
Transportation and Emission Trading

A CGE Analysis for the EU 15

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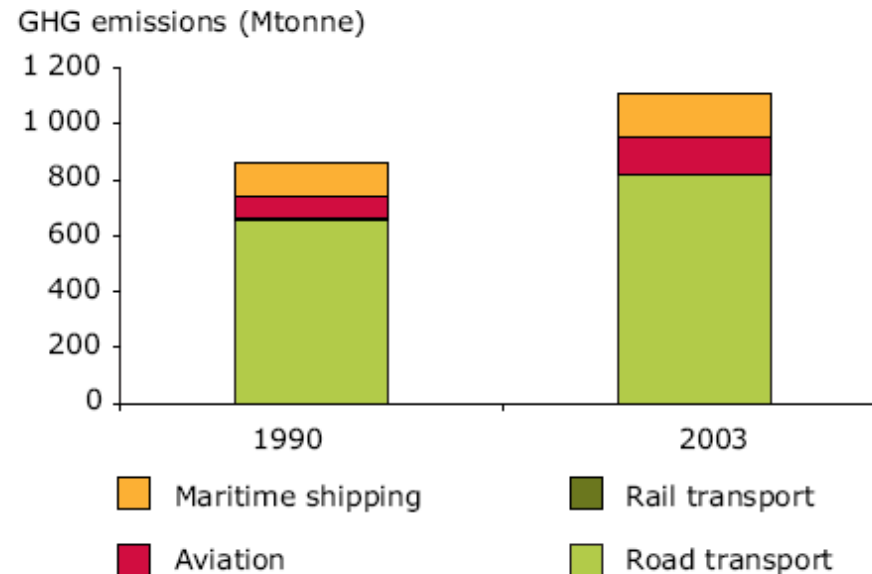
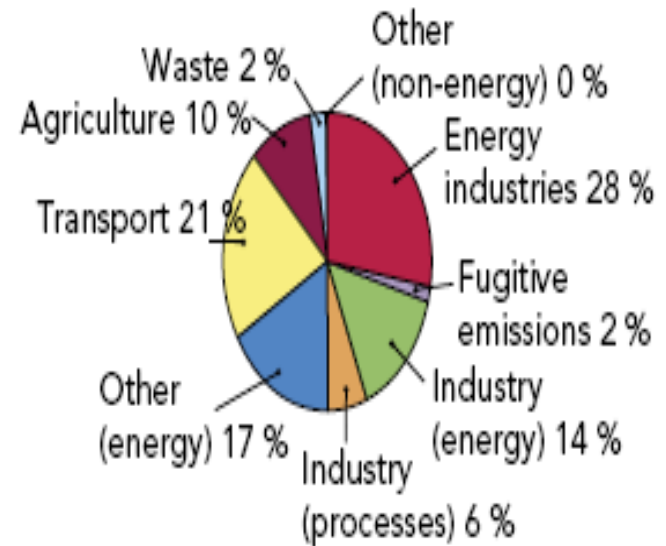
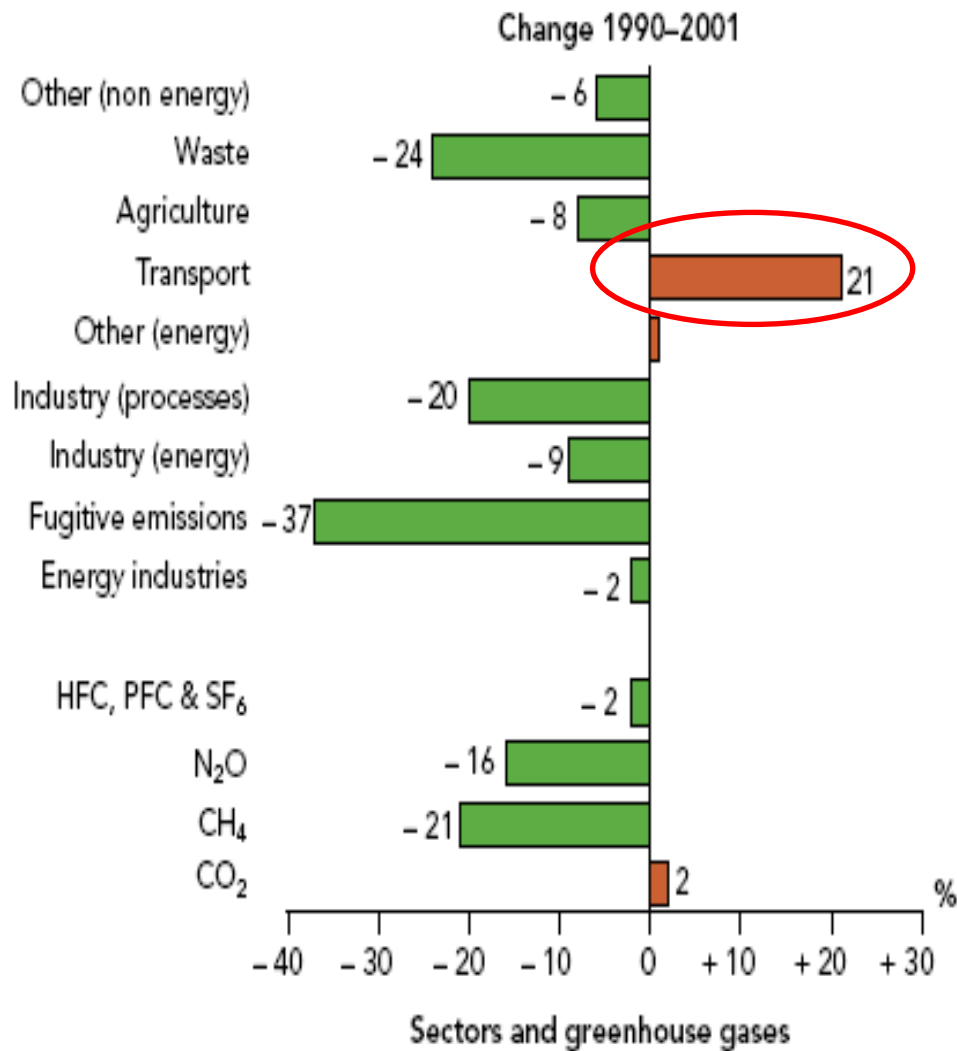
Infraday 2007
06.10.2007, Berlin

