



ENERGY VS. MATERIAL: USES OF WOOD BIOMASS - ECONOMIC IMPACTS OF ALTERNATIVE SCENARIOS

Peter Schwarzbauer, University of Natural Resources and Applied Life Sciences Vienna (Boku) and

Tobias Stern, Competence Centre for Wood Composites and Wood Chemistry (Wood K plus)

Todor Balabanov, Institute for Advanced Studies (IHS)

Wolfgang Schwarzbauer, Institute for Advanced Studies (IHS)

Forest Sector Modeling: State-of-the-Art and Future Challenges in an Expanding Global Marketplace, Seattle. Nov. 17-20th, 2008





Overview of presentation

- **Background and goals of the research**
- **Model structures and theoretical basis**
- **Forest sector scenario assumptions, results and perspectives**
- **Macroeconomic impacts beyond the forest sector**
- **Summary and conclusions**



Background and goals of the project

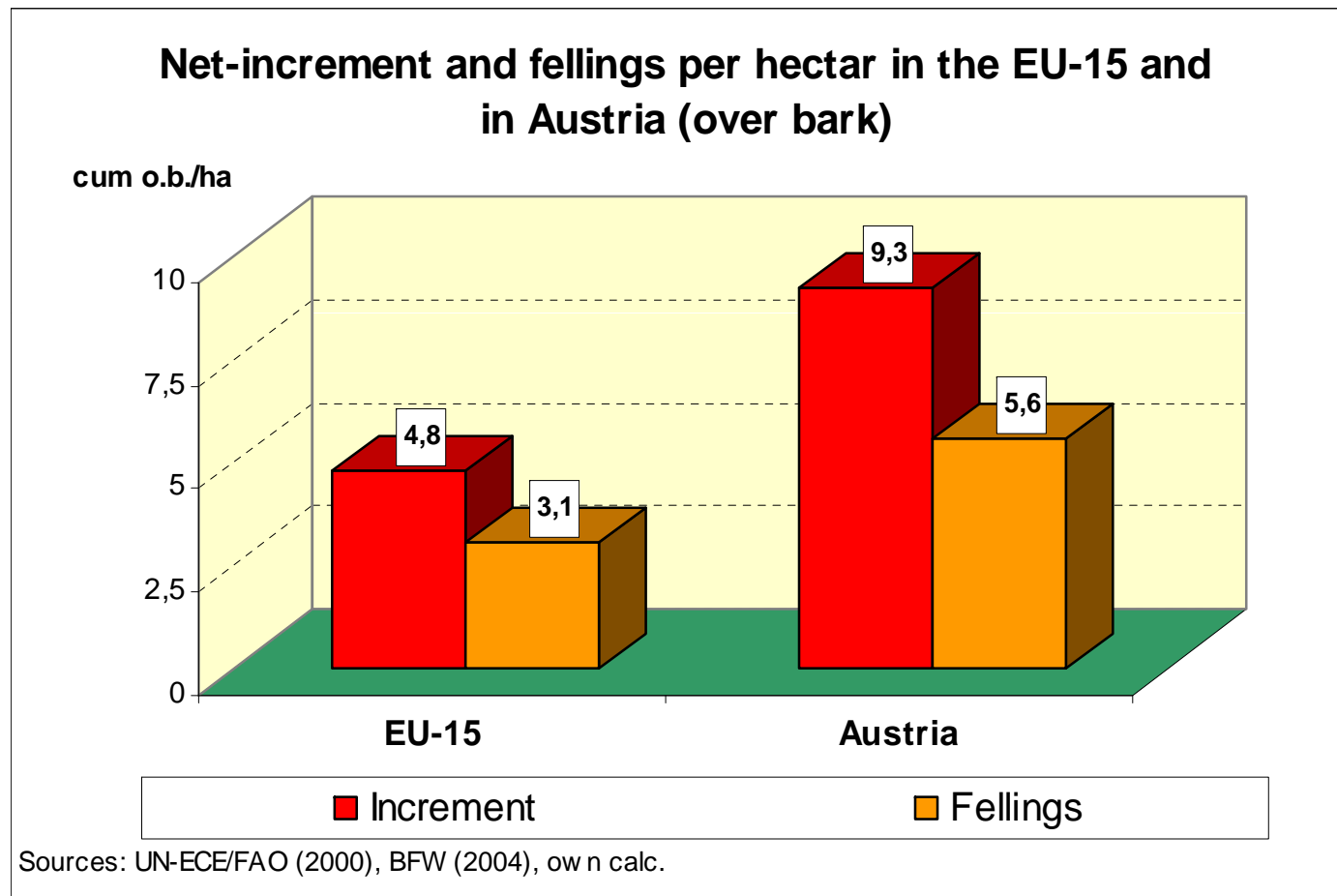
The Austrian forest-based sector is an important branch:

- ***Employment*** (up to 250.000 persons, depending on definition) – especially in economically weak regions
- ***Contribution to GDP*** (3-5%, depending on definition)
- ***Foreign trade*** (10% of all exports in value)

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But:

Only a share of wood potential is actually used



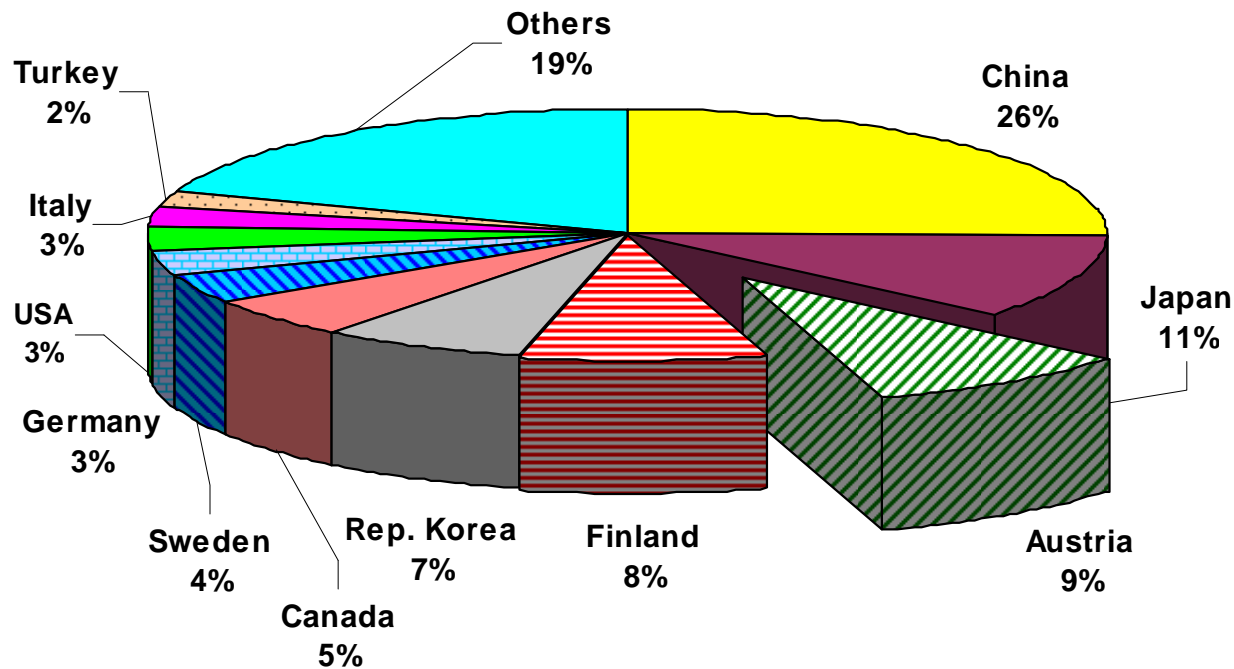
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The largest coniferous industrial round wood importing countries worldwide

Total 2006: 85,1 Mill. cum



Source: FAOSTAT (2008), o.c.

Therefore:

Because not enough wood is supplied from domestic sources, Austria has become the third largest importer of coniferous industrial roundwood worldwide



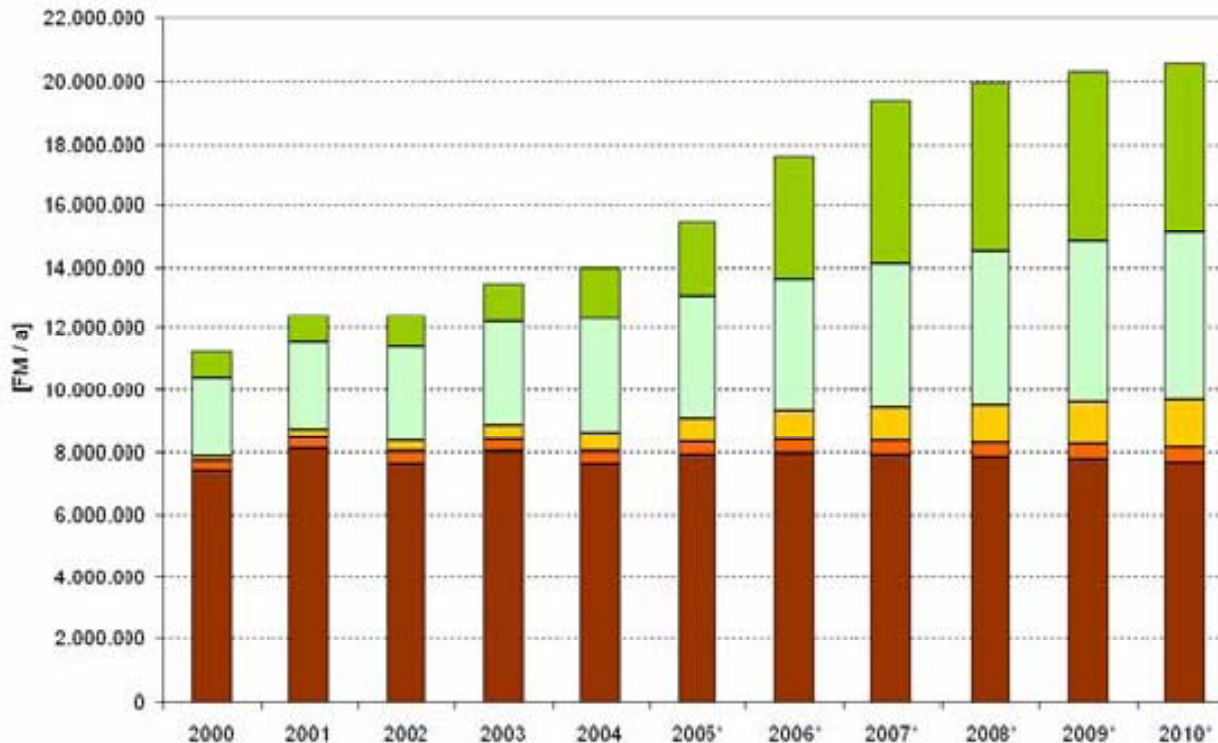
Institut for Marketing & Innovation | Ao.Univ. Prof. DI. Dr. Peter Schwarzbauer



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Forecasts of the consumption of wood for energy (various assortments) in Austria until 2010
(Source: Austrian Energy Agency, 2006)

Increasing demand for wood energy:

Due to the promotion of renewable energy a sharp increase in the consumption of wood for energy is expected.

At the same time:

The demand of industries competing for the same wood is rising as well.





Research goals

Address the links, market effects and macro-economic effects of alternative uses of wood – for energy purposes and for material purposes (trade-off)



