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An Evaluation of Fiscal Measures for Energy Products in the European Union

Results from the
HERMES-Link System

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S. Mertens, E. Meyermans,
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October 1998

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F. Bossier, K. Hendrickx, C. Streel - Juli 1998

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Abstract

This Working Paper presents an evaluation of the economic and environmental consequences of European harmonization proposals, drawn up by the Commission in 1996 and early 1997, and regarding the taxation of energy products. The Paper is a revised version of a study carried out for the Services of the European Commission in 1997.

In the study, two types of measures are considered. The first type defines minimal excise rates on energy products, as well as their evolution. Member countries are supposed to apply the maximum between the effective (existing) rate and the minimal (proposed) rate. The rise in tax rates are applied progressively over five years. Generally, these measures should not lead to substantial increases in existing tax rates. Also, Member states are left free to apply rates higher than those proposed by the Commission. If actual rates are higher than those proposed, they must not be revised downwards, so as to avoid downward fiscal competition between Member states.

Within the first type of measures, two cases are defined. In the first case, certain member states receive a two year derogation regarding the increased minimum excise rates. In the second case, one assumes that industrial sectors are taxed at a level 20 % lower than in the first case. These two cases are evaluated both with and without accompanying fiscal reform measures in favour of employment.

In the second type of measures (or third case), Member states increase their effective tax rates up to the same growth rate of the new EC minimum levels. In this more technical scenario, we have much higher increases in excise rates than in the first group of cases. Once more, this case is evaluated both with and without accompanying fiscal reform measures in favour of employment.

Finally, we evaluate the effects of the Commission's February 1997 energy tax proposal. The differences introduced in this proposal, as compared to case one of the first type of measures, can be summarized as follows :

- Excise tax rates on motor fuels have been lowered ;
- Exemptions for energy intensive industries are implemented as provided in article 15, paragraph 2 of the Commission's Revised Proposal.

In each of the above cases, the tax proceeds may be recycled into either reductions in budget deficits, leading to reductions in interest rates, or reductions in employers' social security contributions.

In general, the more realistic cases (cases one and two, as well as the February 1997 proposal), when tested with accompanying fiscal reform measures, have positive effects on GDP, while leading to only slight increases in inflation. These measures have positive effects on employment, and allow for reductions in CO_2 emissions. Finally, notwithstanding the *ex ante* fiscal neutrality of the measures, the scenarios lead to slightly positive effects on public finances.

"An Evaluation of Fiscal Measures for Energy Products in the European Union. Results from the HERMES-Link System", F. Bossier, L. Lemiale, S. Mertens, E. Meyermans, P. Van Brusselen, P. Zagamé. Working Paper 8-98, October 1998.

I Introduction

This study concerns the evaluation of the economic and environmental consequences of new harmonization proposals, at the European level, for the taxation of energy products. The research was undertaken in 1996 and early 1997, in the framework of a contract with the European Commission [1].

Two types of measures are considered. With the first type of measures, one defines minimal excise rates on energy products, as well as an evolution for these rates. Member countries are supposed to apply the maximum between the effective existing rate and the minimal proposed rate. This rule implies that the additional taxation differs among countries, depending on the initial level of taxation, per product and per sector.

Two intermediate cases are defined within the first type of measures. In the first case, a limited number of Member states receive a two year derogation regarding the increased minimum excise rates. The second case assumes that industrial sectors are taxed at a level 20 % lower than in the first case.

In the second type of measures, the member states increase their effective rates up to the same growth rate of the new EC minimum levels.

The new revised energy tax proposal involves consideration of issues regarding CO_2 emissions reductions and energy efficiency improvements. The results of the different cases, which are presented in Chapter III, were obtained by simulating the HERMES-Link system of models for six countries of the European Union : Belgium, France, Germany, Italy, the Netherlands and the United Kingdom [2].

The paper is organized as follows. Chapter II presents in detail the different scenarios of energy taxation which are proposed by the Commission and comments on the possible uses of the extra revenues (recycling options).

Chapter III presents the main results. A first part describes the *ex ante* consequences of the scenarios on energy prices and the importance of extra tax revenue (in percent of GDP). We also comment the *ex ante* reduction in social security contribution rates implied by the recycling option in favour of labour on one hand, and the interest rate reduction implied by the recycling option in favour of capital

1. European Commission Contract n° 501-CT95-0008, “Climate Technology Strategy Within Competitive Energy Markets”. Research funded in part by the European Commission in the framework of the Non Nuclear Energy Programme JOULE III.
2. For a description of the HERMES-Link system, see below.

on the other hand. The second part presents the main macroeconomic and sectoral results of the scenarios, as well as the results regarding energy.

Finally, Chapter IV presents the simulation results for the Commission's Revised February 1997 Proposal for the taxation of energy products, which now has the status of a Proposed European Directive.

THE EUROPEAN HERMES MODEL

The HERMES (Harmonized European Research for Macrosectoral and Energy Systems) project is a macroeconomic modelling project which originated at and was co-financed by the European Commission (DG XII). The purpose of the project was to construct an instrument for economic analysis of the Economies of the Member States of the European Community. To this end, a standardized version of the HERMES model was designed and implemented in six Member States (simplified models were developed for the other countries).

General characteristics : macrosectoral econometric model, dynamic, annual, short-middle term (2 to 8 years). Production function with 3 to 4 factors (of which energy), with the possibility of *ex ante* technical choice (putty-clay). Energy divided in 8 forms : coal, coke, crude oil, petroleum products, natural gas, derived gas, electricity, other energies of which nuclear heat. Similar models for 19 countries or zones linked by a bilateral trade flow model (of which 12 EU countries, United States, Japan). Desegregation in nine branches : agriculture, energy, intermediate goods, equipment goods, consumption goods, building and construction, transports and communication, other market services, non market services. Fifteen consumption categories for the households.

Quantitative characteristics : between 1500 and 2000 variables per country, of which 300 to 400 exogenous variables. 1500 equations of which 250 behavioural equations. Linkage module of 6000 equations.

Computer system : TROLL software for the management of data banks, econometric estimations and simulations. For the Belgian Planning Office, integrated software IODE.

Uses : medium term economic forecasts. Impact analysis of macroeconomic and sectoral policies, of multinational policies, of energy policies...

Model inputs : exogenous variables concerning the international environment and in particular import prices of energy products, monetary policy variables, (interest rates and exchange rates), fiscal and budgetary policy variables, demographic variables...

Model outputs : Input-Output tables in nine branches, in the ESA nomenclature, production factors demand (labour, capital), detailed accounts for each institutional sector (firms, public administrations, households, rest of the world), household consumption divided in 15 functions, integrated energy balance for 8 energy products, CO_2 emissions.

Main applications :

Economic prospects for Europe : 1990-1994 (June 1990).

Consequences of the Gulf crisis (September 1990).

Technical and economic policy variants for the main EEC countries (September 1990).

Bureau du Plan - Érasme, *Un redéploiement fiscal au service de l'emploi. Réduction du coût salarial financée par la taxe CO_2 / énergie*, Rapport à la DG XI de la Commission Européenne, novembre 1993.

Bureau fédéral du Plan, *Structure des prélèvements obligatoires et emploi. Aspects macroéconomiques des liens et des possibilités d'intervention*, Rapport à la DG XXI de la Commission Européenne, avril 1994.

II Definition of the Policy Cases

A. The EC Harmonisation Proposal for Excise Taxes on Energy Products

The new proposal, as set by the DG-XI in September 1996, implies a rise of the minimum excise tax rates and a restructuring of taxation. Only excise taxes on end-use energy consumption by transportation, residential, commercial and industrial sectors will be affected ; the taxes on energy consumption for power generation will remain unchanged.

TABLE 1 - Proposal for minimum excise taxes *(ECUs per specific unit)*

	Unit	1996 [a]	1998	2000	2002
Motor Fuels					
Gasoline	klt	337	450	500	557
Gasoil	klt	245	343	393	450
Kerosene	klt	245	343	393	450
LPG	tn	100	174	224	281
Natural Gas	m^3	100	174	224	281
Commercial and residential uses					
Gasoline	klt	18	32	36	40
Kerosene	klt	18	32	36	40
LPG	tn	36	42	47	52
Natural Gas	m^3	-.-	10	23	39
Heating fuels - industry					
Heating gas oil	klt	18	21	23	25
Heavy fuel oil	tn	13	18	23	27
Kerosene	klt	-.-	8	16	25
LPG	tn	-.-	10	21	32
Natural Gas	m^3	-.-	8	16	24
Petroleum Coke	tn	-.-	7	14	21
Hard coal	tn	-.-	5	11	17
Low grade anthracite	tn	-.-	4	8	12
Sub-bitumus coal	tn	-.-	3	9	9
Coke	tn	-.-	5	11	17
Opencast lignite	tn	-.-	2	4	5
Lignite briquettes	tn	-.-	4	9	14
Deep mined lignite	tn	-.-	3	7	11
Peat	tn	-.-	2	4	6
Electricity	MWh	-.-	1	2	3

a. Existing values

Table 1 shows the existing and proposed levels of minimum excise taxes (defined in Ecus per specific unit) for each product and each use. The implementation of these tax rates would start as of 1998. The rates should rise twice, in 2000 and in 2002. After 2002, they should keep up with the inflation rate up to 2005 which is the horizon of our study. The first column of the table shows the minimum excise taxes as prevailing in 1996.

Several energy carriers which are currently not taxed will be taxed as of 1998. This will be the case for solid and gas fuels consumed by industry and for natural gas consumed by residential and commercial sectors. Electricity will be taxed at end-use level. Moreover, the growth rate of excise taxes on diesel will be higher than the one on gasoil.