Agenda

- **Overview**
- **Model**
- **Results**
- **Conclusion**

Literature

Transportation and Emissions



Hybrid Regulation under the EU ETS

European Emission Trading System (EU ETS) regulates energy and energy intensive industries as well as refineries

Transportation is subject of national environmental policies

Efficient environmental regulation requires equal marginal abatement costs in each sector

To efficiently regulate the transportation sector the future emission permit price must be known

Thus, hybrid regulation induces economic inefficiency due to informational requirements and lobbying

Transport and Emission Trading

European Commission proposed to include aviation in EU ETS from 2011 onwards

Aircraft operators have to hold emission permits (downstream emission trading)

Road transportation can be included in either an up- or midstream manner

In mid-stream emission trading, producers of cars have to hold emission permits

In up-stream emission trading, the producers and importers of gasoline have to hold emission permits

How to address emissions from ships?

Topic

Use a static multi-region CGE model of the EU 15 to answer the question:

What are the welfare effects of including road, water, and air transportation in the EU ETS?

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Model Dimensions

Static multi-region CGE model

Regions: All EU15 countries and rest of the world

Sectors:

Macro good (industries and services) (MAC)

Agriculture (AGR)

Energy intensive industries (EINT)

Refined oil products (P_C)

Electricity (ELY)

Fossil Fuels: Coal (COA), natural gas (GAS), crude oil (OIL)

Transportation: Air (ATP), water (WTP), other (road/rail) (OTP)

Motor vehicles, ships, and aircrafts (CAR)

Data and Implementation

Use of GTAP 6 database (base year: 2001)

International trade margins are incorporated

Household's private transportation is derived by using the *Household Budget Survey of 1999*

Emissions are calibrated using physical fuel energy flows

→ Emissions from international transportation are assigned to region sectors belong to

Model implementation in GAMS/MPSGE

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Scenarios - Hybrid Regulation

Name	Description
SECTORAL	Sectoral carbon constraints: different CO ₂ taxes across sectors and regions. Road transportation has a uniform tax rate. ROW: regional emission trading system
DOMESTIC	All regions implement regional emission trading scheme
EUROPEAN	All sectors in European regions trade allowances across Europe. ROW: regional emission trading system
EU ETS TAX	Electricity, energy intensive industries, and refineries trade allowances across Europe. Remaining sectors are regulated by sectoral taxes; uniform tax for road transportation. ROW: regional emission trading system
EU ETS DOM	Electricity, energy intensive industries, and refineries trade allowances across Europe. Remaining sectors regionally trade allowances. ROW: regional emission trading system