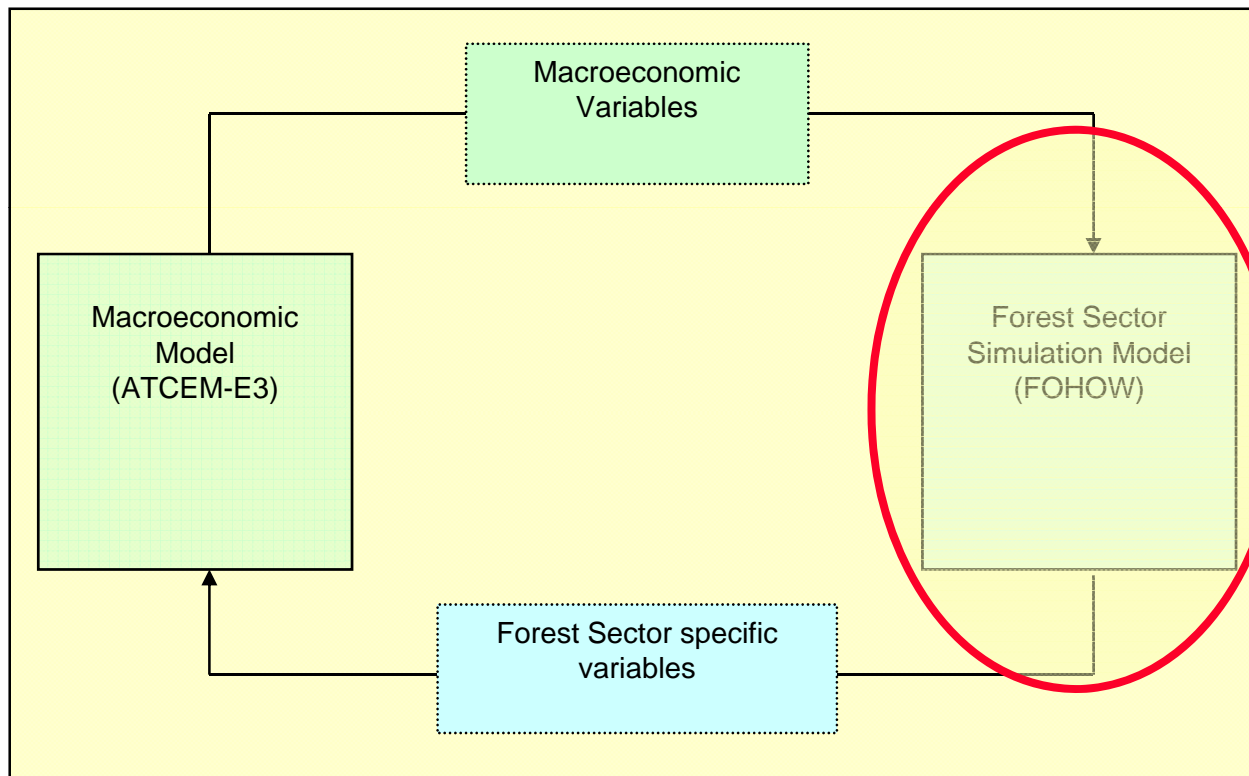


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Model structure and theoretical basis



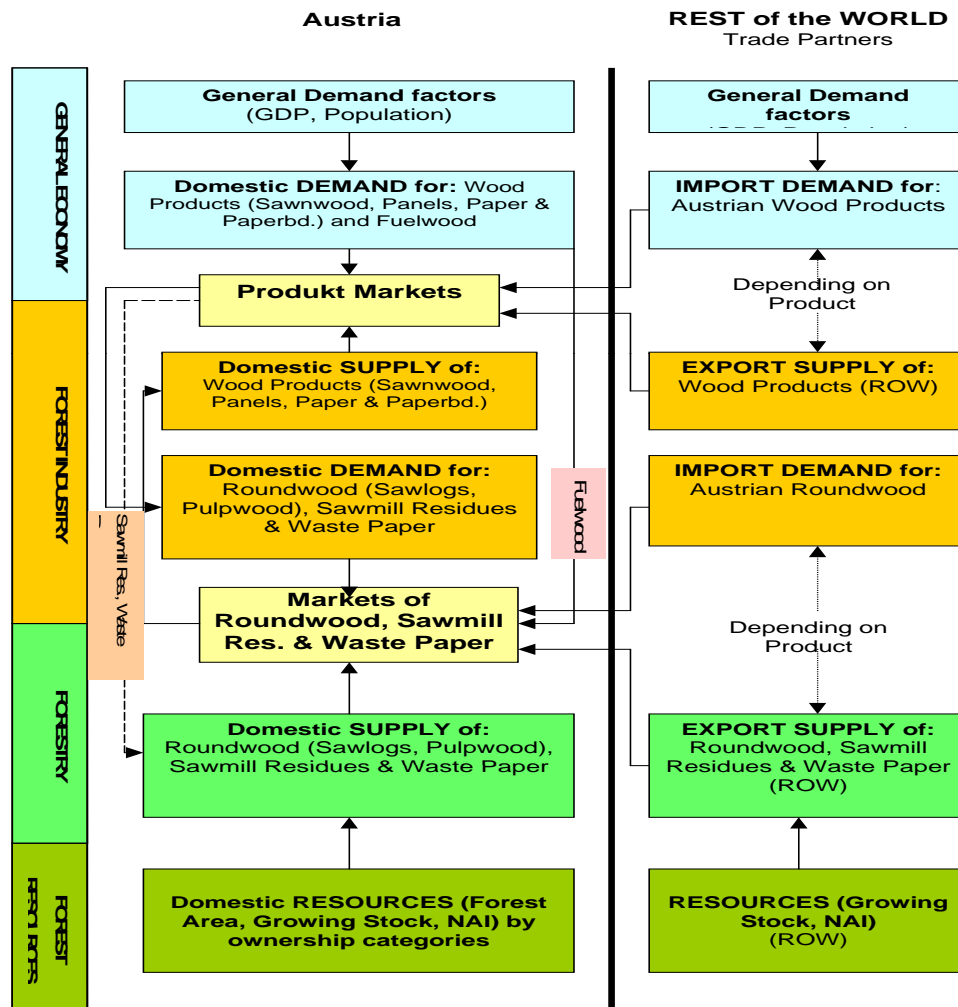
General interactions of the models (off-line)

Main focus

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Structure of FOHOW (Simulation model, based on SD)

