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Environmental, economic and employment effects of resource savings in Austria

Results of the RESA project

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Structure of the presentation

1. Introduction

- Challenges / motivation for increasing resource efficiency

2. Is increasing efficiency the solution?

- Results from the “RESA” project (Reducing resource use in Austria)
 - Scenario development
 - Modelling of the scenarios with an integrated model

3. Conclusion

- Towards integrated policies

Challenges, Motivation

- Improving resource productivity is an important goal for the transition to a sustainable development
 - Increase of resource efficiency around the factor 4 and the absolute decoupling of resource use and economic growth are central goals of the Austrian Sustainability Strategy
- Austria is far from reaching these goals with the current activities and measures
- Potential for resource efficiency gains
- Is increasing efficiency the solution for sustainable development?

Project RESA

- Project sponsor:
 - Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management
- Project team:
 - Sustainable Europe Research Institute
 - Institute for Economic Structures Research (GWS)
- Project duration:
 - January 2006 until April 2007



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Project RESA

- Project question:
 - Which **environmental, economic, and employment effects** on the Austrian society can be expected until the year 2020 if companies start reducing their resource costs now?
- Method:
 - Development of scenarios which show the potential of resource use reductions in Austria
 - Modelling of the scenarios with an integrated ecological-economic model

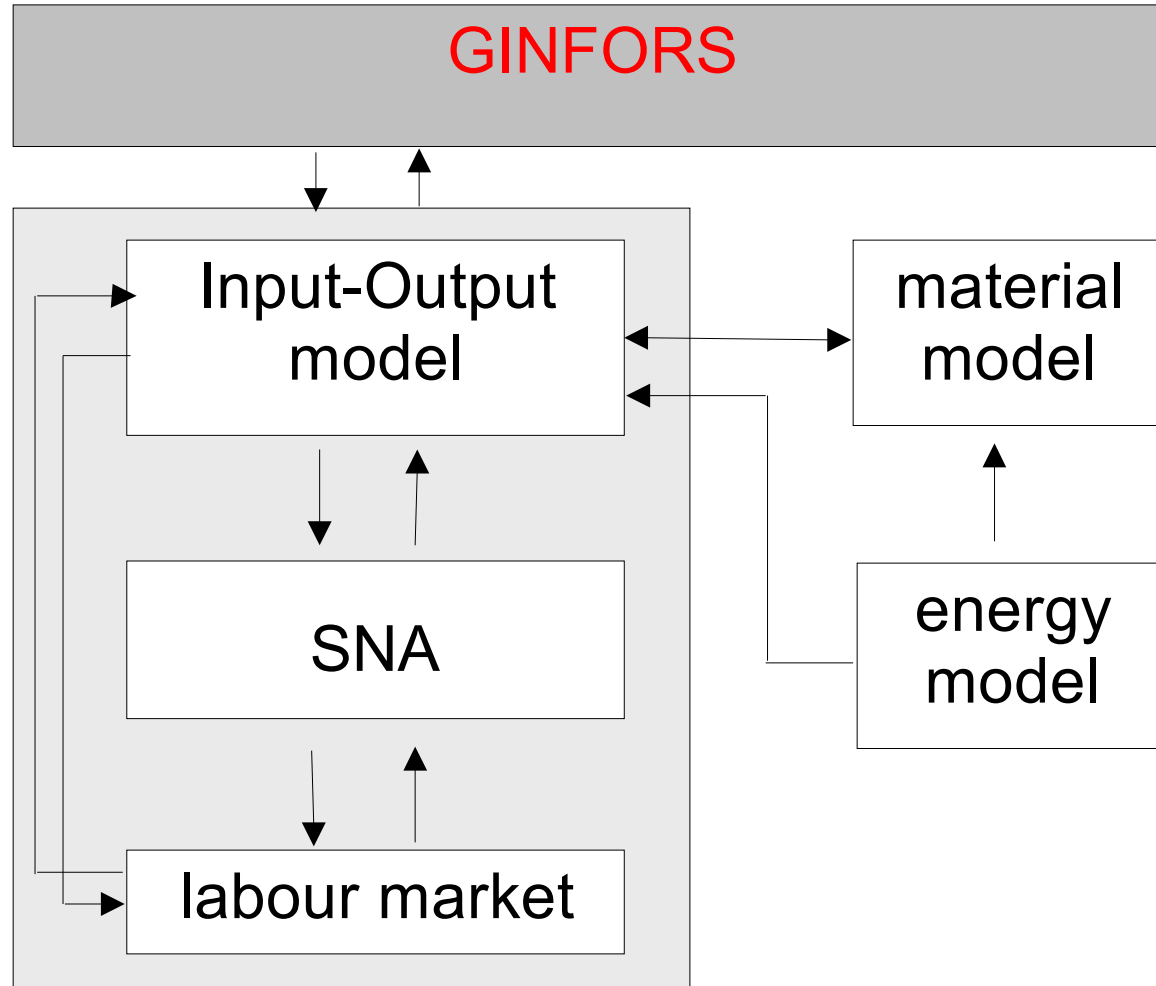


The Model *e3.at*

- New integrated model for Austria
(**E**nvironment – **E**nergy – **E**conomy - Austria)
- Disaggregated (production) structure to show the linkage between economy and environment
- Macro-econometric model
 - Agents behave under conditions of bounded rationality
 - econometrically estimated parameters
- Empirical foundation:
 - based on historical time series

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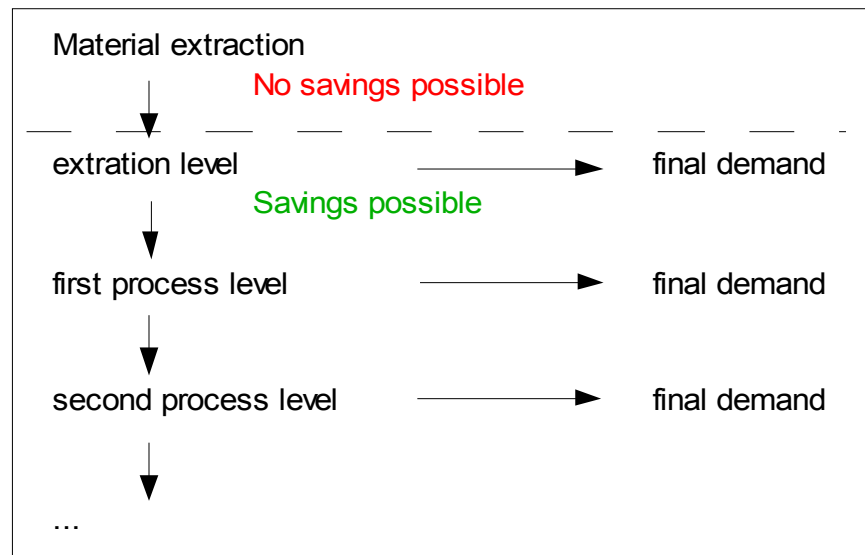
Model Structure



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Material model

- Development of material extraction and of economic variables is proportional.
 - Domestic material extractions are linked to the extracting sector.
 - Imported physical materials are driven by the imports in monetary terms
- No material efficiency gains in extracting sectors, but between the extraction sector and the demanding sectors and on further steps on the process chain



Scenarios

- Baseline scenario
 - possible future development without additional policy measures
- Scenario 1: “Aachen I”
 - minus 20% material costs in **all** manufacturing sectors
- Scenario 2: “Aachen II”
 - minus 10% in **some** selected industries
- Scenario 3: Change in consumption patterns
- Scenario 4: Working time reduction