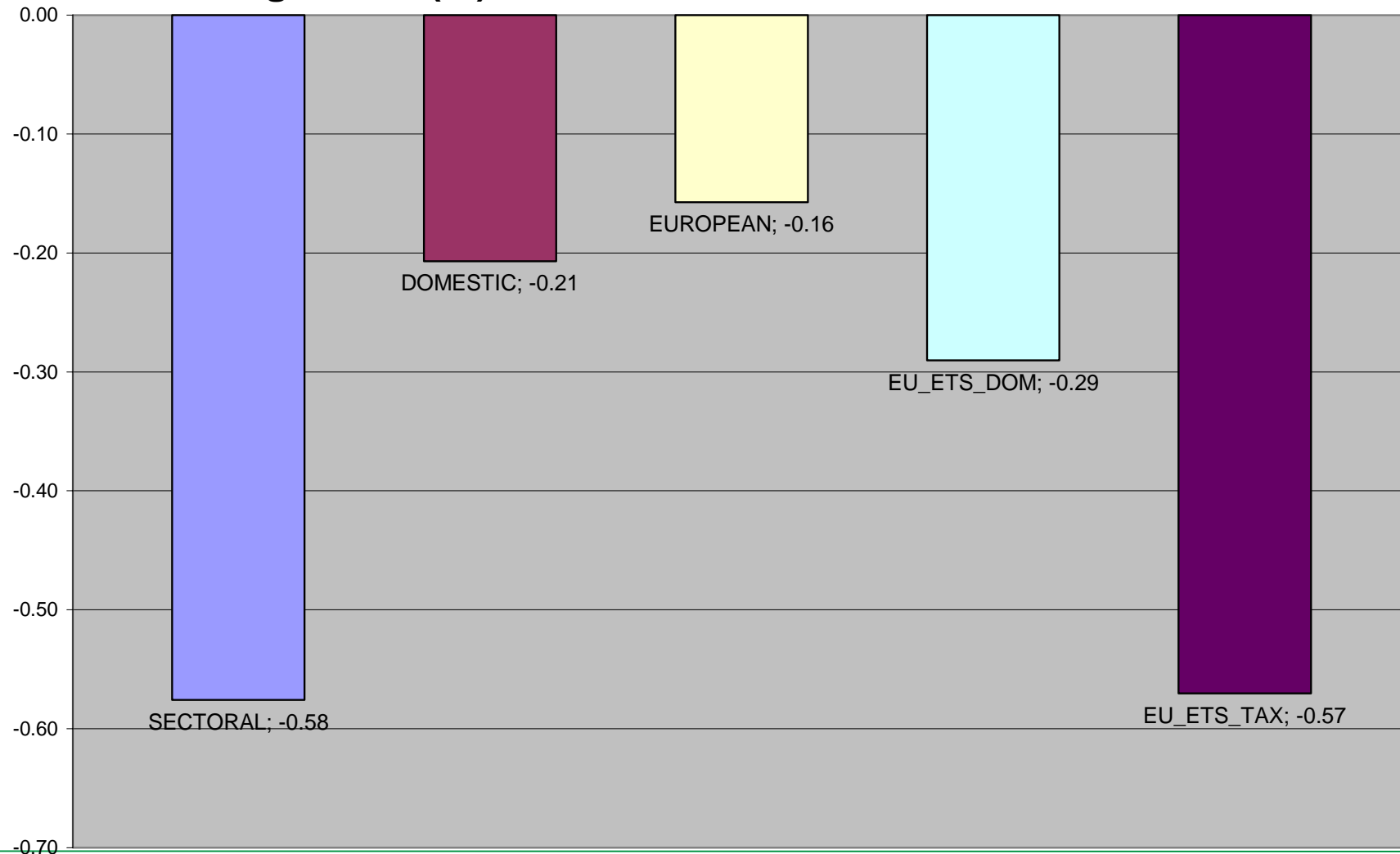
Emission Reduction Requirements

Implement in each scenario effective emission reduction requirement in 2001 under the EU Burden Sharing Agreement

	Effective Target 2001 (%)		Effective Target 2001 (%)
Austria	24.3	Italy	15.0
Belgium	12.0	Luxembourg	11.4
Denmark	22.9	Netherlands	15.4
Finland	10.2	Portugal	12.8
France	5.5	Spain	17.1
Germany	8.2	Sweden	-9.7
Greece	2.3	UK	8.5
Ireland	22.6	Rest of the World	5

Results – Hybrid Regulation

Hicksian Equivalent Variation of EU 15 welfare compared to benchmark of no carbon regulation (%)