B. Recycling of Additional Revenue from the New Taxation Scheme

The proposed modifications to the tax structure may have major economic consequences. At the sectoral level, household consumption and industry's optimal mix of inputs will be reallocated in response to the changes in relative prices. At the macroeconomic level, public finances, total employment and aggregate consumption and investment will adjust to a new equilibrium. However, the exact outcome of the higher energy taxes will to a large extent be determined by the way in which the additional tax revenue is recycled.

When new taxes are implemented, one has to address the question whether the additional revenue from the new taxes should be recycled ? If the answer is yes, what are the recycling options ? If not, what are the consequences for public finances and interest rates ?

In Europe, total labour costs are relatively high, partly due to high employers' social security contributions (ESSC) rates. Therefore, it may prove worthwhile to investigate the consequences of a reduction of these ESSC rates, financed by the additional tax revenue accruing from the rise in excise taxes on energy. There are strong *a priori* reasons to suspect that such a measure would increase total employment, while at the same time reducing CO_2 emissions. Previous analyses carried out with the HERMES models have shown that a "double dividend" can be a realistic consequence from this type of fiscal reform. The DG-XI proposal fits in this "win-win" policy framework. It recommends the recycling of the revenue from the additional excises through a lowering of employers' social security contributions. The characteristics of a double dividend will be found in this scenario.

In the absence of redistribution, revenue from additional taxation will reduce the public deficit, lowering interest rates and, consequently, increase investment and consumption. To evaluate this link, we introduce in our simulations the same assumption as in the exercise run with the GEM-E3 model by the NTUA[1], which concludes that the lowering of interest rates can induce a virtuous cycle of

1. National Technical University of Athens - Capros P., Georgakopoulos T. and Kokkolakis E., Evaluation of Fiscal Measures for Energy Products in European Union - Results from the GEM-E3 and MIDAS Models, Report to European Commission DG-XI.

growth, generated by investment. This report presents the results from six cases run with the following European HERMES models in a simultaneous or linked framework : Belgium, France, Germany, Italy, the Netherlands and the United Kingdom. The six cases are a combination of three fiscal schemes and two revenue recycling options.

C. Definition of the Cases Studied

Case-1 is based on the figures presented in table 1. In this first scenario, all EU Member-States introduce rates defined as the maximum between either their effective energy tax rates or the minimum values proposed by the EC. Current tax rates of EU-countries are assumed to be updated with inflation and then compared to the new minimum levels of taxation rates. This implementation rule implies that the shift in the tax burden will differ between countries, as the additional taxation will depend on the preexisting levels of excise taxes.

Case-1E allows to evaluate the potential negative effects of the taxation policy on European industry by introducing excise rates for the industrial sectors which are 20 % lower than in Case-1.

Case-3 is an alternative scenario in which Member-States increase their effective tax rates up to the same growth rates of the new EC minimum levels. For the energy products that are not currently taxed, the same rates as in Case-1 are adopted.

In order to evaluate these tax policies, their effects have been compared under the assumption of fiscal neutrality [1]. We have adopted the same two revenue recycling options as Capros *et al.* did [2], i.e. :

In the **Labour Fiscal Reform scenarios**, recycling is introduced in the form of lower indirect labour costs. The rate of employers' social security contributions has been lowered uniformly among all sectors. The reduction of the rate of social security contributions has been calibrated *ex ante* in order to compensate exactly the additional revenue from energy taxation.

In the **Interest Rate Cases**, market interest rates are adjusted without any explicit revenue recycling. As investments are directly influenced by the adjustment of real interest rates, this scenario is characterized by a recycling in favour of capital.

1. Note that the NTUA study makes the assumption of budget neutrality. In our study, we only recycle the *ex ante* receipts of the new taxation and do not try to obtain an *ex post* neutral effect on the public budget as a whole.
2. Ibidem., pages 14,15

For each of the three taxation cases (named **1**,**1E** and **3** in the Commission's proposal), we consider two macro-economic recycling options, one in favour of labour, through a lowering of labour costs, and one in favour of capital, through an adjustment of interest rates. Table 2 gives an overview of the cases in this study. As shown in this table, scenarios and cases have been renamed as Cases 1 or 1C, 2 or 2C and 3 or 3C. The DG-XI defined an additional sensitivity analysis, **Case-1D**, assuming that Spain, Portugal, Ireland and Greece would benefit from a derogation of two years. As those countries are not modelled in the HERMES-Link system, we could not analyse this scenario.

TABLE 2 - Cases Studied

	Taxation Scenarios			
Revenue Recycling Options	Case-1	Case-1D	Case-1E	Case-3
Interest Rate Case	Case-1	-.-	Case-2	Case-3
Labour Fiscal Reform	Case-1C	-.-	Case-2C	Case-3C

III Simulation Results

A. The *Ex Ante* Results

Table 3 summarizes the impact of the new taxes on energy prices. The changes in the total energy price differ across countries because of differences in consumption patterns and initial levels of taxation. For Case 1 the initial price increases are modest, although some noticeable differences can be observed in 2005, when prices in the United Kingdom and Belgium differ by more than 5 percent from the baseline, reflecting low initial tax rates. For Case 3 the effects are more pronounced, especially for Italy, the Netherlands and the United Kingdom where in 2005 the total energy price differs by respectively 32, 31 and 20 percent from the baseline, reflecting to a large extent strong increases in the energy price for transportation and households.

Higher taxes generate additional tax revenue, as shown in table 4. In Case 1 the impact in 1998 is rather modest, with the highest additional revenue accruing to Belgium and the United Kingdom, *i.e.* 0.26 and 0.18 percent of GDP respectively, while in 2005 tax revenue increases to about 0.5 percent of GDP in Belgium and the United Kingdom, and less than 0.3 in the other countries. In Case 3 the initial tax revenue increase is more pronounced, and ranges between 0.59 percent of GDPfor Germany and 1.27 percent of GDP for Italy, while in 2005 the additional revenue adds up to 3.10 percent of GDP in Italy, but only 1.04 percent in Belgium.

There are two macroeconomic scenarios to recycle the additional tax revenue.

The first macroeconomic scenario makes no explicit assumption on the recycling of the additional tax revenue. Only a real interest rate adjustment is imposed, which has a direct impact on investment and can thus be seen as a revenue recycling option in favour of capital. Table 5 shows these real interest rate adjustments. Here the real interest rates have to decline more in Case 3 than in Case 1, reflecting the larger amount of deficit reduction in Case 3.

In the second scenario it is assumed that the additional tax revenue is recycled through a reduction of the employers' social security contributions, which applies in all sectors independently of their relative labour cost or the pre-existing level of the rate. Table 6 and Figure 1 show the *ex post* reduction in the implicit employers' social security contributions rates as a percentage point difference from the baseline. In Case 1 the reduction amounts to about 1.7 percent in Belgium and the United Kingdom and about 0.5 percent in Italy, the Netherlands, and France. In Case 3 there is a reduction of more than 10 percent in Italy, compared to a more modest reduction in the other countries, where it varies between 4 percent for Belgium and 8 percent for the Netherlands.

TABLE 3 - Energy prices *(deviation w.r.t. baseline, in percent)*

	1998	2000	2002	2005
Case 1				
Germany	0.64	2.16	3.71	3.84
Belgium	1.75	3.48	5.54	5.50
France	0.50	1.56	3.08	3.14
Italy	0.19	0.62	1.22	1.10
Netherlands	0.08	0.58	1.84	1.79
United Kingdom	1.67	3.67	5.52	5.34
Case 3				
Germany	7.22	13.24	19.33	19.88
Belgium	6.59	9.41	12.61	12.22
France	8.02	13.87	19.43	19.02
Italy	16.70	25.26	33.57	31.86
Netherlands	13.63	22.19	31.18	30.69
United Kingdom	11.08	15.94	20.63	20.28

TABLE 4 - Revenue from the tax *(as a percent of GDP)*

	1998	2000	2002	2005
Case 1				
Germany	0.05	0.17	0.29	0.27
Belgium	0.26	0.41	0.56	0.53
France	0.04	0.12	0.22	0.19
Italy	0.02	0.07	0.11	0.09
Netherlands	0.01	0.05	0.16	0.15
United Kingdom	0.18	0.37	0.53	0.48
Case 3				
Germany	0.59	0.99	1.35	1.24
Belgium	0.69	0.90	1.12	1.04
France	0.63	1.02	1.28	1.10
Italy	1.27	2.19	3.06	3.10
Netherlands	0.93	1.75	2.52	2.39
United Kingdom	1.13	1.31	1.80	2.02

TABLE 5 - Reduction of real interest rates *(deviation w.r.t. baseline, in percentage points)* [a]

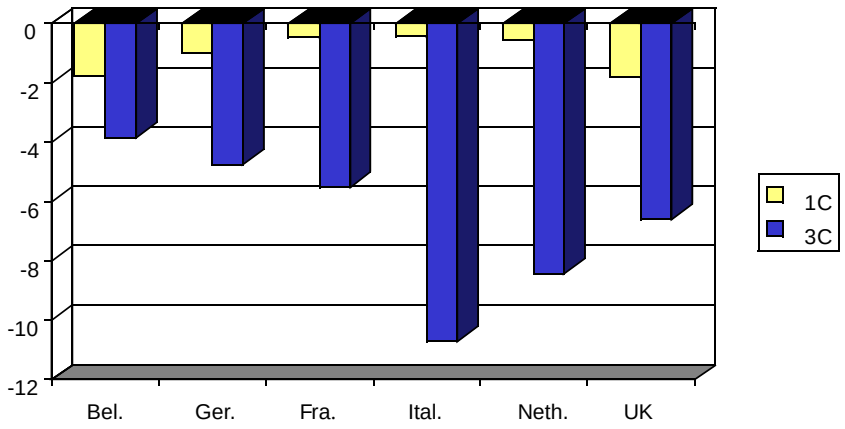
	1998	2000	2002	2005
Case 1				
Germany	-0.13	-0.23	-0.35	-0.30
Belgium	-0.14	-0.26	-0.39	-0.34
France	-0.21	-0.40	-0.57	-0.53
Italy	-0.07	-0.14	-0.21	-0.18
Netherlands	-0.12	-0.23	-0.35	-0.31
United Kingdom	-0.13	-0.21	-0.31	-0.27
Case 3				
Germany	-0.96	-1.40	-1.76	-1.55
Belgium	-1.01	-1.49	-1.87	-1.65
France	-1.69	-2.42	-3.01	-2.60
Italy	-0.54	-0.91	-1.07	-0.86
Netherlands	-0.72	-1.32	-1.68	-1.66
United Kingdom	-0.88	-1.25	-1.57	-1.32

a. Source : Capros et al. (NTUA), *Evaluation of Fiscal Measures for Energy Products in European Union - Results from the GEM-E3 and MIDAS Models*, Report to European Commission DG-XI under Contract b4-3040/95/449/MAR/B1, October 30 1996.