Scenario “Aachen I”: Outline

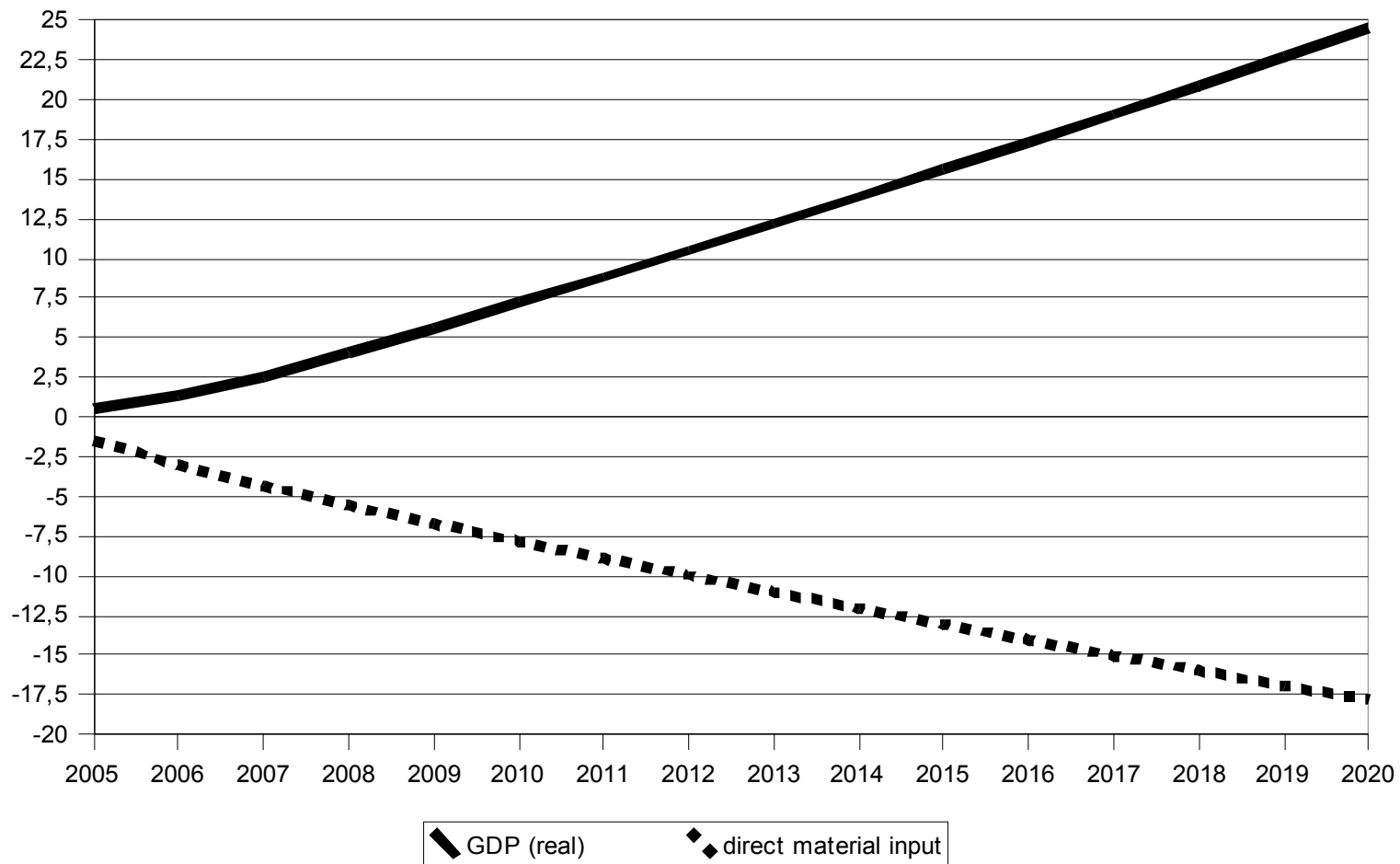
- Huge resource savings potential in manufacturing sectors (can be achieved by information and consulting)
 - Potential of 20% material cost savings (based on A.D. Little)
- Linear reduction of material costs of each production unit
 - in all manufacturing sectors, construction and public administration (not in service sectors)
 - minus 20% (until 2020)
- Permanent reduction of material costs is achieved by additional inputs in the magnitude of the material savings of one year (consulting efforts and investment in machinery)