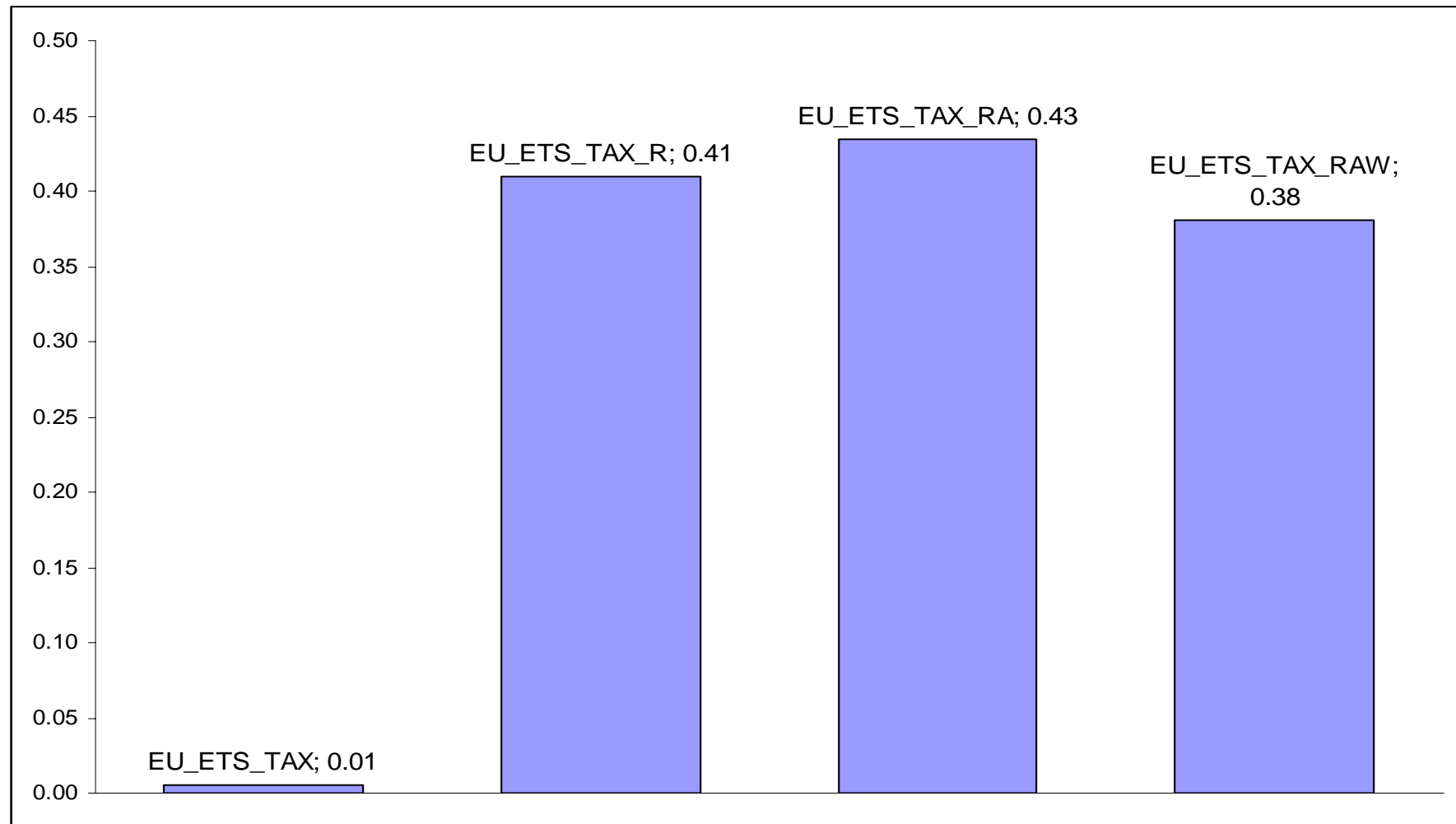


Scenarios – Transportation under Emission Trading

Name	Description
EU ETS TAX R	Electricity, energy intensive industries, refineries, and road transportation trade allowances across Europe. Remaining sectors are regulated by sectoral taxes; uniform tax for road transportation. ROW: regional emission trading system
EU ETS TAX RA	Electricity, energy intensive industries, refineries, road, and air transportation trade allowances across Europe. Remaining sectors are regulated by sectoral taxes; uniform tax for road transportation. ROW: regional emission trading system
EU ETS TAX RAW	Electricity, energy intensive industries, refineries, road, air, and water transportation trade allowances across Europe. Remaining sectors are regulated by sectoral taxes; uniform tax for road transportation. ROW: regional emission trading system