Components / Modules

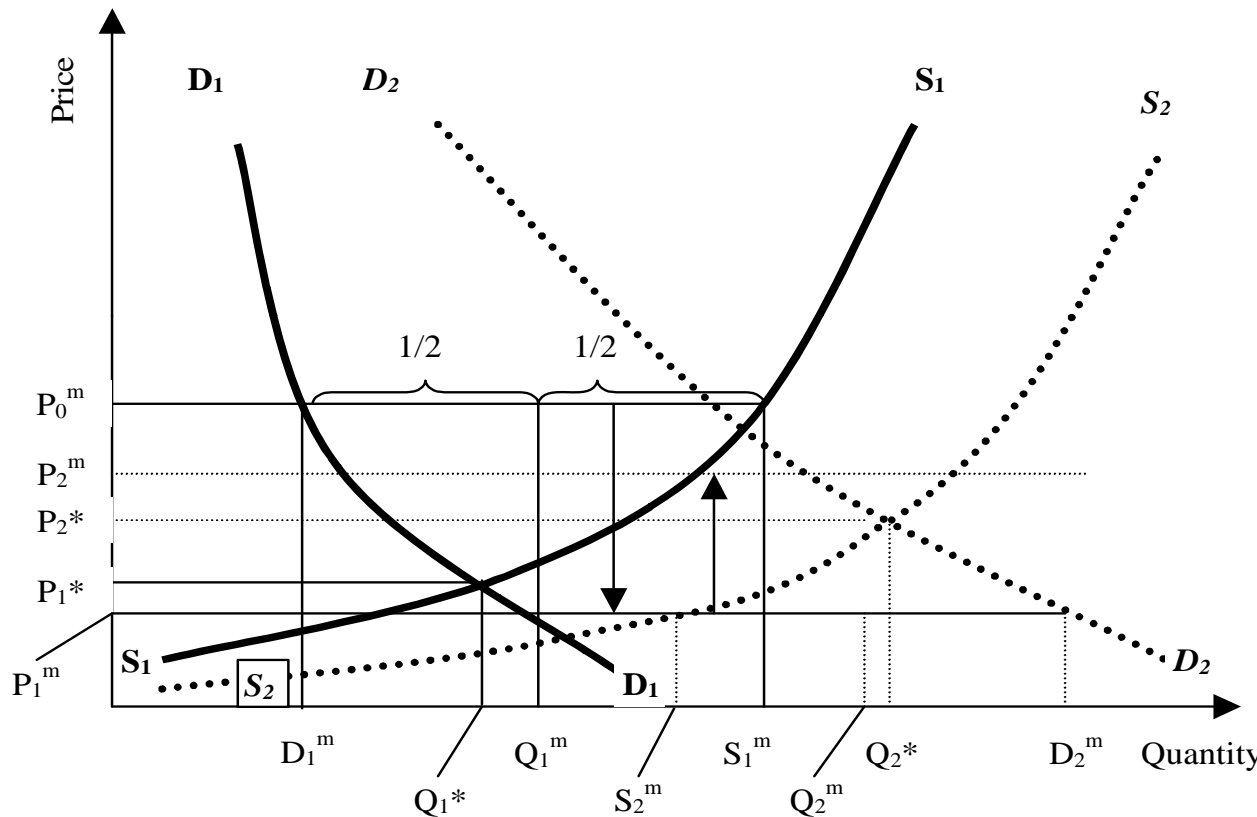
- Forest resources
- Timber production
- Demand for timber and production of wood products (sawmills, panel-, paper industry and energy use)
- General economy

2 Regions:

- Austria
- Total of all trade partners (ROW)

Ca. 1500 equations





Market-clearing mechanism of FOHOW

- No simultaneous equations possible
- Price equations formulated as “levels”.
- Changes in current period through changes in supply & demand of previous period (very short periods)



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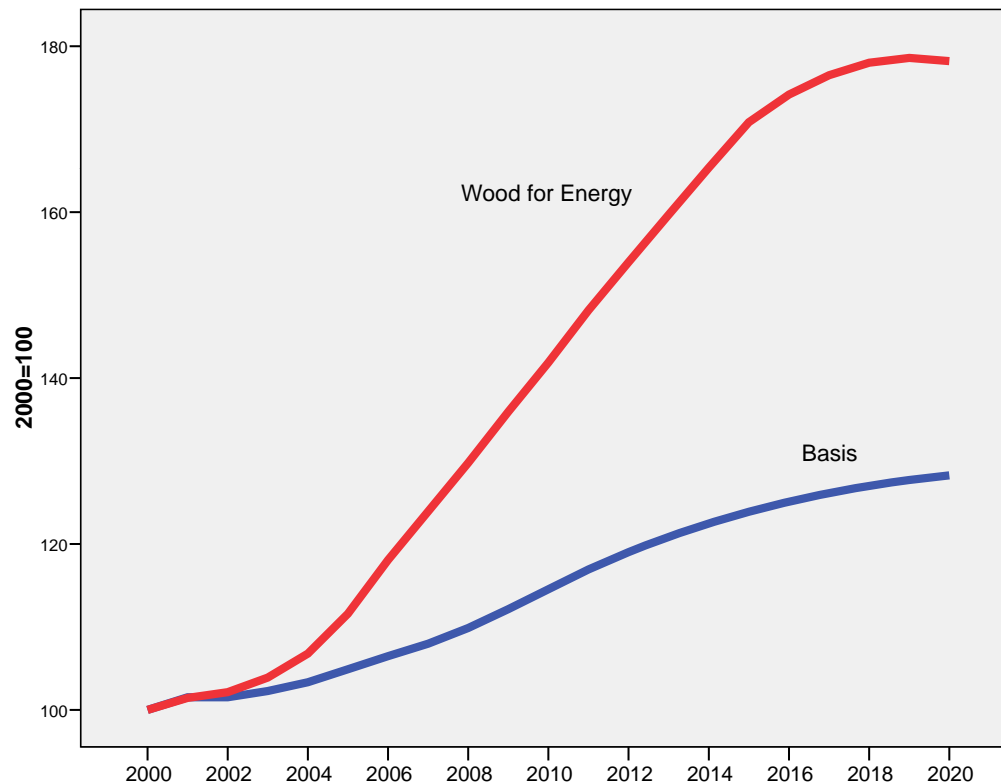
Assumptions for the FOHOW-BASE-scenario

- **„Business as usual“ (no specific energy-related policies)**
- **Time horizon 2000-2020**
- **GDP-growth according to published forecasts**
- **Oil-price increased to 128 US \$ (HWWI) by 2020, Euro-US \$ exchange rate 2020 1.30 €**
- **Because of new wood-processing capacity in neighboring countries roundwood-imports cannot grow any further: freeze at the 2005 level until 2010, decrease by 20% (from the 2005 level) by 2020.**

Assumptions for the FOHOW-„WOOD-FOR-ENERGY“-scenario“ (in addition to the base-scenario)

- **Demand of wood fuel (from forest and from sawmill residues) increases; in 2010 doubles and in 2020 tripples the amount in the base-scenario (in accordance to the „Biomasseaktionsplan“) (shift of the demand curves to the right)**
- **No exogenous limitations of wood supply from the forest. Timber supply from forest is based on market mechanisms; econometrically estimated supply functions.**