TABLE 6 - *Ex-post* reduction in social security rates *(deviation w.r.t. baseline, in percentage points)*

	1998	2000	2002	2005
Case 1C				
Germany	-0.20	-0.64	-1.06	-1.00
Belgium	-0.59	-1.22	-1.80	-1.74
France	-0.09	-0.27	-0.51	-0.49
Italy	-0.09	-0.30	-0.51	-0.46
Netherlands	-0.02	-0.18	-0.57	-0.55
United Kingdom	-0.63	-1.31	-1.89	-1.77
Case 3C				
Germany	-2.24	-3.73	-5.10	-4.76
Belgium	-2.28	-3.14	-4.07	-3.82
France	-2.71	-4.43	-5.95	-5.50
Italy	-6.61	-9.43	-11.80	-10.68
Netherlands	-3.11	-5.93	-8.70	-8.44
United Kingdom	-4.04	-5.44	-6.84	-6.58

FIGURE 1 - Scenario impacts on employers' social security contributions rates in 2005 *(deviations in points of % w.r.t. the baseline scenario)*



B. Macroeconomic Coherence and Main Results

1. The scenarios without recycling

There exists a common logic underlying each of the three cases considered : The energy price increases produce negative effects through a lowering of household real disposable income. They are also responsible for initial substitution effects in favour of labour in those sectors that are modelled by Putty-Clay production functions where one finds complementarity between energy and capital. However, this substitution effect is not very pronounced or, in any case, not sufficient to compensate for the negative effects of the higher energy taxes on disposable income. In the medium term, the negative effects are reinforced by the lower competitiveness resulting from the rise in production costs.

The lower interest rates do not produce any important effects on aggregate capital formation, and so do not lead to an investment-lead rise in GDP. This result is contrary to that obtained by the GEM-E3 model, which shows a a slight increase in GDP by the year 2005, although the income from the increased taxation is not the object of any explicit recycling. This highlights the classical properties of the GEM model, in which interest rates are function of budget deficits, while investment and consumption respond markedly to interest rates. One must note however that this version of the GEM model does not work with a rational expectations structure, thus excluding any possible relation between anticipated reductions in budget deficits and increases in private consumption. On the other hand, the HERMES models exhibit some Keynesian properties, by which the absence of tax income recycling is at the origin of a fall in GDP for EUR-6 by the year 2005. The obtained reduction in GDP are -0.23, -0.21 and -1.60 percent, respectively for the scenarios 1, 2 and 3.

These general results are, however, the canvas for some important differences between the three scenarios. First, an important difference can be noted regarding the magnitude of the *ex ante* tax increase, much larger in Case 3 than of the other two scenarios. This is the essential factor explaining the very similar effects of scenarios 1 and 2 on EUR-6 GDP. In turn, the smaller tax increase in scenario 2 than in 1 explains the relatively better results of this scenario on GDP and its relatively better industrial competitiveness.

With regard to the employment effects, one may note that the substitution effects are unable to generate sufficient employment and income to compensate for the negative effects of the increased taxation. Employment in scenarios 1, 2 and 3 decreases by 0.14, 0.13 and 1.01 percent respectively. Concerning the public finances of EUR-6, one notes that, notwithstanding the general decrease in economic activity, the budget in the three scenarios benefits from the measures.

In scenario 3, the increase in inflation is significant. Household real gross disposable income falls throughout the simulation period due in particular to the presence of delays in wage indexation mechanisms as well as to increased unemployment.

Finally, the reduction in energy consumption for EUR-6 varies from -0.8 % in scenario 1 to -7.1 % in scenario 3. The cost of the reduction in energy consumption is thus very high when this cost is evaluated through the computation of multiplier defined as the ratio of the energy consumption reduction over the energy tax increase.

One must bear in mind that these general macroeconomic results at an European level can hide important differences both at the national and sectoral levels. For example, the *ex ante* tax increase in 2005 in scenario 3 represents 1.0 % of GDP for Belgium but 3.1 % for Italy. A more detailed analysis on the national and sectoral results can be found in a following chapter.

2. The scenarios involving a recycling of the tax receipts through a reduction in indirect labour costs

Here, the additional tax revenues are recycled through reductions in employers' social security contributions, which limit the negative effect of the tax rise by reinjecting income into the economy. This policy also enhances employment by increasing the substitution effects, that arise between the production factors. This explains why the macroeconomic results for EUR-6 reveal a positive impact of the measures on GDP for each of the three scenarios 1C, 2C and 3C.

The measures have the following implications : The higher substitution in favour of labour increases employment. The rise in employment and the indexation of wages to inflation in the medium term gradually lead to real wage increases, inducing a rise in private consumption and an increase in economic activity.

However, one may note some differences across countries. In the case of Belgium, where the evolution of wages is closely linked to labour productivity (even if a Phillips curve is also present), real gross wages per capita fall below their levels in the reference scenario. This comes from a relative decline in labour productivity, following a rise in employment that is all the larger in the presence of a reduction in employers' social security contributions. Economic growth is primarily lead by the rise in exports stemming from increased price-competitiveness.

The general rise in real wages and hence private consumption, even in the face of a decline in labour productivity, is similar to the results obtained by the NTUA team with the GEM-E3 model. However, the rise in real wages and private consumption obtained by the GEM model is not due to a Phillips curve (absent in the model), but by rigidities in the labour supply curve. The results of both the HERMES and GEM models show, however, that there exists the possibility of achieving a double dividend in terms of employment and energy consumption, even if there exist differences in the simulation results concerning these two variables.

Though a double dividend outcome can be found, the mechanisms behind the rise in private consumption are also those that will tend to limit economic growth in the longer run and, so doing, reverse the double dividend solution. Indeed, in the long run, the real wage increases will impede competitiveness and growth, which will then reduce the initial employment increase obtained with the tax revenue recycling. Though this phenomenon is particular to macroeconometric models possessing Phillips curves, it has the merit of emphasizing that if the implementation of an economic policy measure creates employment through a fall in labour productivity, then it is important to limit real wage increases to labour productivity growth if one wishes to avoid job destruction in the long run.

Taking these general considerations about scenarios 1C, 2C and 3C as a starting point, we may now turn to a more in depth analysis of the scenario results at the national and the sectoral levels.

C. Country Results

1. The scenarios without any recycling of the proceeds from the tax

In these scenarios, an assumption was made linking the reduction in public budget deficits and debt to interest rates. All results will be given for the year 2005.

a. Scenarios 1 and 2

The differences between countries mainly reflect the *ex ante* differences in the energy tax increases. Scenario 1 highlights countries such as Italy or the Netherlands, where the initial excise taxes on energy are relatively high and thus where the tax increases are small. Indeed, we may note that the revenue from the tax increases in scenario 1 are of 0.09 % of GDP for Italy and 0.15 % for the Netherlands, compared to 0.53 % for Belgium and 0.48 % for the United Kingdom. General comments below apply to both the scenarios 1 and 2. The numerical results given below refer only to scenario 1.

i. Belgium

In the case of Belgium, the excise tax increases are at the origin of a 5.5 % rise in general energy prices. Though the *ex ante* tax receipts are proportionally larger in Belgium than in the other European countries considered, the *ex post* impact of the measure on prices is lower than the European average. The moderate effect on prices reflects two important features of the Belgian model. Firstly, the wage setting mechanism links rises in nominal wages to rises in labour productivity. Secondly, the automatic indexation of wages and social benefits is based on a "health price index", which is the general consumer price index from which the prices of alcohol, tobacco products and energy are eliminated. This type of indexation insures that the excise tax rises are not automatically passed on into wages. Thus, although GDP and employment fall by 0.12 % and 0.07 % respectively, their reduction is smaller than the European average.

International comparison of the impact of the tax increase can be made by calculating the "tax to GDP multiplier", which measures the ratio of the percentage fall in GDP in 2005 to the tax income in percentage of GDP in 2005. This gives a "tax-GDP multiplier" with a rather low value of -0.23 for Belgium. This result stems from the fact that although the additional excise taxes raise consumption prices and reduce household real disposable income, the wage setting mechanism limits the price-cost spiral and the fall in price-competitiveness.