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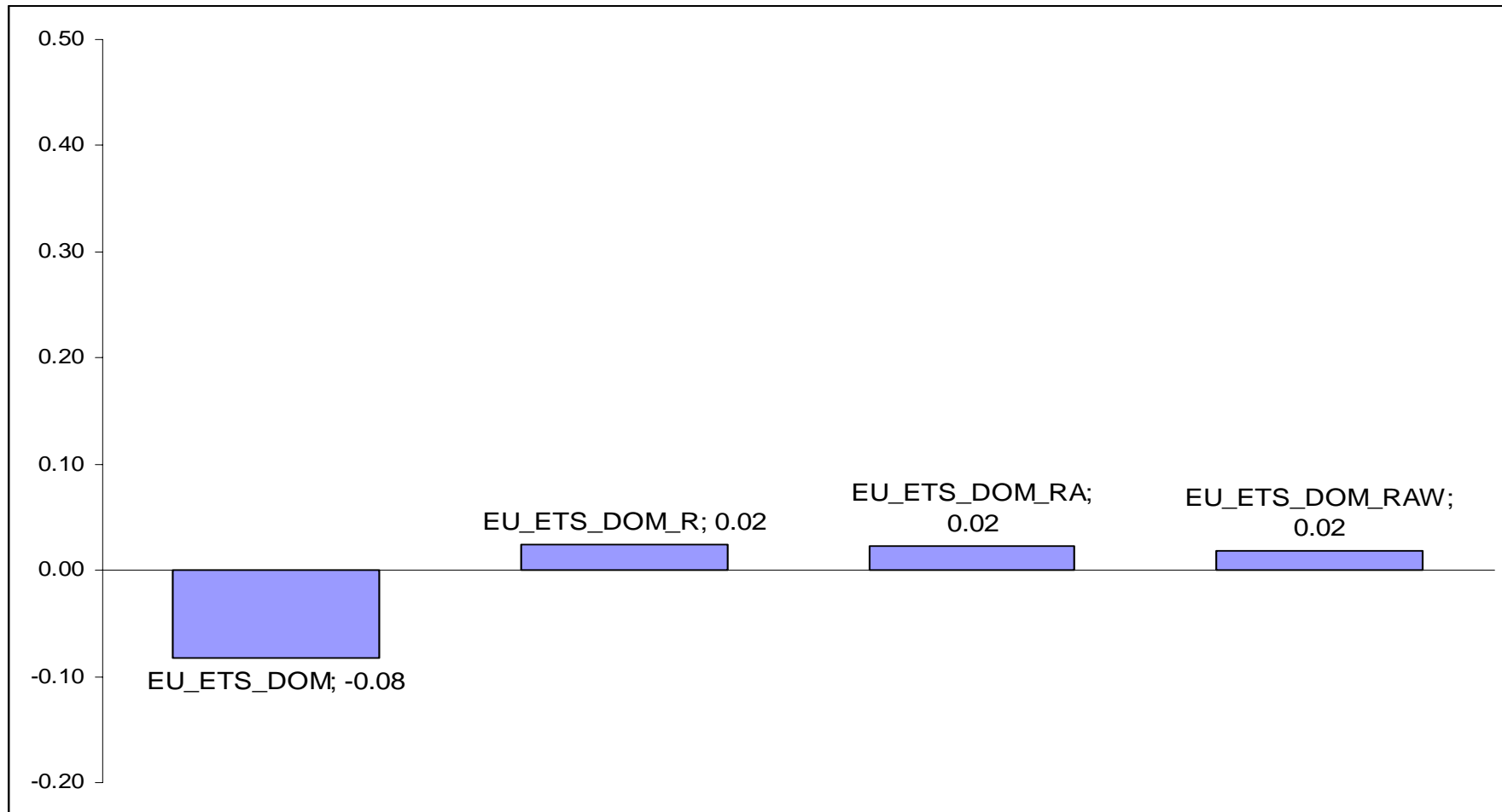
Results – Sectoral Carbon Taxes

Hicksian Equivalent Variation of EU 15 welfare compared to SECTORAL scenario (%)



Results – Domestic Emission Trading

Hicksian Equivalent Variation of EU 15 welfare compared to DOMESTIC scenario (%)



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Conclusion

Including road transportation in the EU ETS provides high welfare gains

Including air transportation also provides welfare gains

Environmental policy for maritime shipping has an great impact on international trade patterns via transportation margins

Caveat:

- Modeling of EU 15 trade with the rest of the world is treated very aggregated**
- Abatement burden not differentiated across sectors**