Scenario “Aachen I”: Results

- Direct effects of resource efficiency gains:
 - Cost reduction in manufacturing, construction and public administration
 - Reduced sales of the deliverers of material - which belong to the manufacturing sectors
- Indirect effects of resource efficiency gains:
 - lower prices (induced by cost reductions)
 - increased profits (if prices decrease less than costs)
 - increased tax revenues and income of households
 - stimulation of final demand and sales, as well as production and employment.
- In total, a strong stimulation of the economy will be induced

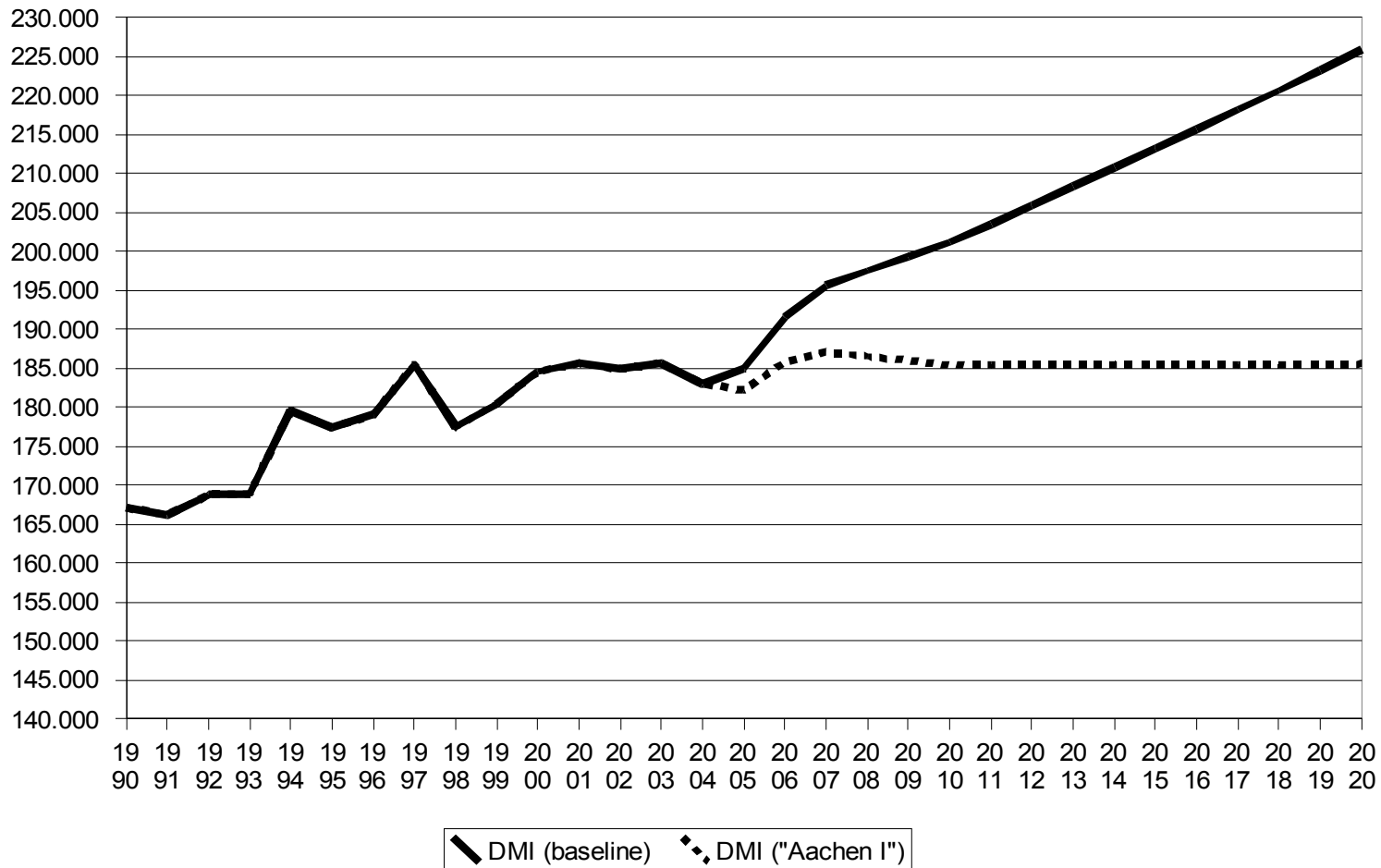
Scenario “Aachen I”: Results

- Relative deviations of **GDP** and **material input** compared to the baseline scenario (in %)