Note also that the reduction in domestic demand, and particularly domestic energy demand, has a significant negative effect on imports. The reduction in energy imports produces a positive effect on the external balance and thus limits the negative effect of the measure on GDP. The results also show that the reduction in interest rates that is introduced in the model is not sufficient to compensate for the negative effects of the higher taxation. Aggregate capital formation is increased relative to its level in the reference scenario, only due to the

high interest sensitivity of household investment in dwellings. Finally, energy consumption is reduced by 1.04 %, which is more than the average for EUR-6.

ii. France

Computing the ratio of the fall in GDP in 2005 to the income resulting from the tax increase in 2005, we obtain a tax-GDP multiplier that is roughly equal to one (in absolute terms). This can be considered as a typical value for this type of measure. The fall in GDP comes as no surprise : The energy price rise induces a reduction in real income that is not compensated by the rise in employment. This income effect reduces private consumption and, consequently, output. In turn, investment suffers from the downturn in activity as well as from the rise in energy prices, due to the complementarity between capital and energy in the Putty-Clay production functions of the models. The fall in interest rates that is introduced in the scenario is not sufficient to counter this effect. In the medium term, the decrease in GDP is reinforced by a loss in price-competitiveness resulting from production cost increases that are greater in France than in the other European countries. This higher inflation is obtained notwithstanding the fact that the *ex ante* rise in excise taxes is relatively limited. Employment falls by 0.05 % below its level in the reference scenario, although this fall is more limited than the decrease in GDP, due to the factor substitutions following the rise in the relative price of energy. Finally, energy consumption falls by 0.71 %, indicating a significant increase in energy efficiency.

iii.Germany

The implementation of the excise tax rise in Germany, equivalent to 0.27 % of GDP in 2005, reduces GDP by 0.24 % at the end of the simulation period. This effect on activity is in line with the average European reduction in output. The mechanisms leading to the reduction in growth are straightforward. The rise in excises drive up consumption prices, so reducing household real disposable income. The lags in the wage setting mechanism as well as the rise in unemployment keep that nominal wage increases below inflation, leading to a regular decrease in real income and private consumption. The reduction in real wages limits the rise in unit labour costs and the subsequent loss of price-competitiveness. Though we may note a rise in export prices, this rise does not produce marked effects on exports, which fall only very moderately at the end of the simulation period. In 2005, employment is reduced by 0.14 %, which is in line with the EUR-6 average. The tax-GDP multiplier is equal to -0.88, while final energy consumption falls by 0.83 % in 2005.

iv.Italy

In the case of Italy, the computed tax-GDP multiplier is equal to -1.1. The mechanisms behind the results are similar to those described in the case of France, with a fall in all the components of domestic demand. Note however that Italy increases its competitiveness relative to the other European countries, due to the relatively small increase in excise taxes. A decrease in labour productivity is also noted in the case of Italy, although its reduction is less important than that of GDP. Finally, scenario 1 produces a 0.45 % reduction in total energy consumption.

v. The Netherlands

The implementation of the scenario in the Netherlands imposes a rise in excise taxes corresponding to an *ex ante* fiscal income of 0.15 % of GDP in 2005. This rise in taxes is somewhat below the EUR-6 average, and the computation of the tax-GDP multiplier gives a value of -0.60, which is somewhere between those of Belgium and Germany. Here again, the logic behind the results is quite straightforward. The measure produces a moderate 1.79 % increase in energy prices in 2005. The only limited and delayed adjustment of nominal wages to consumption prices allows the unit labour costs to remain more or less unchanged over the whole simulation period, while some small employment increases are obtained due to the factor substitutions brought about by the relative price increase of energy inputs. By the year 2005, GDP falls by 0.09 %, while total energy consumption decreases by 0.82 %.

vi. The United Kingdom

With regard to the magnitude of the *ex ante* fiscal measure, the tax increase implemented in the United Kingdom is one of the most important, second only to the one in Belgium. The fiscal revenue generated by the measure is equivalent to 0.48 % of GDP in 2005, compared to 0.53 % in Belgium and 0.09 % in Italy. The effect on the UK economy is significant, the tax-GDP multiplier being equal to -1.02. The initial tax increase directly affects consumption prices and reduces household real disposable income. A strong wage-price spiral raises nominal wages to compensate for the price rise, limiting the fall in real wages even in the face of declining labour productivity and greater unemployment. In 2005, unit labour costs rise by 0.91 %, while GDP and real wages fall by 0.49 % and 0.24 %, respectively. This wage-price spiral reduces the country's price-competitiveness and hence exports. In all, employment is reduced by 0.33 % in 2005, while total energy consumption falls by 1.41 %.

b. Scenario 3

In this scenario, where the rise in excise taxes is more notable than in scenarios 1 and 2, we find that the results are more contrasted from one country to another. In the present case, countries, where tax levels were initially higher than the European average, see their tax rates rise proportionally to the rises in other countries, resulting in much higher tax levels in absolute terms. This is particularly the case for Italy and the Netherlands, where the resulting tax revenue in 2005 represents respectively 3.1 % and 2.4 % of GDP. The larger part of this revenue comes from the rise in the energy prices for household energy consumption and private transportation.

i. Belgium

The effect of this scenario in terms of ex ante tax revenue is important, since tax income in 2005 is equal to 1.04 % of GDP compared to 0.53 % in scenario 1. The magnitude of the measure is thus multiplied by two, but the increase relative to scenario 1 is smaller for Belgium than for the other EUR-6 countries. Indeed, whereas the measure in scenario 1 was more important for Belgium than for the other countries, it is now the least important in scenario 3. The computed tax-GDP multiplier is equal to -0.41 in this scenario, larger (in absolute terms) than in sce-

nario 1. This results essentially from the more inflationary import prices and the larger fall in the GDPS and imports of Belgium's main trading partners in this scenario. The mechanisms behind the present results are identical to those described for scenarios 1 and 2. The energy price rise reduces real income, and so private consumption. Nominal wages don't fully adjust to the price increase due to the declining labour productivity and rising unemployment. This limits the rise in unit labour costs and consequently the loss of price-competitiveness. In 2005, GDP falls by 0.43 % and employment by 0.34 %. Finally, total energy consumption is reduced by 2.5 %.

ii. France

In this scenario, the measure that is implemented reduces GDP by 1.3 % in 2005. This is obtained with an additional tax income of 1.1 % of GDP, resulting in a tax-GDP multiplier of -1.15. A reduction in private consumption, and more precisely household energy consumption, leads to a decline in GDP. Once more, we note that although the ex ante excise tax rise is relatively smaller in France that in the other European countries considered, the effect on prices turns out to be larger, leading to a reduced price-competitiveness. Also, the reduction in interest rates is not sufficient to lead to a rise in investment. Employment is only reduced by 0.57 % due to the substitution effects brought about by the rise in the relative price of energy. Total energy consumption falls by 4 % at the end of the simulation period.

iii. Germany

Scenario 3 produces much more pronounced effects on the German economy than scenario 1. In the present case, the tax-GDP multiplier is equal to -1.31, down from -0.88 in scenario 1. The larger fall in GDP, i.e. 1.62 % in 2005, is partly explained by the larger rise in excise taxes, tax income representing 1.24 % of GDP in 2005. Another and more essential explanation of the lower multiplier is the stronger negative impact and the higher import prices in Germany's trading partner countries. Indeed, we note that, while scenario 1 hardly produced any negative effects on German exports, scenario 3 reduces them by 0.82 %. Import prices rise by 0.50 % in 2005, whereas we noted a 0.10 % rise in scenario 1. The lags in the wage setting mechanisms, as well as the rise in unemployment, allow for reductions in real wages throughout the simulation period, inducing further reductions in real disposable income, and hence in domestic demand. In 2005, employment is reduced by 0.98 %, while energy consumption falls by 6.13 %.

iv. Italy

The rise in excise taxes in this scenario is very important, generating tax income equivalent to 3.1 % of GDP in 2005. With a 1.8 % decline in GDP in 2005, we compute a tax-GDP multiplier of -0.58. This multiplier is low, indicating that country-specific properties are important in this scenario. A detailed analysis of the results reveal that investment in fixed capital formation by firms and investment in housing by households is relatively more sensitive to the reduction in interest rates in Italy than in the other European countries : Total investment falls by only 0.35 % in 2005. Employment declines by 1.1 % in 2005, the substitution effects and a rather long productivity cycle tend to limit job destruction. Finally, the impor-

tant increase in energy prices leads to a 15 % reduction in total energy consumption.

v. The Netherlands

The measure implemented in scenario 3 for the Netherlands is quite important. It implies an ex ante tax receipt that is equivalent to 2.39 % of GDP, second only to the effect of the measure in Italy. The value of the tax-GDP multiplier is -0.53, which cannot be considered as high (in absolute terms). Here, the limited and delayed adjustment of nominal wages to prices allows the unit labour costs to remain more or less unchanged at the end of the simulation period, though employment falls due to the larger reduction in import demand in the other EUR-6 countries. Note that the drop in exports mainly affects the energy sector, EUR-6 energy consumption falling by 7.13 % in2005. By the end of the simulation period, GDP falls by 1.27 %, while total Dutch energy consumption decreases by 3.57 %.

vi. The United Kingdom

Scenario 3 introduces a substantial increase in excise taxes in comparison with scenario 1, the measure implemented resulting in ex ante tax revenue equal to 2.02 % of GDP and a 2.02 % reduction in GDP in 2005, giving a unit tax-GDP multiplier. The initial rise in energy prices tends to reduce real household disposable income, driving up nominal wage demands. However, the wage setting process does not allow for a full indexation of wages to prices, pushing real wages down. In a context of declining labour productivity, the resulting drop in real wages is insufficient to stop unit labour costs from rising by 3.33 % in 2005, this rise being much larger than the EUR-6 average of 2.29 %. This significant rise in costs pushes up export prices, limiting price-competitiveness and exports. In 2005, total exports drop by 1.02 % while exports of energy products fall by 3.2 %, due to a reduction in EUR-6 imports and a reduction in general energy consumption. By the end of the simulation period, employment is reduced by 1.64 %, while energy consumption drops by 5.1 %.

