

# Implications for Europe: results from the E3ME model

Environmental Tax Reform (ETR) in Europe: The Key to a Resource-Efficient, Low-Carbon Competitive Economy

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[www.e3me.com](http://www.e3me.com)

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## Outline

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- **Introduction**
  - the role of modelling in petrE
  - the E3ME model
- **Scenario design**
- **Empirical results**
  - energy and environment impacts
  - economic impacts
- **Impacts of the financial crisis**
- **Conclusions**

# The role of modelling in petrE

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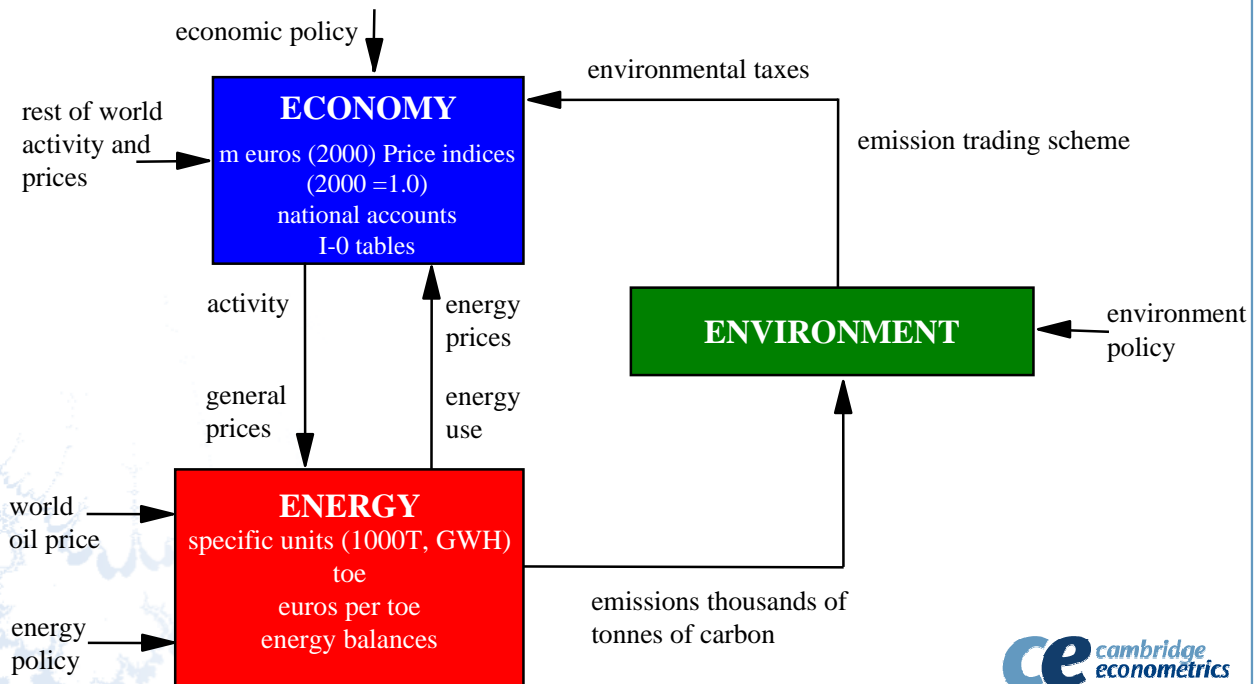
- To provide a forward-looking quantitative assessment of the impacts of ETR on:
  - energy demand and emissions
  - consumption of materials
  - economic activity

# The E3ME model

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- **Econometric model**
  - integrated energy-environment-economy and material use
  - covers EU27 + Norway and Switzerland
  - based on the system of national accounts
  - includes specialised model of power generation
  - large sectoral disaggregation
  - long and short-term specification
- For more details see [www.e3me.com](http://www.e3me.com)

## The E3ME model (cont)



## Scenarios - Baseline

- Derived from 'Energy and Transport: Trends to 2030 (2007 update)'
- An alternative was set up with higher oil prices

# Scenario Definitions

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- **Scenario 1L: 2020 EU 20% GHG emissions target is met (domestically)**
- **Scenario 1H: 2020 EU GHG emissions target is met in a world with higher energy prices**
- **Scenario 2H: Same target with 10% investment in energy-efficient technologies**
- **Scenario 3H: As S1H but with international cooperation and a 30% EU target**
- **Other scenario inputs**
  - All scenarios include a materials tax (minerals and biomass)
  - Revenues are recycled through reductions in income taxes and employers' social security contributions