Scenario "Aachen I": Results

- Development of material inputs (in 1000 tons)



Scenario “Aachen I”: Results

- Development of **employment**:
 - Production has a positive, the real wage rate a negative effect on employment.
 - In the scenario “Aachen I” **employment increases** because the negative effect from the real wage rate will be overcompensated by the positive production effect.
 - Rising employment means a further positive effect on household income and from there to final demand.

Scenario “Aachen I”: Results

- Employment level in 2020 will be 2.4 % or about 81,000 persons higher than in the baseline scenario.
- Structure of employment changes

Employees in 1000 persons	"AachenI"			
	2005	2010	2015	2020
agriculture, hunting, forestry	25,8	25,4	25,1	24,9
mining and quarrying	85,3	84,8	85,8	87,3
manufacturing	505,9	495,9	482,1	468,7
electricity, gas, water supply	26,8	25,2	23,6	22,1
construction	233,7	233,8	233,1	232,8
wholesale, retail trade; repair of motor vehicles, personal goods	493,9	502,3	510,0	517,9
hotels, restaurants	159,0	169,4	180,3	191,5
transport, storage and communication	209,6	202,4	197,3	194,0
financial intermediation	110,7	114,3	117,9	121,8
real estate, renting and business activities	310,7	355,6	401,6	456,4
public and private services	921,6	966,4	1015,7	1066,2

Scenario “Aachen II”: Outline and Results

- Closer look at potential reductions in certain sectors
- Based on the workshop results, literature research and interviews, three sectors were selected for a closer investigation:
 - **construction**: minus 10% of the intermediate demand for “other mining and quarrying”
 - **wood working and processing**: minus 10% of the intermediate demand for forestry
 - **production and processing of synthetics**: minus 10% of the intermediate demand for “production of rubber and plastic material”
- In contrast to “Aachen I”: effects of minimal potentials of reductions
- Results point in the same direction as in “Aachen I”, but only minor changes