2. The scenarios with recycling of the tax proceeds

In the following scenarios we explicitly assume that the additional tax revenue is completely recycled into reductions in employers' social security contributions, so reducing indirect labour costs. Once more, we choose to focus on scenarios 1C and 3C, due to the contrast in the magnitude of the measures that are implemented.

a. Scenario 1C

The recycling of the tax revenue reduces indirect labour costs, inducing further substitution effects. Although these substitution effects have a positive impact on employment, their effect on GDP is relatively small.

i. Belgium

In the case of Belgium, the recycling of the *ex ante* tax income, equivalent to 0.53 % of GDP in 2005, allows a reduction of employers' social security contributions (ESSC) rates of 1.74 percentage points. This fall in indirect labour costs allows employers to offset the initial inflationary effect of the excise tax increase and so to reduce unit labour costs, even in the face of declining labour productivity. The energy tax increases, combined with the revenue recycling into lower ESSC rates, modifies the relative prices of production factors in favour of labour. The lower production costs bring about a rise in GDP, due to increased price-competitiveness and subsequent higher exports and reduced imports. Note that the rise in GDP is fully export-lead, with a negative contribution of domestic demand to the higher growth. This results from the fact that the tax increases drive up consumption prices and reduce household real disposable income, even though the increase in output raises employment by 0.41 % in 2005. Finally, the measure leads to a 0.89 % drop in total energy consumption and produces a positive effect on public finances.

ii. France

This scenario hardly produces any effect on GDP. Employment increases in 2005 by 0.09 % due to the substitution effects coming from the rise in energy prices, reinforced by a 0.49 percentage point reduction in ESSC rates due to the recycling of the tax proceeds. The consumption price increases by 0.10 %, which is slightly above the average for EUR-6. Energy consumption is reduced by 0.61 % at the end of the simulation period.

iii. Germany

In Germany, the *ex ante* tax receipts represent the equivalent of 0.27 % of GDP in 2005. This revenue, when recycled into reductions in ESSC rates, allows for a 1 percentage point reduction of these rates at the end of the simulation period. As was the case for Belgium, the recycling measure allows employers to offset the effect of the energy price rise on gross nominal wages and to reduce real wage costs. The reduction in the price of labour relative to the other production factors is at the origin of higher employment, which rises by 0.26 % in 2005. This job creation more than fully compensates for the lower real gross wages, producing a rise in household real disposable income. Thus, in the case of Germany, the measure raises GDP by 0.17 % in 2005 due to an increase in both domestic demand and exports. Finally, total energy consumption falls by 0.41 % in the year 2005.

iv. Italy

In the case of Italy, GDP rises by 0.12 %, which can be considered to be substantial given the magnitude of the initial tax increase of 0.09 % of GDP in 2005. The rise in economic activity is mainly due to private consumption, which increases by 0.17 % relative to its level in the reference scenario. Employment increases by 0.11 %, the substitution effects not having any significant impact.

v. The Netherlands

In the Netherlands, the increased tax receipt resulting from the rise in excises represents 0.15 % of GDP, which is relatively smaller than the tax revenue in the other EUR-6 countries. Not surprisingly, the implied reduction in ESSC rates is also the smallest of all EUR-6 countries except Italy. The recycling measure does however allow for a reduction in unit labour costs and a slight rise in employment. The negative effect on household real disposable income of the excise tax increases is more than offset by the higher employment, allowing domestic demand to rise slightly in 2005. The reduction in energy imports by the other EUR-6 countries produces a small decline in Dutch exports, but GDP manages to stabilize in 2005. Also, the measure reduces final energy consumption in 2005 by 0.55 %.

vi. The United Kingdom

The *ex ante* tax receipts available to reduce ESSC rates are equal to 0.48 % for the United Kingdom. This allows a 1.77 percentage point drop in ESSC rates in 2005, which is the largest point reduction of all EUR-6 countries for scenario 1C. Similarly to the Netherlands, the relatively important reduction in indirect wage costs are at the origin of a significant fall in unit labour costs. This tends to mitigate the effect of the energy price rise on the overall consumption price index, so preserving price-competitiveness. The reduction in the relative price of labour induces production factor substitutions that lead to a 0.20 % rise in employment in 2005. The higher employment, combined with gross real wage increases, raises household real disposable income and hence private consumption. By 2005, the measure increases GDP by 0.10 % though final energy consumption falls by a significant 1.14 %.

b. The 3C scenario

i. Belgium

The strong positive effects of the scenario 3C on Belgian GDP is due to the magnitude of the *ex ante* tax proceeds, which represent 1.04 % of GDP in 2005, and the 3.82 percentage point reduction of ESSC rates that their recycling allows. The associated reduction in labour costs tends to reinforce the substitution effects initiated by the rise in energy prices, leading to a 0.90 % increase in employment by 2005. The measure produces a fall in total production costs, allowing for an increase in price-competitiveness and a 0.13 % rise in exports at the end of the period. However, the price rise is not completely compensated by the rise in employment, explaining the reduction in household real disposable income and private consumption. Also, the measure has a positive effect on public budget deficits and it is at the origin of a 1.92 % drop in final energy consumption.

ii. France

The recycling of the additional tax revenue allows for a 5.50 percentage point reduction in the ESSC rates, which in turn produces a 0.33 % rise in employment, whereas GDP increases by 0.15 %. The comparison of these two figures highlights the importance of the substitution effects.

iii. Germany

In Germany, the tax revenue from the measure is recycled into a 4.76 percentage point reduction of ESSC rates, allowing for a 1.05 % decline in unit labour costs by 2005. The reduction in the price of labour relative to other production factors increases employment by 1 % at the end of the simulation period. The important job creation, accompanied by gross real wage increases, tends to raise household disposable income and private consumption. The increase in output and domestic demand lead to price increases that are reinforced by rising wage pressures due to the fall in unemployment. The competitive position of Germany suffers, because the fall in unit labour costs is smaller than the EUR-6 average, resulting in a 0.15 % fall in exports. Finally, total energy consumption declines by 4.04 % in 2005.

iv. Italy

In this scenario, the fiscal measure implemented in Italy is equivalent to a little more than 3 % of GDP in 2005. The associated energy price rise for households is 31.86 %, leading to important substitution effects between energy and non energy consumption categories. This results in an *ex post* energy consumption and tax receipts that are notably lower that what the *ex ante* computations would suggest. This implies that the *ex ante* lowering of employers' social security contributions rates, computed in function of the *ex ante* tax revenue, turns out to be excessive. Thus, in the case of Italy it was necessary to simulate an *ex post* equivalence between the increase in tax receipts and the reduction in social security rates. The final *ex post* reduction in ESSC rates is 10.7 percentage points in 2005. The recycling of the proceeds from the tax increase allows for a 2.53 % rise in GDP, whereas employment only rises by 1.25 % in 2005.

v. The Netherlands

In this scenario, the relatively high level of tax revenue from the rise in excises allows for an important 8.44 percentage point reduction in ESSC rates in 2005. This reduction in labour costs increases the substitution effects in favour of labour, resulting in an increase in employment of 0.41 % in the year 2005. The rise in employment, along with a rise in real gross wages, pushes up household real disposable income and consumption without compromising the fall in unit labour costs. Notwithstanding the substantial reduction in energy exports, total exports rise by 0.16 % in 2005 due to increased price-competitiveness. Lastly, final energy consumption is reduces by 2.14 % at the end of the period.

vi. The United Kingdom

The effects of scenario 3C for the United Kingdom are similar to those described for the Netherlands. The recycling of the relatively large tax revenue allows a 6.58 percentage point reduction in ESSC rates. This significant reduction in wage cost reduces unit labour costs, even though the fall in unemployment pushes real gross wages up and reduces labour productivity. The subsequent rise in household real income increases private consumption by the end of the simulation period, while the only very limited reduction in export prices reduces price-competitiveness and exports. In 2005, the measure leads to a 0.12 % rise in GDP, a 0.39 % rise in employment, and a 4.09 reduction in final energy consumption.

TABLE 7 - Main macroeconomic results for 2005 *(differences in %, w.r.t. the baseline)*

	1	2	3	1C	2C	3C
Gross Domestic Product						
Germany	-0.24	-0.23	-1.62	0.17	0.14	0.44
Belgium	-0.12	-0.12	-0.43	0.12	0.11	0.23
France	-0.18	-0.16	-1.27	0.03	0.01	0.15
Italy	-0.10	-0.07	-1.81	0.12	0.10	2.53
Netherlands	-0.09	-0.08	-1.27	0.01	0.01	0.33
United Kingdom	-0.49	-0.45	-2.02	0.10	0.09	0.12
Europe -6 countries	-0.23	-0.21	-1.60	0.10	0.08	0.74
Consumer prices						
Germany	0.42	0.41	2.79	0.03	0.05	0.67
Belgium	0.37	0.35	1.14	0.20	0.20	0.27
France	0.56	0.52	4.16	0.10	0.10	1.06
Italy	0.03	0.00	5.15	-0.35	-0.32	-3.29
Netherlands	0.18	0.17	3.04	0.12	0.12	1.63
United Kingdom	1.01	0.98	3.93	0.38	0.36	2.16
Europe -6 countries	0.47	0.44	3.79	0.04	0.05	0.23
Real gross wages per head (firms)						
Germany	-0.16	-0.16	-1.21	0.29	0.25	1.32
Belgium	-0.29	-0.29	-0.74	-0.43	-0.42	-1.02
France	-0.06	-0.06	-0.89	0.12	0.10	0.56
Italy	-0.15	-0.11	-4.22	-0.05	-0.03	-0.83
Netherlands	-0.11	-0.11	-2.02	0.23	0.23	0.44
United Kingdom	-0.24	-0.21	-1.16	0.46	0.39	2.17
Europe -6 countries	-0.16	-0.15	-1.77	0.20	0.17	0.80
Employment						
Germany	-0.14	-0.14	-0.98	0.26	0.22	1.00
Belgium	-0.07	-0.07	-0.34	0.41	0.38	0.90
France	-0.05	-0.05	-0.57	0.09	0.07	0.33
Italy	-0.06	-0.04	-1.10	0.11	0.09	1.25
Netherlands	0.01	0.01	-0.05	0.08	0.08	0.41
United Kingdom	-0.33	-0.31	-1.64	0.20	0.18	0.39
Europe -6 countries	-0.14	-0.13	-1.01	0.18	0.15	0.74
Net lending or net borrowing of public administrations (in % of GDP)						
Germany	0.26	0.23	1.12	0.11	0.09	0.47
Belgium	0.61	0.58	1.74	0.08	0.07	0.12
France	0.23	0.21	1.04	-0.01	-0.01	-0.22
Italy	0.05	0.05	1.39	-0.06	-0.05	-0.66
Netherlands	0.08	0.08	2.04	0.13	0.13	1.63
United Kingdom	0.50	0.47	2.02	-0.04	-0.03	-0.22
Europe -6 countries	0.27	0.25	1.38	0.02	0.02	0.02