# Main Results (EU, 2020)

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	Carbon tax rate (2008 euro/tCO <sub>2</sub> )	Revenues from carbon tax/ETS (% of GDP)	Revenues from material tax (% of GDP)
S1L	141.9	4.8	1.2
S1H	59.4	2.0	1.3
S2H	52.9	1.8	1.3
S3H	204.0	6.2	1.3

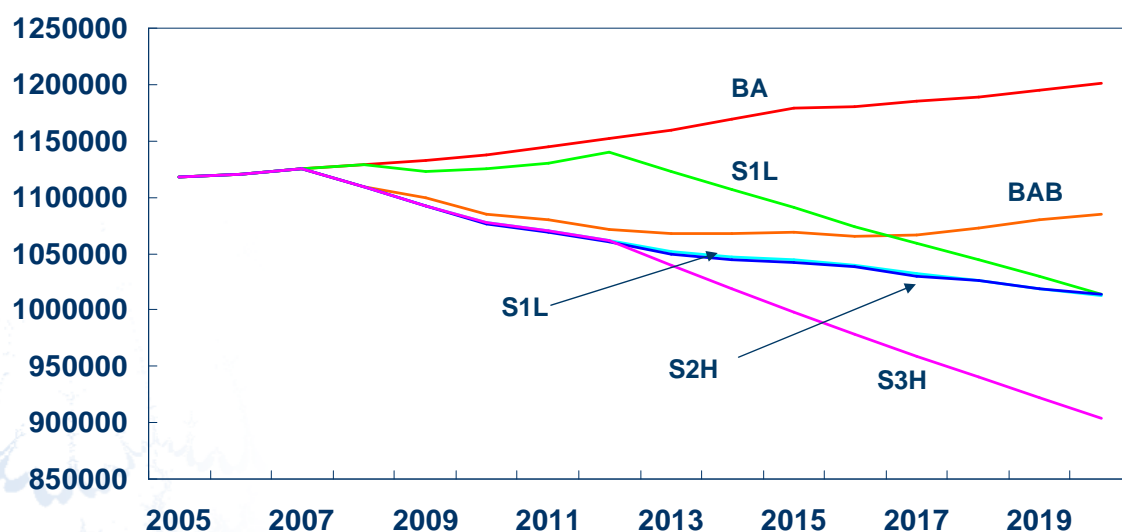
# Productivity Impacts

(% difference from baseline)	Carbon Productivity	Material Productivity	Labour Productivity
<b>Scenario 1L</b>	19.1	3.4	-1.6
<b>Scenario 1H</b>	7.3	2.8	-0.9
<b>Scenario 2H</b>	7.9	3.0	-0.3
<b>Scenario 3H</b>	20.7	3.1	-2.1

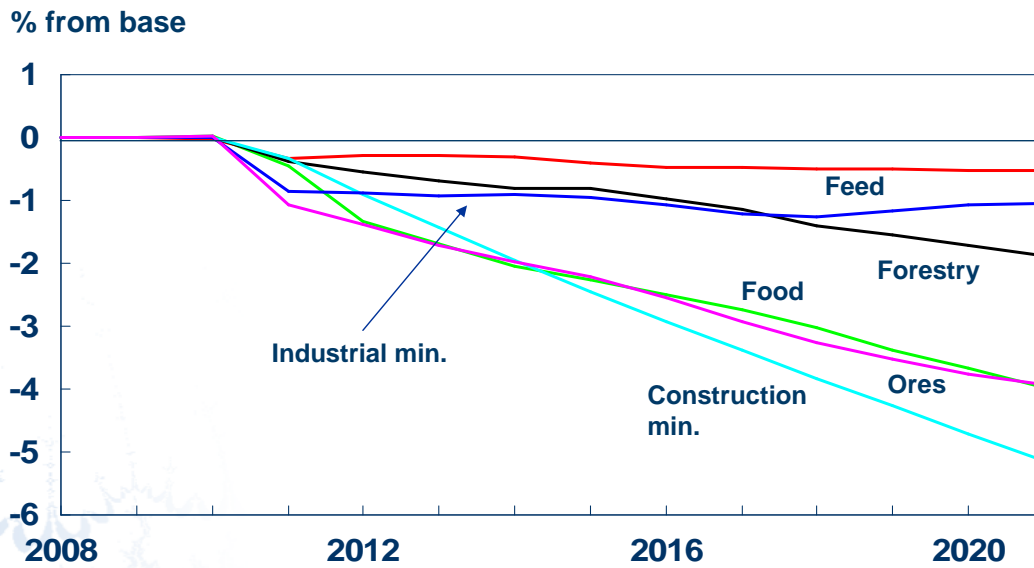
Note(s) : Defined as GDP per unit of material inputs, carbon and labour inputs. Differences between scenario results partly reflect change in GDP in the scenarios.