Results



Total removals

base-scenario (blue)

wood-for-energy-scen. (red)

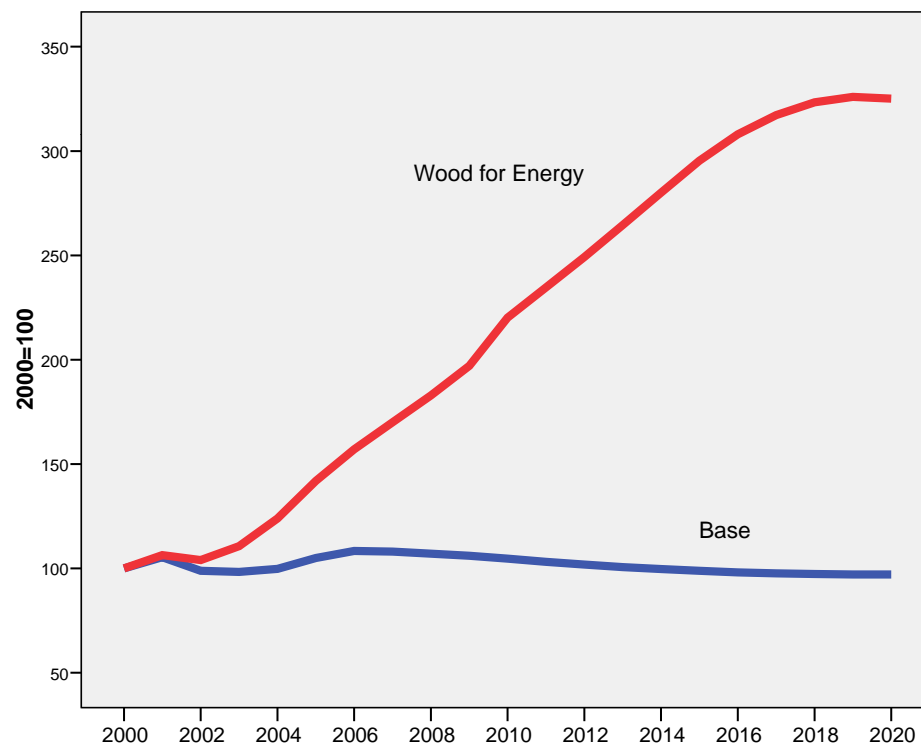
Increasing components:

* pulpwood

* fuelwood

logs not much affected

Results



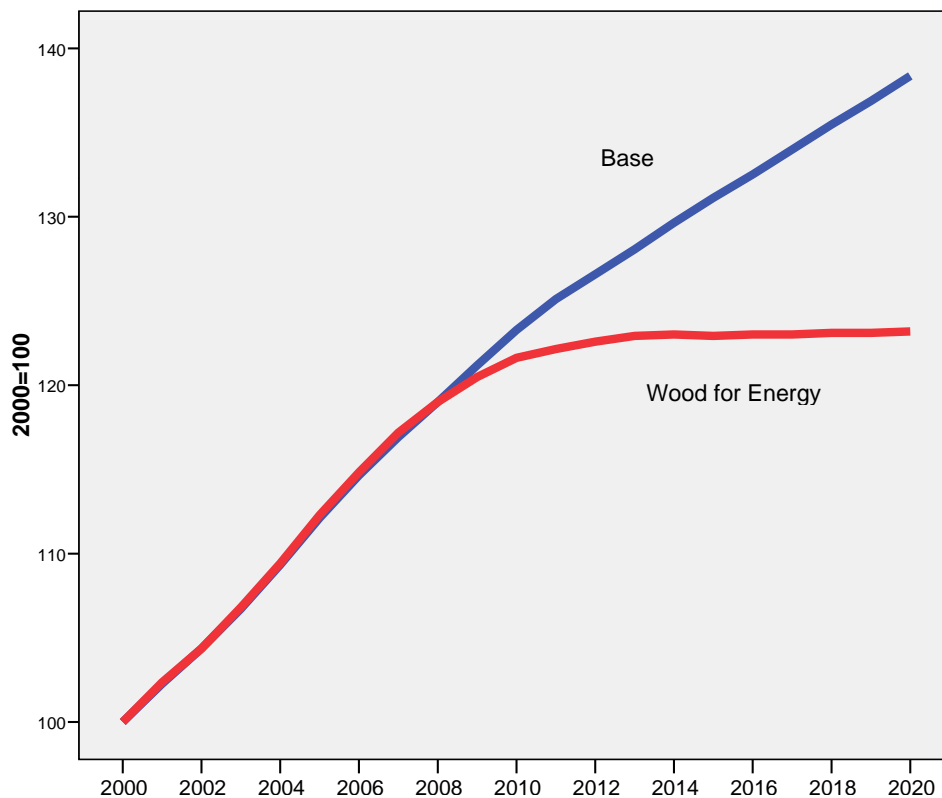
**Fuelwood Consumption (from
forest and sawmill residues)**

base-scenario (blue)

wood-for-energy-scen. (red)