TABLE 8 - Summary of results for 2005

	1	2	3	1C	2C	3C
Employment (differences in thousands w.r.t. the baseline)						
Germany	-40	-41	-286	75	64	291
Belgium	-3	-3	-13	15	14	34
France	-11	-11	-132	20	17	77
Italy	-12	-9	-245	26	21	280
Netherlands	0	0	-3	4	4	22
United Kingdom	-87	-84	-436	53	49	104
Europe -6 countries	-153	-147	-1 115	194	169	808
Final energy consumption (differences in % w.r.t. the baseline)						
Germany	-0.83	-0.80	-6.13	-0.41	-0.49	-4.04
Belgium	-1.04	-1.02	-2.50	-0.89	-0.88	-1.92
France	-0.71	-0.63	-4.00	-0.61	-0.50	-3.19
Italy	-0.45	-0.30	-15.00	-0.21	-0.11	-12.31
Netherlands	-0.82	-0.80	-3.57	-0.69	-0.67	-2.14
United Kingdom	-1.41	-1.29	-5.10	-1.14	-1.03	-4.09
Europe -6 countries	-0.84	-0.76	-7.13	-0.59	-0.54	-5.50
Total CO_2 emissions (differences in % w.r.t. the baseline)						
Germany	-2.99	n.a.	-8.29	-1.43	-1.66	-5.62
Belgium	-2.25	-2.30	-3.55	-1.82	-1.68	-3.02
France	-3.06	n.a.	-6.72	-2.93	-2.28	-5.73
Italy	-3.39	n.a.	-18.25	-1.38	-0.73	-12.53
Netherlands	-1.40	n.a.	-4.65	-1.18	-1.08	-2.75
United Kingdom	-3.37	n.a.	-7.83	-2.69	-2.34	-5.54

FIGURE 2 - Net new job creations in 2005
(deviations in thousands, w.r.t. the baseline)

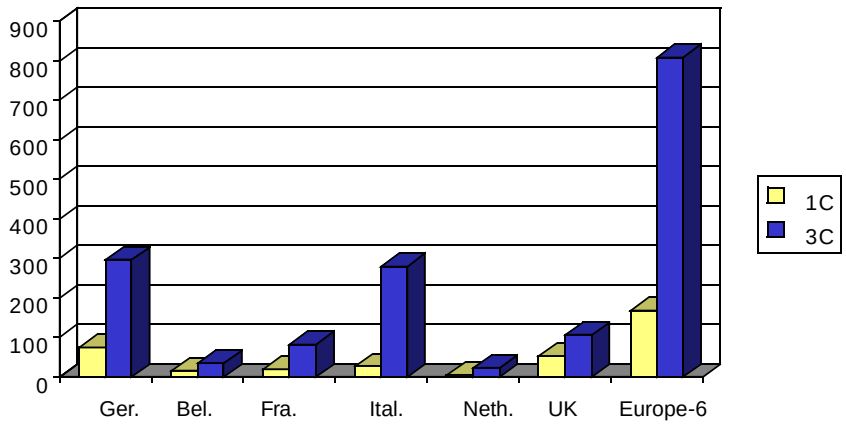


FIGURE 3 - Scenario impacts on European GDP
(deviations in %, w.r.t. the baseline scenario)

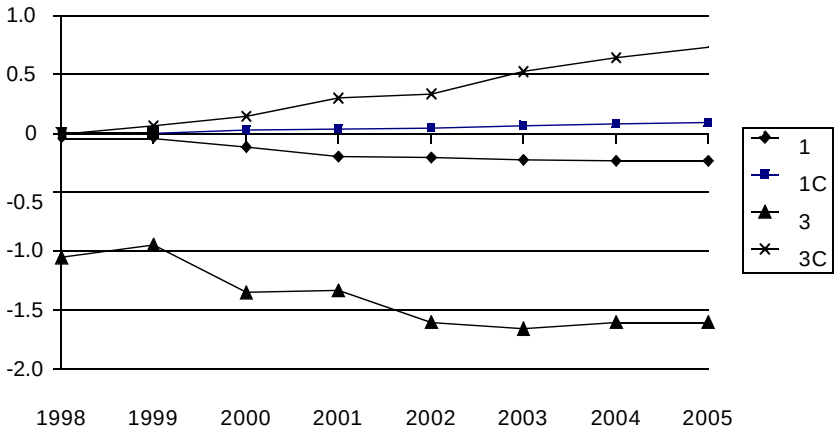


FIGURE 4 - Scenario impacts on European consumption
(deviations in %, w.r.t. the baseline scenario)

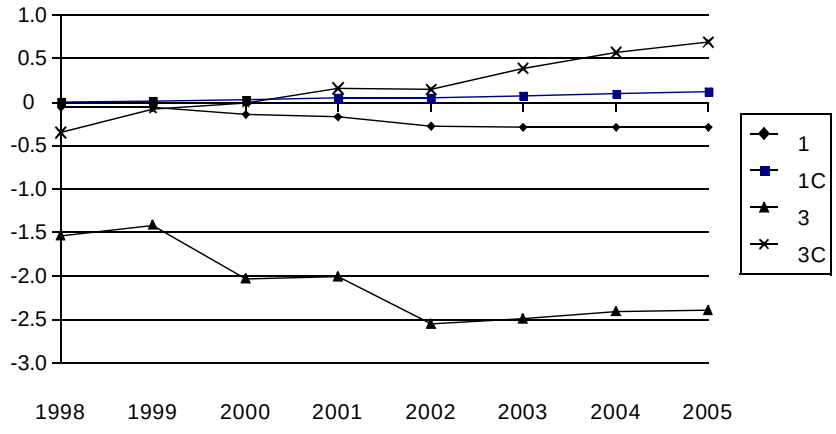


FIGURE 5 - Scenario impacts on European final energy consumption in 2005
(deviations in %, w.r.t. the baseline scenario)

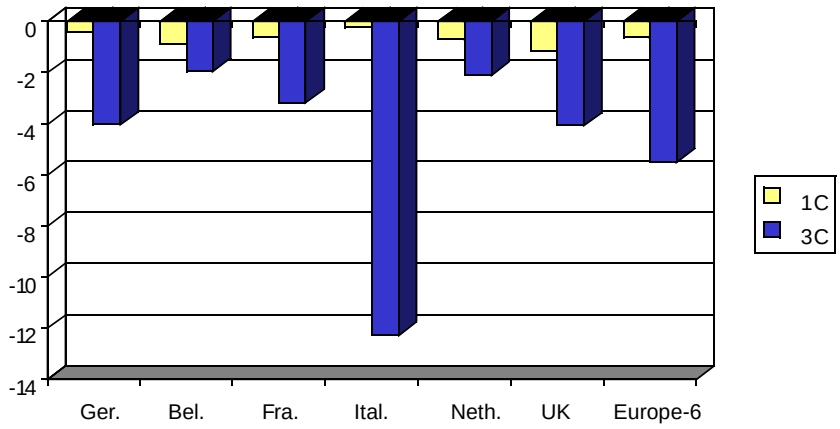
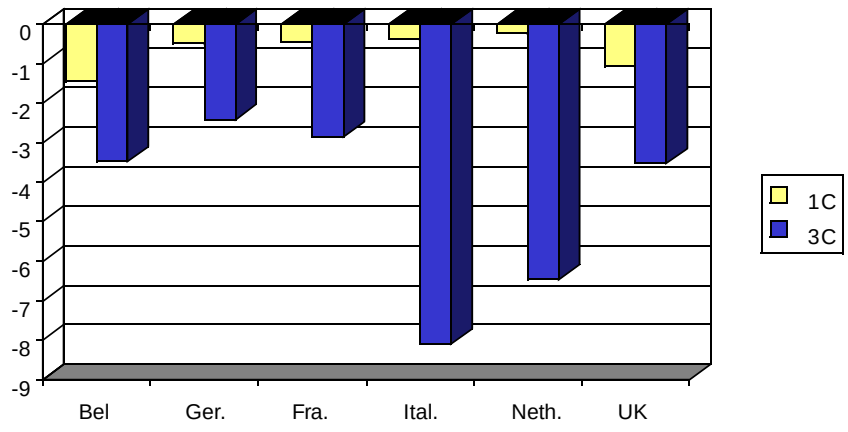


FIGURE 6 - Scenario impacts on real *per capita* wage costs in 2005
(deviations in %, w.r.t. the baseline scenario)



IV The February 1997 Proposal for the Taxation of Energy Products

This fourth chapter presents the results of simulations carried out with the HERMES - Link system of models following alternative assumptions regarding minimum excise tax rates as presented in the February 1997 proposal of the Commission services.