# Impacts on CO2 emissions

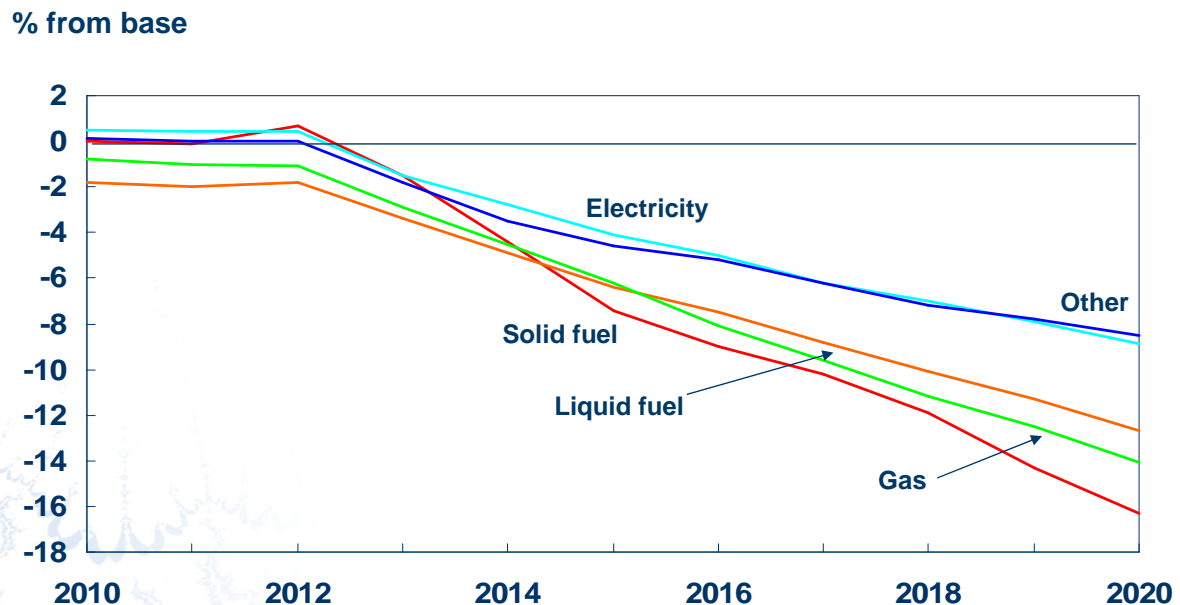
th tonnes carbon



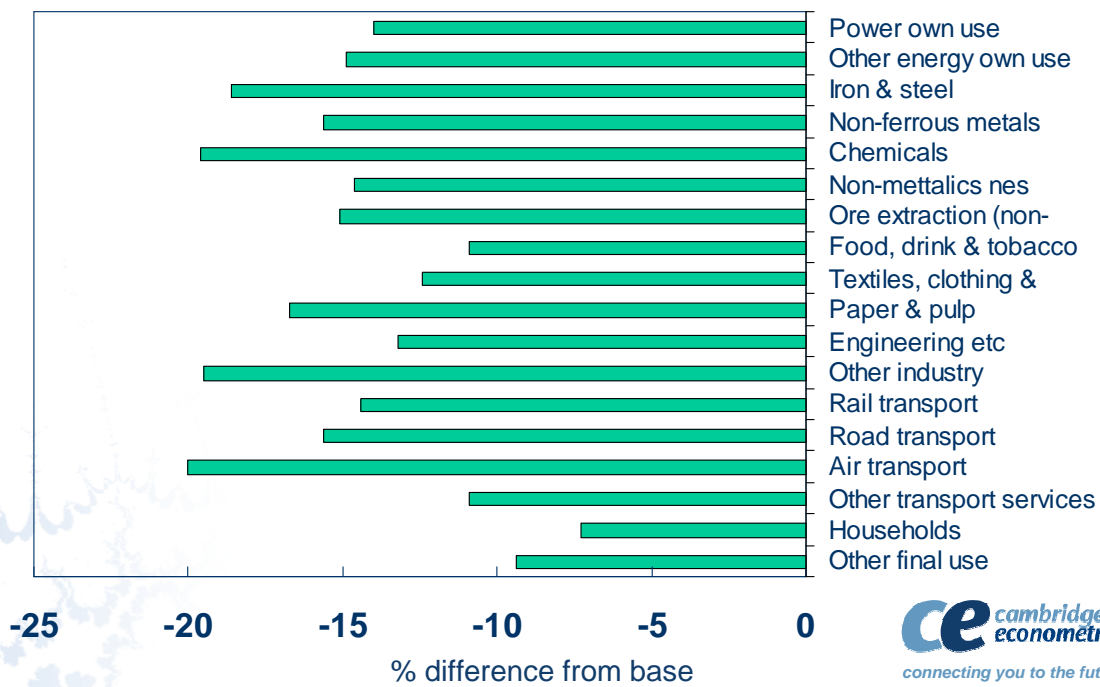
# Impacts on Materials Consumption