Scenario “Aachen II”: Results

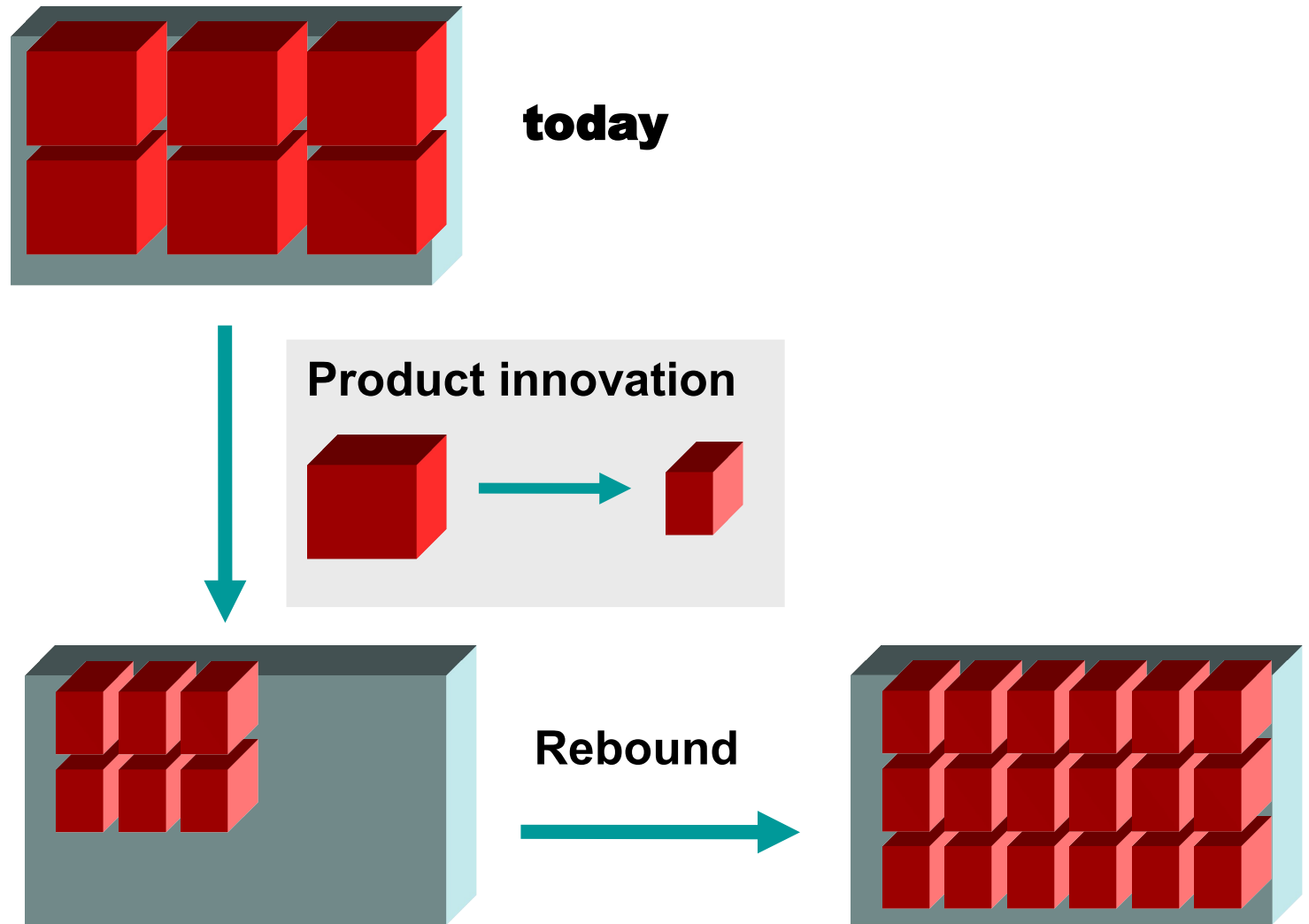
- **Total material use** (domestic extraction plus imports) decreases by 2.9 % to 219.4 Mio. tons in 2020 compared to the baseline scenario
- **GDP** increases by 0.3 % in 2020 compared to the baseline scenario
- **Employment** level is nearly the same as in the baseline scenario, only some structural changes can be observed:
 - In 2020 less persons will be employed in the sector “agriculture and forestry”, “mining” and “other mining and quarrying”.
 - Additional jobs will be created in the sectors “construction”, “hotel and restaurant services”, and “public and private services”.

Conclusions from the Aachen scenarios

- Reduction of material costs leads to
 - positive effects on economic development and competitiveness
 - increase in employment (but: development of labour market is dependent on the wage increases compared to productivity increases)
 - huge increases in material efficiency, but also increase in absolute material use
- Strong **rebound effect**
 - only a relative reduction of material inputs in relation to the baseline scenario, but not in relation to historical data