We recall that in Case 1, as defined in section II, point C, all EU Member-States introduce rates defined as the maximum between either their effective energy tax rates or the minimum values proposed by the EC. Current tax rates of EU-countries are assumed to be updated with inflation and then compared to the new minimum levels of taxation rates. This implementation rule implies that the shift in the tax burden will differ between countries, as the additional taxation will depend on the preexisting levels of excise taxes.

TABLE 9 - Revised February 1997 Proposal for Minimum Excise Taxes *(ECUs per specific unit)*

	Unit	1998	2000	2002
Motor Fuels				
Gasoline	klt	417	450	500
Gasoil	klt	310	343	393
Kerosene	klt	310	343	393
LPG	tn	141	174	224
Natural Gas	Gj	2.9	3.5	4.5
Fuels used as provided in Article 7, paragraph 2				
Gasoline	klt	32	37	41
Kerosene	klt	30	35	39
LPG	tn	41	48	53
Natural Gas	Gj	0.3	0.6	1.1
Fuels				
Heating gas oil	klt	21	23	26
Heavy fuel oil	tn	18	23	28
Kerosene	klt	7	16	25
LPG	tn	10	22	34
Natural Gas	Gj	0.2	0.45	0.7
Solid fuels	Gj	0.2	0.45	0.7
Electricity	MWh	1	2	3

The changes introduced in this revised proposal, as compared to Case 1, can be summarized as follows :

Excise tax rates on motor fuels have been lowered ;

Exemptions of energy intensive industries have been implemented as provided in article 15, paragraph 2 of the revised Proposal.

TABLE 10 - Main macroeconomic results for 2005 *(differences in %, w.r.t. the baseline)*

	1	2	3	1C	2C	3C	4C
Gross Domestic Product							
Germany	-0.24	-0.23	-1.62	0.17	0.14	0.44	0.09
Belgium	-0.12	-0.12	-0.43	0.12	0.11	0.23	0.09
France	-0.18	-0.16	-1.27	0.03	0.01	0.15	0.01
Italy	-0.10	-0.07	-1.81	0.12	0.10	2.53	0.10
Netherlands	-0.09	-0.08	-1.27	0.01	0.01	0.33	0.00
United Kingdom	-0.49	-0.45	-2.02	0.10	0.09	0.12	0.06
Europe -6 countries	-0.23	-0.21	-1.60	0.10	0.08	0.74	0.06
Consumer prices							
Germany	0.42	0.41	2.79	0.03	0.05	0.67	0.07
Belgium	0.37	0.35	1.14	0.20	0.20	0.27	0.14
France	0.56	0.52	4.16	0.10	0.10	1.06	0.09
Italy	0.03	0.00	5.15	-0.35	-0.32	-3.29	-0.30
Netherlands	0.18	0.17	3.04	0.12	0.12	1.63	0.11
United Kingdom	1.01	0.98	3.93	0.38	0.36	2.16	0.27
Europe -6 countries	0.47	0.44	3.79	0.04	0.05	0.23	0.04
Real gross wages per head (firms)							
Germany	-0.16	-0.16	-1.21	0.29	0.25	1.32	0.17
Belgium	-0.29	-0.29	-0.74	-0.43	-0.42	-1.02	-0.30
France	-0.06	-0.06	-0.89	0.12	0.10	0.56	0.10
Italy	-0.15	-0.11	-4.22	-0.05	-0.03	-0.83	-0.04
Netherlands	-0.11	-0.11	-2.02	0.23	0.23	0.44	0.17
United Kingdom	-0.24	-0.21	-1.16	0.46	0.39	2.17	0.26
Europe -6 countries	-0.16	-0.15	-1.77	0.20	0.17	0.80	0.12
Employment							
Germany	-0.14	-0.14	-0.98	0.26	0.22	1.00	0.17
Belgium	-0.07	-0.07	-0.34	0.41	0.38	0.90	0.30
France	-0.05	-0.05	-0.57	0.09	0.07	0.33	0.07
Italy	-0.06	-0.04	-1.10	0.11	0.09	1.25	0.10
Netherlands	0.01	0.01	-0.05	0.08	0.08	0.41	0.08
United Kingdom	-0.33	-0.31	-1.64	0.20	0.18	0.39	0.19
Europe -6 countries	-0.14	-0.13	-1.01	0.18	0.15	0.74	0.14
Net lending or net borrowing of public administrations (in % of GDP)							
Germany	0.26	0.23	1.12	0.11	0.09	0.47	0.07
Belgium	0.61	0.58	1.74	0.08	0.07	0.12	0.07
France	0.23	0.21	1.04	-0.01	-0.01	-0.22	0.00
Italy	0.05	0.05	1.39	-0.06	-0.05	-0.66	-0.05
Netherlands	0.08	0.08	2.04	0.13	0.13	1.63	0.07
United Kingdom	0.50	0.47	2.02	-0.04	-0.03	-0.22	-0.01
Europe -6 countries	0.27	0.25	1.38	0.02	0.02	0.02	0.02

Tables 10 through 16 present the main macroeconomic results of the new scenario, called Case 4C, which adopts the Commission's Revised February 1997 Proposal along with a recycling of the increased tax revenue into reductions in employers' social security contributions. These results are put into perspective, being presented along those of cases 1 to 3, both with and without the labour fiscal reform option.

As can be seen, the simulation of Case 4C confirms the conclusions reached in the previous report concerning scenarios 1C and 2C. The results are very similar to those of Case 2C, the main difference residing in the somewhat lower growth and employment levels due to the recycling of a smaller tax revenue than in Case 2C. Finally, we once again obtain a double dividend solution in terms of employment and CO_2 emissions, thus confirming the possibility of this type of outcome.

TABLE 11 - Summary of results for 2005

	1	2	3	1C	2C	3C	4C
Employment (differences in thousands w.r.t. the baseline)							
Germany	-40	-41	-286	75	64	291	50
Belgium	-3	-3	-13	15	14	34	11
France	-11	-11	-132	20	17	77	17
Italy	-12	-9	-245	26	21	280	21
Netherlands	0	0	-3	4	4	22	4
United Kingdom	-87	-84	-436	53	49	104	49
Europe -6 countries	-153	-147	-1 115	194	169	808	152
Final energy consumption (differences in % w.r.t. the baseline)							
Germany	-0.83	-0.80	-6.13	-0.41	-0.49	-4.04	-0.48
Belgium	-1.04	-1.02	-2.50	-0.89	-0.88	-1.92	-0.79
France	-0.71	-0.63	-4.00	-0.61	-0.50	-3.19	-0.47
Italy	-0.45	-0.30	-15.00	-0.21	-0.11	-12.31	-0.20
Netherlands	-0.82	-0.80	-3.57	-0.69	-0.67	-2.14	-0.50
United Kingdom	-1.41	-1.29	-5.10	-1.14	-1.03	-4.09	-0.95
Europe -6 countries	-0.84	-0.76	-7.13	-0.59	-0.54	-5.50	-0.52
Total CO_2 emissions (differences in %w.r.t. the baseline)							
Germany	-2.99	n.a.	-8.29	-1.43	-1.66	-5.62	-1.63
Belgium	-2.25	-2.30	-3.55	-1.82	-1.68	-3.02	-1.51
France	-3.06	n.a.	-6.72	-2.93	-2.28	-5.73	-2.14
Italy	-3.39	n.a.	-18.25	-1.38	-0.73	-12.53	-1.33
Netherlands	-1.40	n.a.	-4.65	-1.18	-1.08	-2.75	-0.81
United Kingdom	-3.37	n.a.	-7.83	-2.69	-2.34	-5.54	-2.16

In Case 4C, we note a positive effect on total market sector value added in all countries considered. Sectoral activity is increased with respect to the baseline scenario in all but the energy sector and, in the case of France and the United Kingdom, the construction and equipment goods sectors. When comparing these results to those obtained in Case 2C, we note that the results are very similar. Sectoral value added is generally only marginally worse off than in Case 2C, and the only more or less significant differences are to be found in Germany.

TABLE 12 - Impact of scenario 4C on sectoral value added and employment in 2005
(deviation in %, w.r.t. baseline scenario)

	Belgium	France	Germany	Italy	Netherlands	United Kingdom
Value Added						
Energy	-0.56	-0.16	-1.52	-0.28	-0.45	-0.75
Intermediate goods	0.06	0.07	0.48	0.02	0.08	0.32
Equipment goods	0.09	-0.04	0.07	0.13	0.00	0.12
Consumption goods	0.14	0.00	0.19	0.14	0.02	0.40
Construction	0.26	-0.01	0.04	0.12	0.14	-0.02
Transportation & Communication	0.10	0.00	0.00	0.06	0.07	0.57
Other market services	0.17	0.04	0.18	0.16	0.06	0.05
Total of market sectors	0.11	0.01	0.10	0.13	0.01	0.10
Employment						
Energy	-0.20	-0.03	-0.07	0.00	-0.19	-0.21
Intermediate goods	0.55	0.28	-0.52	-0.10	0.13	0.41
Equipment goods	0.18	0.15	0.47	0.23	0.07	0.56
Consumption goods	0.43	0.37	0.21	0.11	0.14	0.44
Construction	0.70	0.08	0.19	0.07	0.18	0.11
Transportation & Communication	0.51	0.02	0.26	0.01	0.11	0.61
Other market services	0.31	0.04	0.17	0.14	0.11	0.13
Total of market sectors	0.36	0.09	0.21	0.11	0.11	0.24

TABLE 13 - Main macroeconomic results for 2000 *(differences in %, w.r.t. the baseline)*