# Demand for Energy – By Carrier



## Demand for Energy – By Sector (S1L)



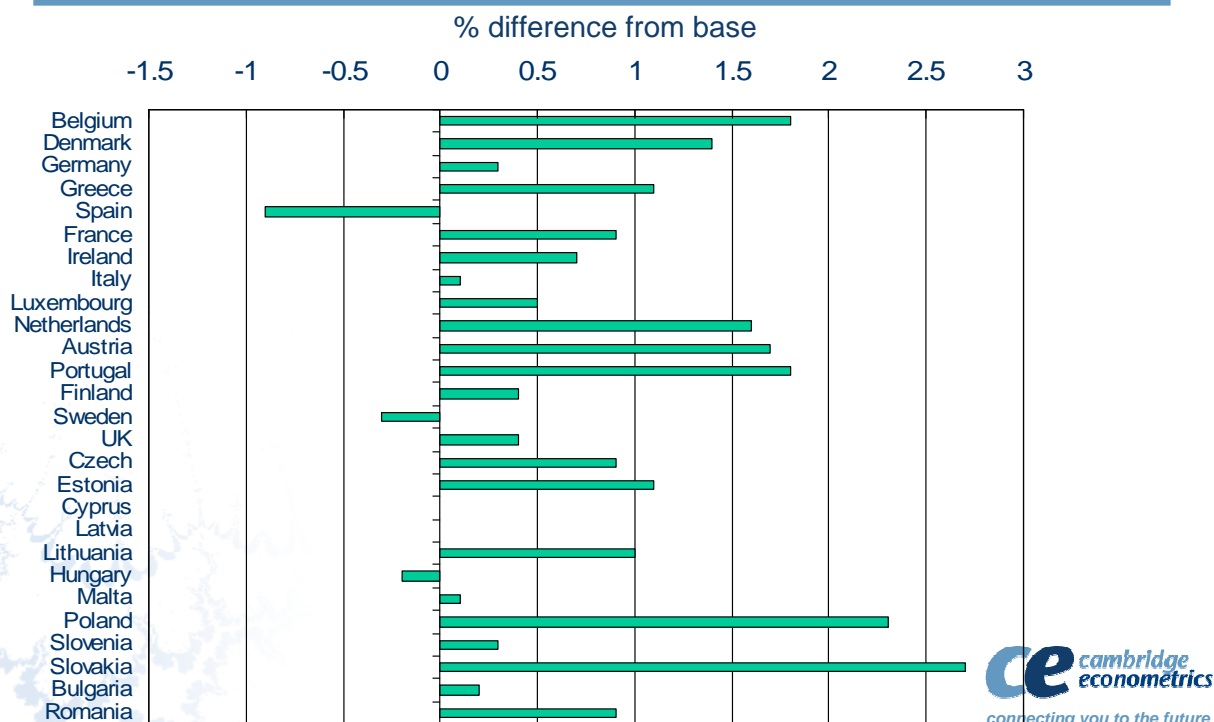
## Economic Results – EU27 (% from base)