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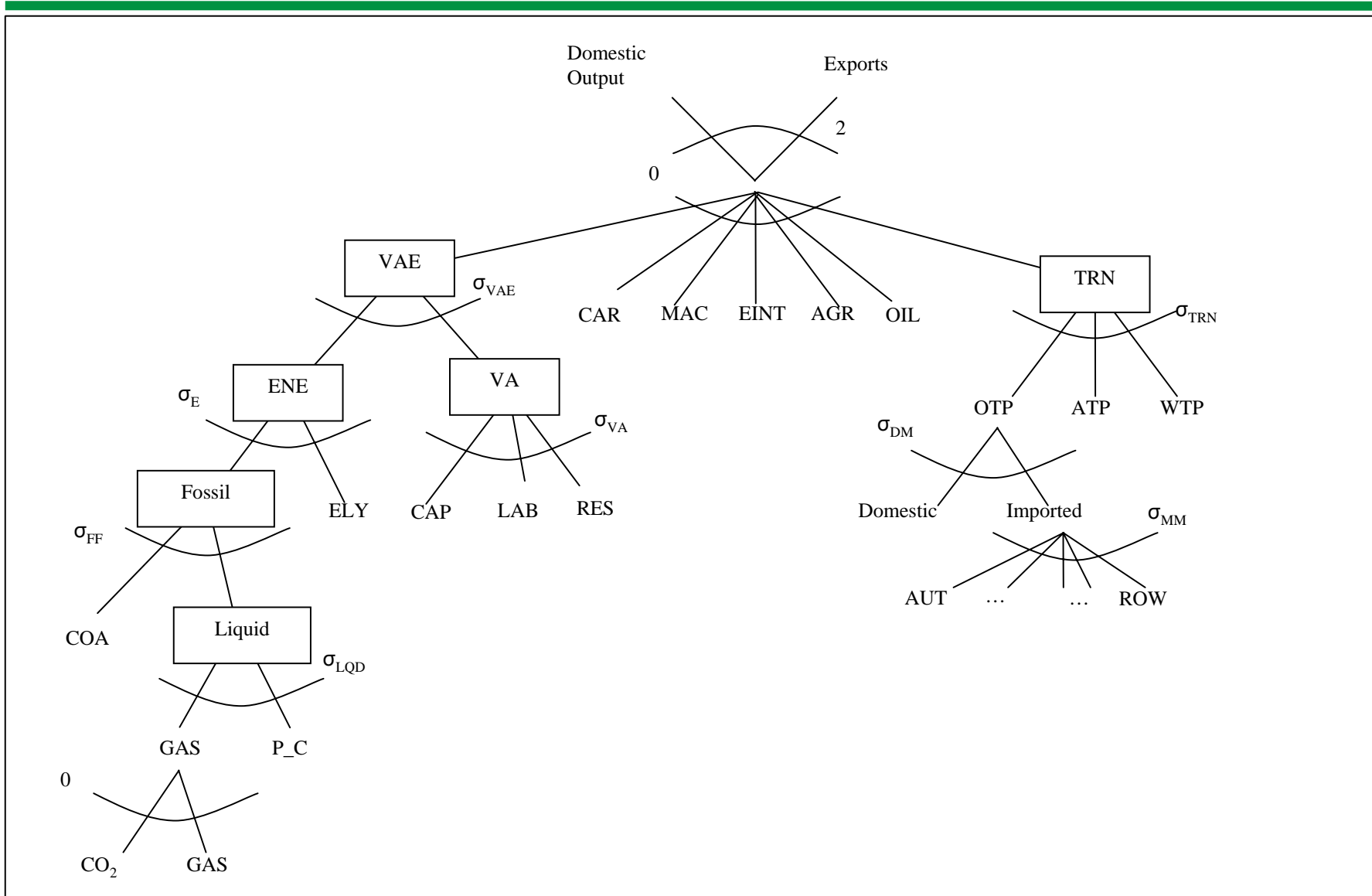
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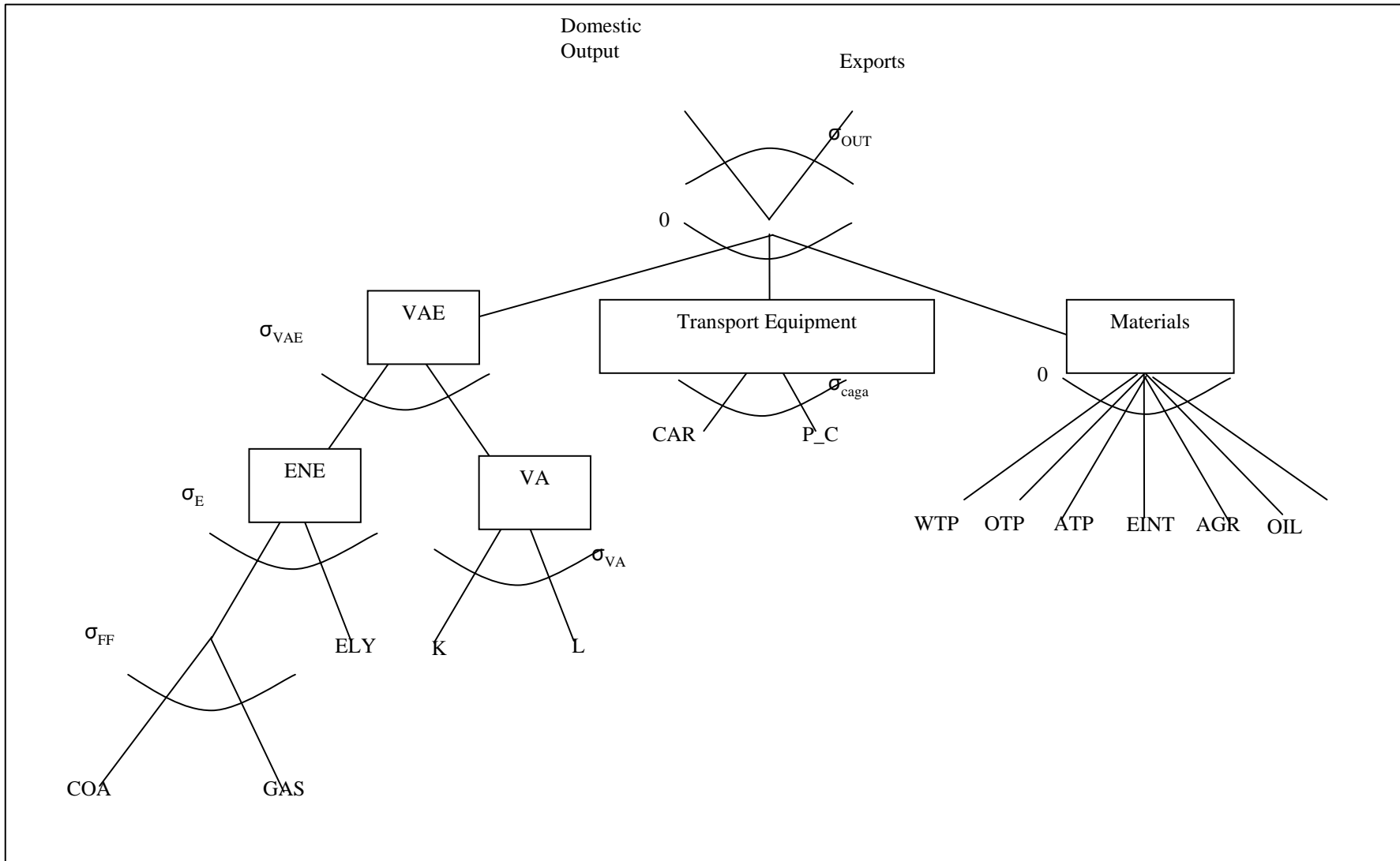
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Appendix: Model Structure