	1	2	3	1C	2C	3C	4C
Gross Domestic Product							
Germany	-0.09	-0.09	-0.87	0.02	0.01	-0.07	0.02
Belgium	-0.01	-0.01	-0.02	0.07	0.07	0.10	0.04
France	-0.05	-0.04	-0.60	0.01	0.00	-0.04	0.01
Italy	-0.07	-0.05	-2.93	0.05	0.04	0.85	0.04
Netherlands	-0.02	-0.02	-0.65	-0.01	-0.01	-0.04	0.01
United Kingdom	-0.29	-0.29	-1.62	0.03	0.02	-0.05	0.03
Europe -6 countries	-0.11	-0.10	-1.35	0.03	0.02	0.15	0.02
Consumer prices							
Germany	0.18	0.17	1.75	0.06	0.07	0.82	0.00
Belgium	0.24	0.23	0.86	0.09	0.09	0.18	0.08
France	0.18	0.17	2.58	0.03	0.03	0.86	0.01
Italy	-0.02	-0.01	3.63	-0.12	-0.10	0.19	-0.10
Netherlands	0.05	0.05	2.21	0.02	0.02	1.22	0.00
United Kingdom	0.56	0.58	3.03	0.08	0.11	0.85	0.05
Europe -6 countries	0.21	0.21	2.60	0.02	0.03	0.69	-0.01
Real gross wages per head (firms)							
Germany	-0.09	-0.08	-0.50	0.02	0.01	0.21	0.02
Belgium	-0.13	-0.14	-0.53	-0.20	-0.19	-0.73	-0.10
France	-0.04	-0.04	-0.44	0.00	0.00	-0.03	0.01
Italy	-0.02	-0.02	-2.49	0.02	0.02	-0.12	0.02
Netherlands	-0.04	-0.03	-1.45	0.05	0.05	0.11	0.02
United Kingdom	-0.21	-0.23	-1.07	0.05	0.02	0.38	0.04
Europe -6 countries	-0.09	-0.10	-1.08	0.02	0.01	0.10	0.02
Employment							
Germany	-0.04	-0.04	-0.43	0.08	0.07	0.44	0.04
Belgium	-0.01	-0.01	0.01	0.17	0.17	0.44	0.08
France	-0.01	-0.01	-0.26	0.02	0.02	0.12	0.02
Italy	-0.02	-0.02	-1.22	0.04	0.03	0.21	0.03
Netherlands	0.01	0.01	-0.03	0.03	0.03	0.23	0.03
United Kingdom	-0.12	-0.12	-1.00	0.12	0.11	0.28	0.11
Europe -6 countries	-0.05	-0.05	-0.66	0.07	0.06	0.28	0.05
Net lending or net borrowing of public administrations (in % of GDP)							
Germany	0.18	0.16	1.13	0.02	0.02	0.25	0.00
Belgium	0.31	0.30	0.90	0.03	0.03	-0.01	0.02
France	0.11	0.10	0.85	-0.03	-0.03	-0.30	-0.02
Italy	0.04	0.03	0.52	-0.02	-0.02	-0.39	-0.02
Netherlands	0.04	0.04	1.31	0.03	0.03	0.88	-0.01
United Kingdom	0.32	0.33	1.31	-0.02	0.02	0.18	0.00
Europe -6 countries	0.16	0.15	1.00	0.00	0.00	0.01	-0.01

TABLE 14 - Summary of results for 2000

	1	2	3	1C	2C	3C	4C
Employment (differences in thousands w.r.t. the baseline)							
Germany	-12	-12	-122	23	19	126	10
Belgium	-0	-0	0	7	6	16	3
France	-3	-3	-59	5	4	28	4
Italy	-5	-4	-264	9	7	46	7
Netherlands	0	0	-1	2	2	12	2
United Kingdom	-30	-32	-261	32	28	72	29
Europe -6 countries	-51	-50	-707	77	66	300	55
Final energy consumption (differences in % w.r.t. the baseline)							
Germany	-0.30	-0.28	-2.99	-0.21	-0.20	-2.30	-0.05
Belgium	-0.45	-0.45	-1.16	-0.46	-0.46	-1.25	-0.37
France	-0.19	-0.18	-1.90	-0.16	-0.15	-1.56	-0.12
Italy	-0.12	-0.09	-13.32	0.03	0.03	-9.60	0.02
Netherlands	-0.18	-0.17	-1.80	-0.14	-0.14	-1.07	-0.13
United Kingdom	-0.61	-0.59	-2.94	-0.50	-0.48	-2.38	-0.36
Europe -6 countries	-0.30	-0.28	-4.88	-0.21	-0.20	-3.65	-0.13
Total CO_2 emissions (differences in %w.r.t. the baseline)							
Germany	-1.08	n.a.	-4.04	-0.73	-0.68	-3.20	-0.17
Belgium	-0.97	-1.01	-1.65	-0.94	-0.88	-1.97	-0.71
France	-0.82	n.a.	-3.19	-0.77	-0.68	-2.80	-1.01
Italy	-0.09	n.a.	-16.21	-0.20	-0.20	-9.77	-0.27
Netherlands	-0.31	n.a.	-2.34	-0.24	-0.23	-1.38	-0.41
United Kingdom	-1.46	n.a.	-4.51	-1.18	-1.09	-3.20	-2.05

TABLE 15 - Impact of scenario 4C on sectoral value added and employment in 2000
(deviation in %, w.r.t. baseline scenario)

	Belgium	France	Germany	Italy	Netherlands	United Kingdom
Value Added						
Energy	-0.17	-0.02	-0.24	0.00	-0.06	-0.40
Intermediate goods	0.03	0.02	0.12	-0.24	0.05	0.06
Equipment goods	0.06	0.00	-0.01	0.06	0.00	0.14
Consumption goods	0.04	0.00	0.03	0.07	0.00	0.23
Construction	0.08	0.00	-0.01	0.06	0.05	0.01
Transportation & Communication	0.03	0.01	0.10	0.03	0.02	0.33
Other market services	0.08	0.02	0.03	0.11	0.03	0.09
Total of market sectors	0.05	0.01	0.02	0.06	0.02	0.09
Employment						
Energy	-0.04	0.00	0.00	0.00	0.03	-0.17
Intermediate goods	0.09	0.04	-0.29	-0.06	0.03	-0.04
Equipment goods	0.04	0.01	0.08	0.05	0.02	0.34
Consumption goods	0.06	0.05	0.04	0.01	0.02	0.16
Construction	0.25	0.05	0.07	0.03	0.07	0.09
Transportation & Communication	0.15	0.00	0.18	0.00	0.05	0.29
Other market services	0.10	0.02	0.05	0.07	0.05	0.12
Total of market sectors	0.10	0.02	0.04	0.04	0.04	0.15

TABLE 16 - Impact of scenario 4C on sectoral value added and employment for EUR-6
(deviation in %, w.r.t. baseline scenario)

	2000	2005
Value Added (factor costs)		
Energy	-0.14	-0.52
Intermediate goods	0.00	0.22
Equipment goods	0.04	0.06
Consumption goods	0.07	0.17
Construction	0.02	0.04
Transportation & Communication	0.10	0.13
Other market services	0.05	0.11
Total of market sectors	0.04	0.10
Employment (in %)		
Energy	-0.06	-0.11
Intermediate goods	-0.11	-0.03
Equipment goods	0.12	0.39
Consumption goods	0.05	0.25
Construction	0.07	0.14
Transportation & Communication	0.11	0.22
Other market services	0.07	0.13
Total of market sectors	0.07	0.18
Employment (in thousands)		
Energy	-0.89	-1.44
Intermediate goods	-3.73	-0.92
Equipment goods	13.55	42.83
Consumption goods	5.29	24.58
Construction	5.04	11.04
Transportation & Communication	7.36	14.87
Other market services	26.50	55.05
Total of market sectors	53.11	146.00

V Conclusion

Generally, the simulation results show that when recycling of the tax proceeds of the rise in energy tax rates into reductions in employers' social security contributions is allowed for, the different scenarios lead to slightly higher GDPS while producing only limited inflationary increases. These scenarios also tend to lead to higher employment, while simultaneously reducing CO_2 emissions (we thus obtain the so called "Double Dividend" solution [1]).

The measures were simulated in linked mode, allowing to take into account the simultaneous implementation of fiscal measures in the different European countries considered.

The more realistic cases (the first group of measures, as well as the Commission's February 1997 proposal), when tested with accompanying fiscal reform measures in favour of employment, lead to positive effects on GDP, while increasing inflation only slightly. They also have positive effects on employment and allow for reductions in CO_2 emissions. Finally, notwithstanding the *ex ante* fiscal neutrality of the measures, these scenarios lead to slightly positive effects on public finances.

Without the accompanying recycling measures in favour of employment, the scenarios generally lead to lower GDPS and a decline in employment. However, a more positive effect is found on public finances.

The technical scenario (the second group of measures), imposing relatively higher tax increases than the former cases, produces less favourable results in terms of employment and growth, though it leads to relatively greater reductions in CO_2 emissions.

Finally, the robustness of the results presented above has been tested and corroborated by similar simulation experiments, carried out by other research teams in the framework of the European Commission contract, using both macro-econometric (HERMES and E3ME) and general equilibrium (GEM-E3) models. In particular, the three models allow the testing of the existence of the "Double Dividends" solution, and confirm its possibility when the tax proceeds are recycling into reductions in employers' social contributions.

1. This result was already found in an earlier study, conducted with HERMES-Link for the European Commission. See F. Bossier, I. Bracke, Th. Bréchet, L. Lemiale, C. Streel, P. Van Brusselen, P. Zagamé : *Un redéploiement fiscal au service de l'emploi : réduction du coût salarial financé par la Taxe CO_2/énergie*, Planning Paper n° 65, Federal Planning Office, November 1993.

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