**Use of sawmill residues
for energy increase
more than fuelwood
from the forest !!!!**

Results

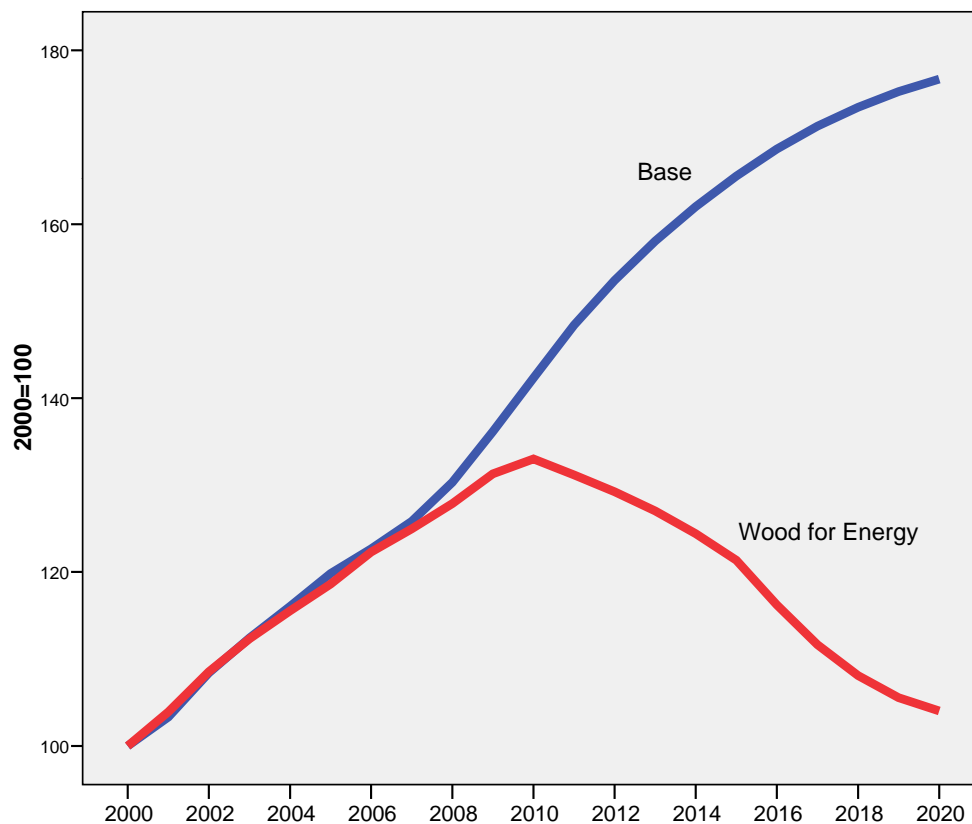


Pulwood consumption (rd. & split and sawmill residues) of panel- and paper-industry

base-scenario (blue)
wood-for-energy-scen. (red)

Due to diminishing price differential a significant amount of (former) pulpwood and sawmill residues is transferred to energy use

Results

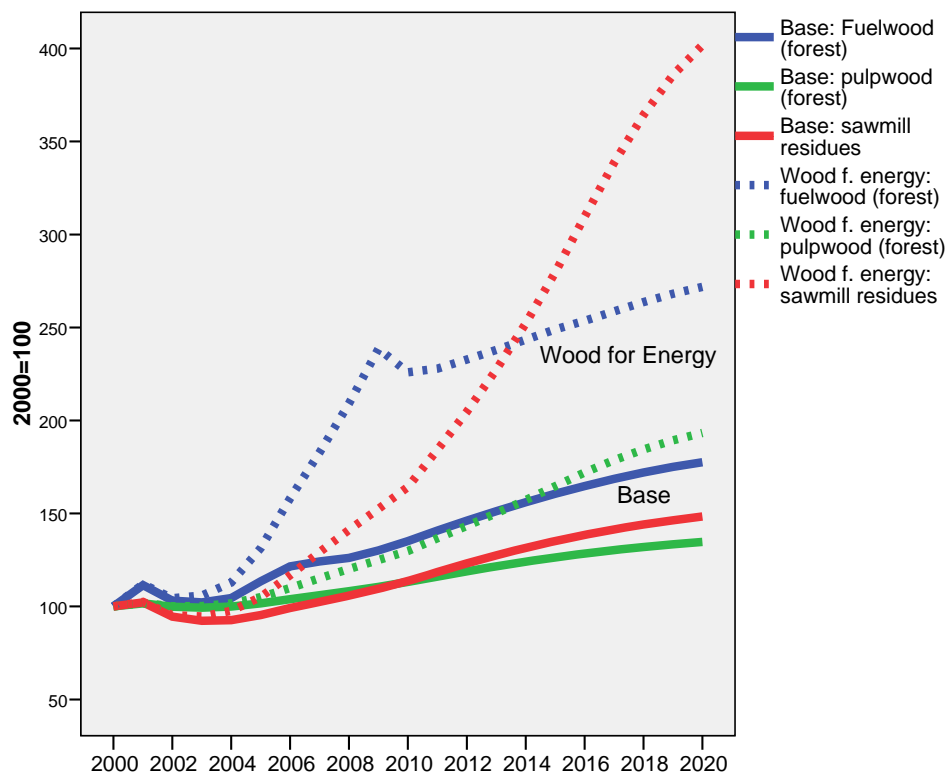


Sawmill residue consumption of panel- and paper-industry

base-scenario (blue)
wood-for-energy-scen. (red)

More sawmill residues are used for energy purposes than (former) pulpwood from the forest

Results



Pulpwood price (green)
Sawmill residue price (red)
Fuelwood price (solid)(blue)

base-scenario (full lines)
wood-for-energy-scen. (dotted lines)

Most affected is the price of sawmill residues

Results – intermediate summary FOHOW

Deviations (%) of wood-for-energy-scenario from base-scenario

	2000	2010	2020
Forestry			
<i>gross prod. value</i>	0	+61.1	+94.2
Conif. sawmills			
<i>gross prod. value</i>	0	+0.2	+14.0
<i>gross profit</i> ¹⁾	0	-47.1	+82.7
Panel industry			
<i>gross prod. value</i>	0	-0.3	-3.4
<i>gross profit</i> ¹⁾	0	-9.6	-33.0
Paper industry			
<i>gross prod. value</i>	0	-0.7	-6.3
<i>gross profit</i> ¹⁾	0	-10.6	-60.4

¹⁾ gross profit = gross production value – minus rawmaterial costs – minus (other) variable production costs

Forestry and sawmills (the latter not immediately) are winners, panel- und paper-industry are losers of a “wood-for-energy”-policy

