in the trading sectors. The level of this effort differs quite a lot across countries because the different national targets and the weight of trading sectors in the economy, varying from 154€/ton of CO2 in Italy to 0.7€/ton of CO2 in the UK. However, as a whole it represents quite a big share of the effort required to reach the Kyoto in the EU. Under the specific assumption made in the scenario regarding the initial allocation of allowances, the allowance trading and minimum energy tax rates would deliver only 3,25% reduction of CO2 emissions in 2005, while the target in 2010 is 12,7% (cf. first and second column in table 19). The difference between the two is reached by implementing the domestic carbon tax in each Member State.

Sectoral impacts

The impacts on the sectors participating in the trading scheme are roughly similar to those of the 15€/t CO2 scenario, as the allowance price and the energy tax are nearly at the same level. However, certain sectors outside the trading scheme would suffer bigger output and export market losses, in particular in the countries, where the required level of domestic carbon tax is high (Austria, Denmark, Italy, Spain). These sectors include notably chemical products and transport. Also the volume of energy production would decrease much more than in the tax scenarios, since energy producers now need to pay a price for their additional emissions, while in the tax scenarios only the final product (electricity) is taxed. Certain labour-intensive sectors, in contrast, could increase their export volumes, as they benefit from revenue recycling. These sectors include, for instance, electric goods, other equipment goods, telecommunication services and services of credit and insurance.