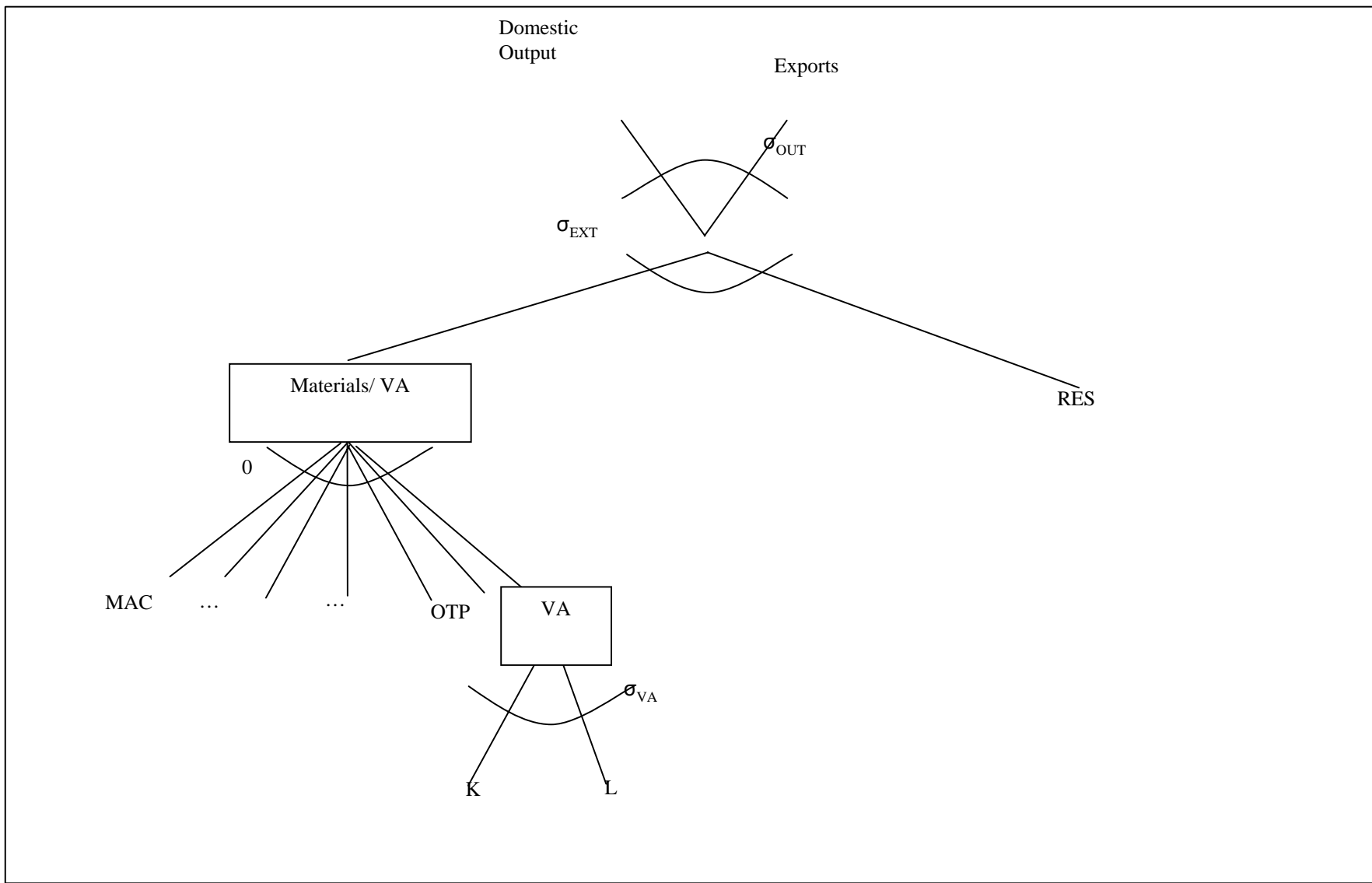
Production Structure Except Transportation and Extraction