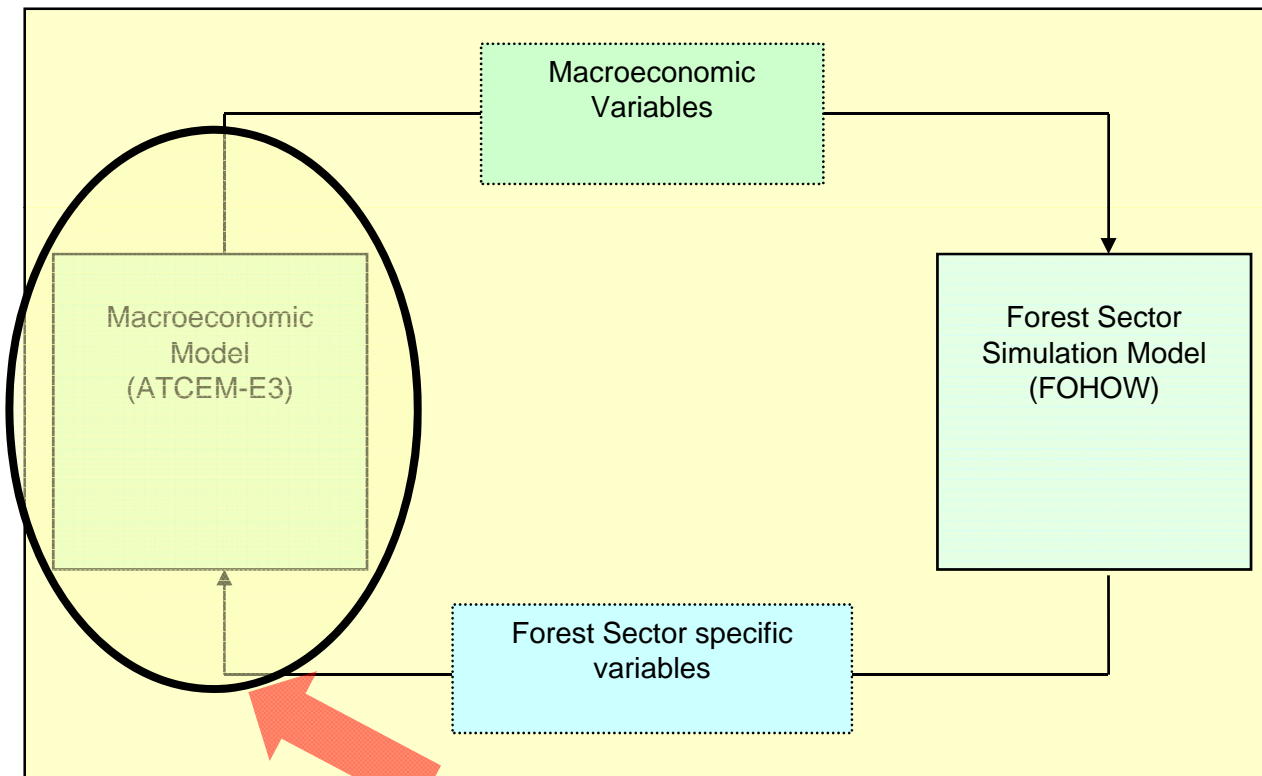


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Model structure and theoretical basis



General interactions of the models

Impacts beyond the forest sector

Forest Sector Modelling



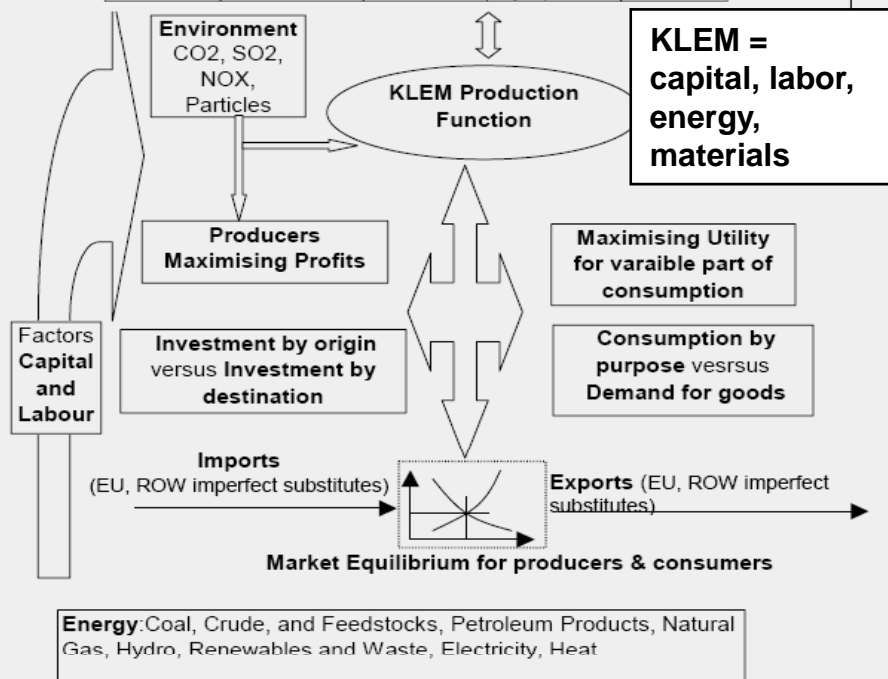
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ATCEM-E3 - Social Accounting Matrix with 25 sectors

Revenues ↕ Expenditures ↘	Sectors	Factors	Agents	Investment & Stocks	Total Expenditures
Goods from Sectors	Intermediate Consumptions	0	Demand for goods for consumption and exports	Demand for investment goods	Total demand for goods
Factors (Labour and Capital)	Rewarding of factors from value added by sector	0	Income transfer from foreign sources	0	Total factor revenues
Agents	Indirect taxes, VAT subsidies, duties & imports	Factor payment to agents according to ownership	Income transfers between agents	0	Total income of agents
Gross savings	0	0	Total revenues minus investment and stocks	0	
Total revenues	Total supply of goods	Total payment of factors	Total spending of agents	0	
Surplus or deficit	0	0	Lending (- or -) capacity of sector	0	

General Structure of ATCEM-E3 (IHS) E3=Economy, Energy, Environment

- static computable general equilibrium model (perfect competition)
- similar to maximization of consumer- and producer surplus (but less strict)
- economy of Austria represented by Social Accounting Matrix (SAM; like World Bank models)
- 3 regions: Austria, other EU, ROW
- 25 sectors, of which 3 are forest-based: forestry, wood-processing, paper industry
- GAMS software; mixed non-linear complementarity problem solved by using the PATH algorithm