	Scen 1L	Scen 1H	Scen 2H	Scen 3H
<b>GDP</b>	<b>0.6</b>	<b>0.2</b>	<b>0.8</b>	<b>0.5</b>
<b>Employment</b>	<b>2.2</b>	<b>1.1</b>	<b>1.1</b>	<b>2.7</b>
<b>H'hold Consumption</b>	<b>1.3</b>	<b>0.6</b>	<b>0.7</b>	<b>1.4</b>
<b>Investment</b>	<b>-0.4</b>	<b>-0.3</b>	<b>0.3</b>	<b>-0.7</b>
<b>Exports</b>	<b>-0.1</b>	<b>-0.2</b>	<b>0.8</b>	<b>-0.3</b>
<b>Imports</b>	<b>0.0</b>	<b>-0.2</b>	<b>0.2</b>	<b>-0.1</b>
<b>Price level</b>	<b>1.6</b>	<b>0.8</b>	<b>0.7</b>	<b>1.8</b>

# Economic results by country

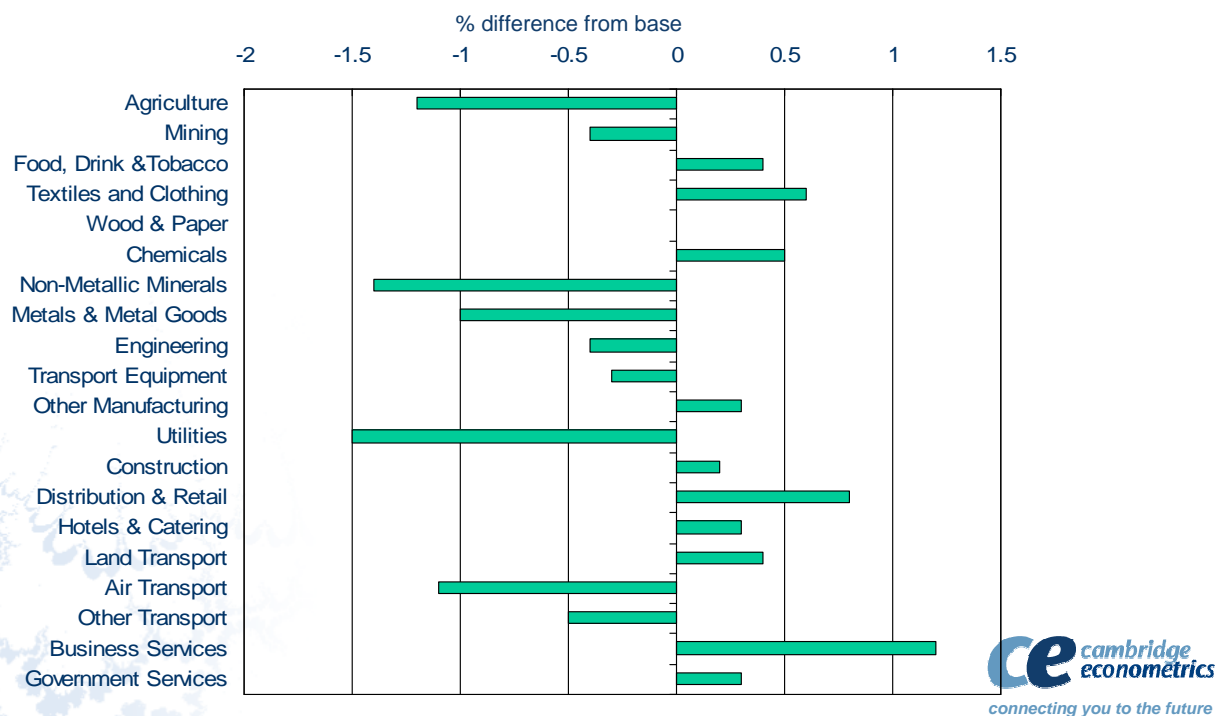
- Many factors, eg:
  - fuel mix/ease of switching
  - sectoral composition
  - how much of energy/material price increases are passed on
  - whether lower employers' taxes creates jobs
  - trade ratios

# GDP impacts by country (S1L)





# Economic results by sector (S1L)



## The Economic Crisis

- The financial crisis was not included in the analysis (outcomes were too uncertain at the time)
- The main impacts would be:
  - lower baseline emissions
  - targets easier to achieve, lower carbon price
  - less revenue to recycle
- The magnitude of the effects would be smaller but the direction of the impacts would be unchanged

## Brief Conclusions

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- A high carbon price is needed (ETS and ETR) to meet the 2020 emission target
- A large shift in taxation from labour and income to carbon (and material) can create additional jobs
- In a EU policy mix ETR can play an important role together with RES and efficiency policies



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