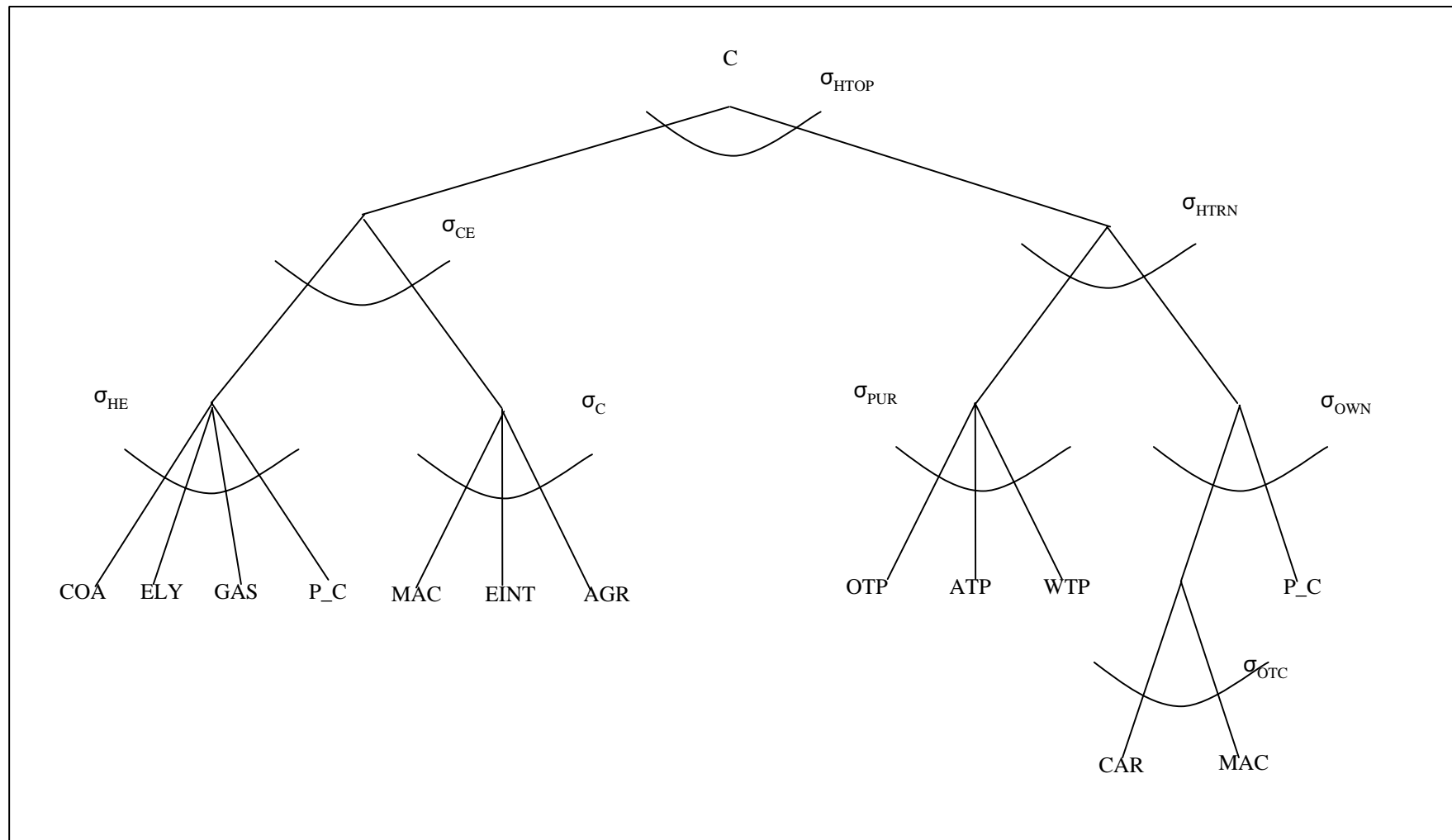
Production Structure Transportation Services



Production Structure Extractive Industries (Crude Oil, Natural Gas, Coal)



Utility Structure



Modeling of International Trade Margins