Assumptions and data in ATCEM-E3

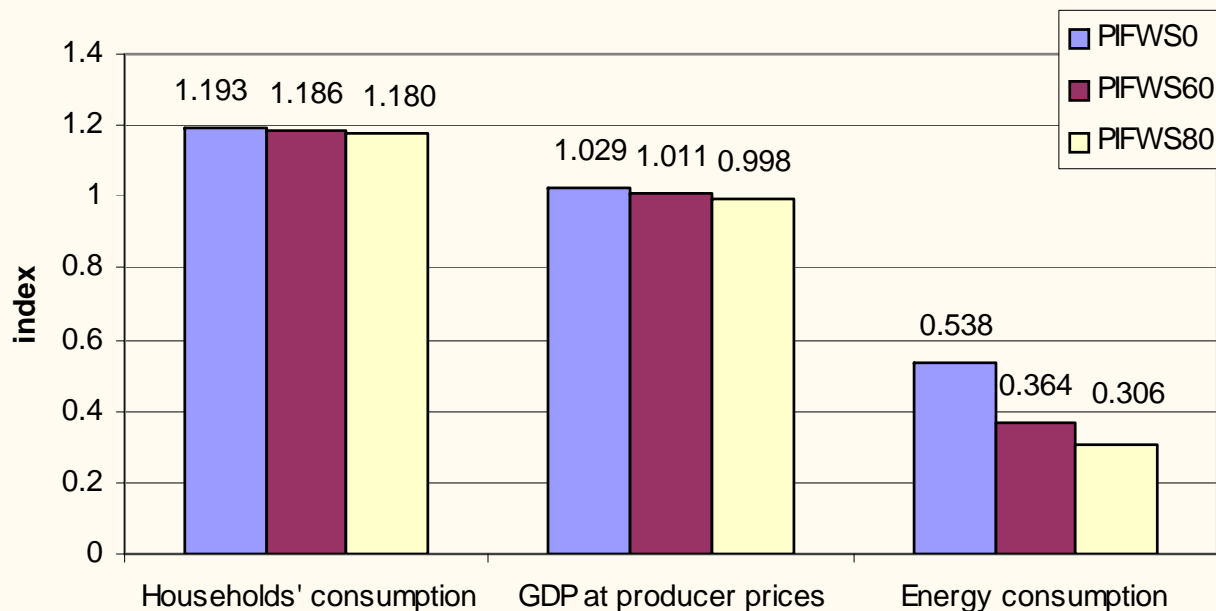
- Same general economic indicators as FOHOW (e.g. GDP growth)
- Assumptions based on FOHOW results (e.g. fuelwood demand and prices)
- Three levels of CO₂ taxation in €/t emission: 0, 60, 80
- Linear growth of electricity end-use until 2020
- No more increase of hydro-power

- All developments are measured in their relation to GDP. GDP development equals index 1,0
- An index of e.g. 1.2 means that a sector (or whatever) has performed better than the GDP development, 0.7 would mean that it has developed less well.

Results – beyond the forest sector

GDP growth is slightly higher due to biomass utilization.

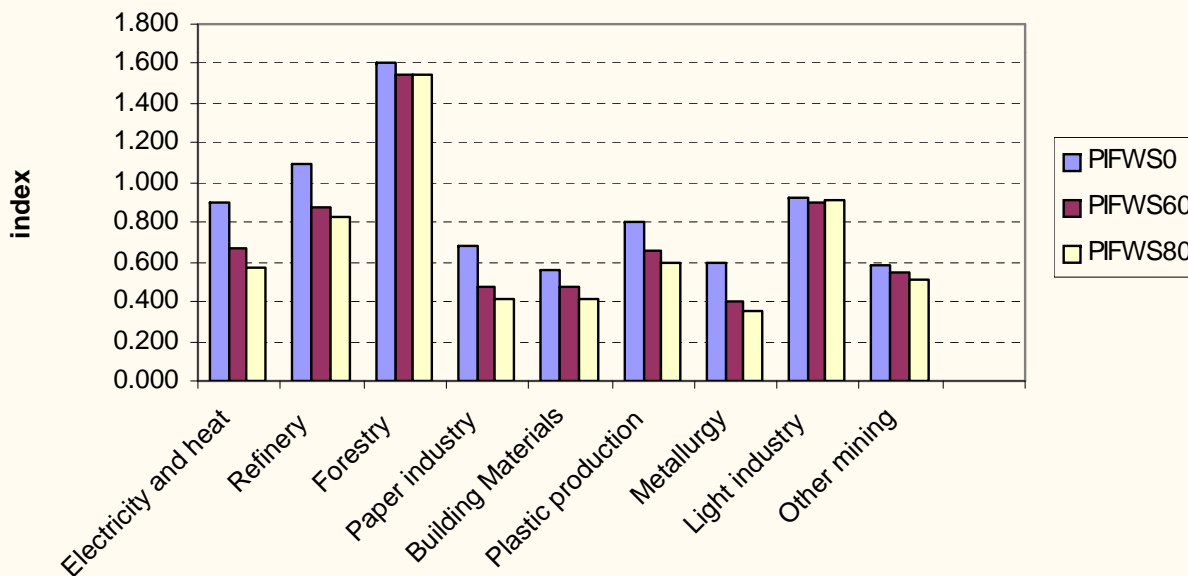
Summary of the main indicators in the three scenarios



- This gain is diminishing with increased CO₂ taxation.
- Households' consumption is above GDP growth and energy consumption is far below.

Results – on the sectoral level

Sectoral Production/GDP growth - Fuelwood-for-energy scenario



- The (solid wood) forest sector will benefit, prospects for sectors such as pulp & paper, building material, plastics, metallurgy, construction and mining will worsen.



Results – intermediate summary – ATCEM-E3

- **The analysis shows that the Austrian economy can afford the enhanced use of renewables and a sustained economic growth; and can benefit from the double dividend - sustained economic growth and fulfilment of EU targets on renewables and CO₂ reduction.**
- **The restructuring to more energy efficient technologies, and/or production processes/practices is one of the prices to be paid for increased use of renewables.**



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Summary and conclusions – Forest sector level

- The impact of a “wood-for-energy”-policy is different for the forest-based sectors.
- Forestry (production of roundwood) is benefiting because fuelwood prices rise and have an impact on other assortments as well.
- Sawmills are winners in the long run, because they can sell sawmill residues at a higher price.
- The panel and paper industries are both affected negatively due to problems in raw-material procurement.
- The paper industry is also negatively affected due to its high energy consumption

Summary and conclusions – Entire Economy

- **Enhancing the use of fuel wood, as well as taxing CO₂ emissions at a higher rate will not alter the level of GDP and household consumption tremendously.**
- **The Austrian economy can afford the enhanced use of renewables and a sustained economic growth; and can benefit from the double dividend - sustained economic growth and fullfilment of EU targets on renewables and CO₂ reduction.**
- **The restructuring to more energy efficient technologies, and/or production processes/practices is one of the prices to be paid for increased use of renewables.**



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Thank You for Your Attention !!!!!