Rebound effect

- We are getting more and more productive



Conclusions from the Aachen scenarios

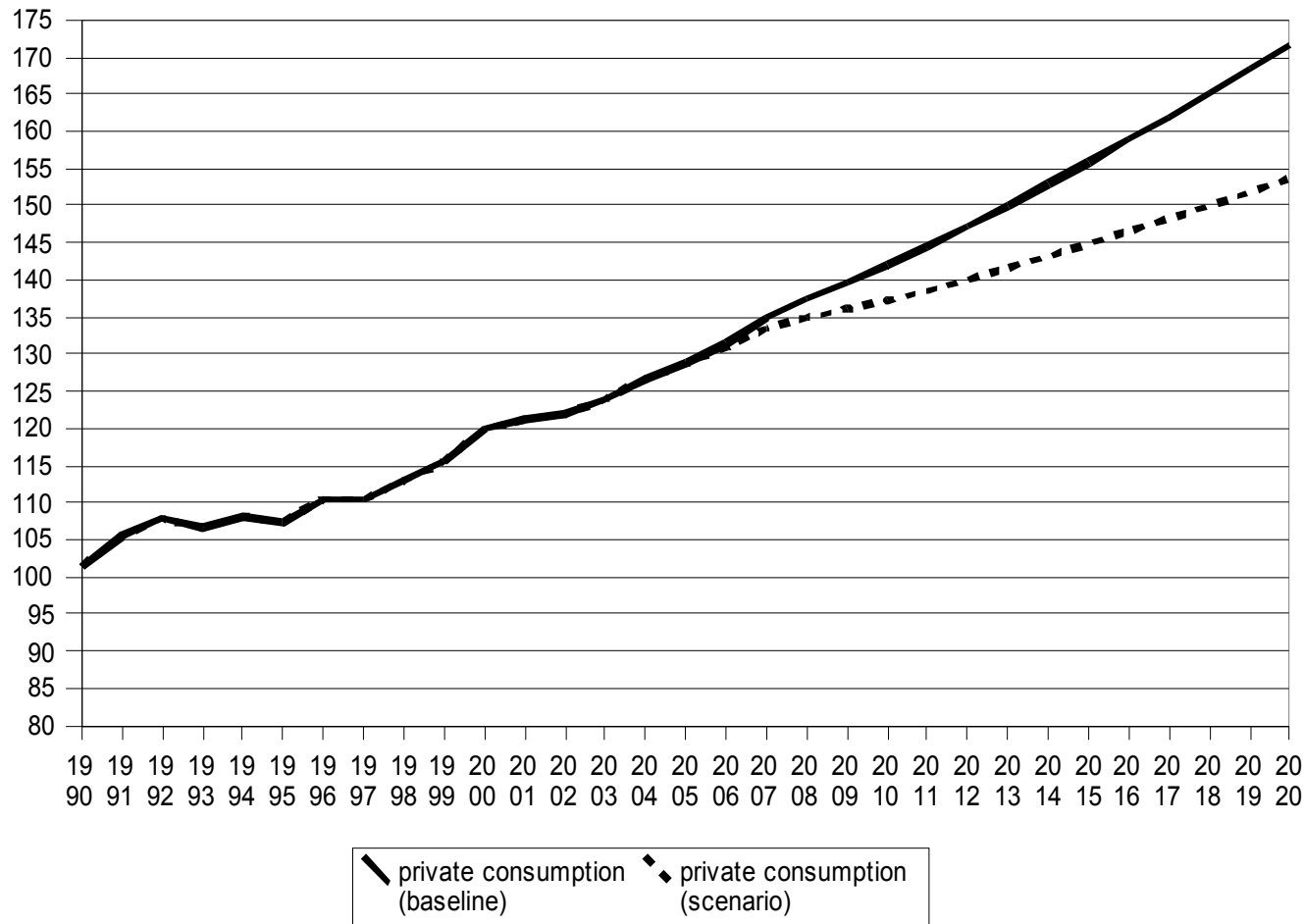
- Increasing resource productivity will not, on its own, achieve economic growth, high and stable employment levels and a substantial reduction of resource consumption at the same time
- must be accompanied by other activities and measures
- One promising strategy is to change the level and the structure of consumption pattern
- Design of **two additional scenarios** which deal with consumption changes and work time reductions, but only on a very general level

Consumption scenario: Outline

- Focus on the environmental and economic consequences of an overall change (in all sectors) in final demand of private households.
- Assumption that private consumption will be reduced by 5% in the year 2020 compared to the baseline scenario (savings increase)
- Absolute growth of consumption over time
- Initial reduction, which will increase accordingly by the multiplier effect
- Interplays and backlashes of the financial market are being neglected

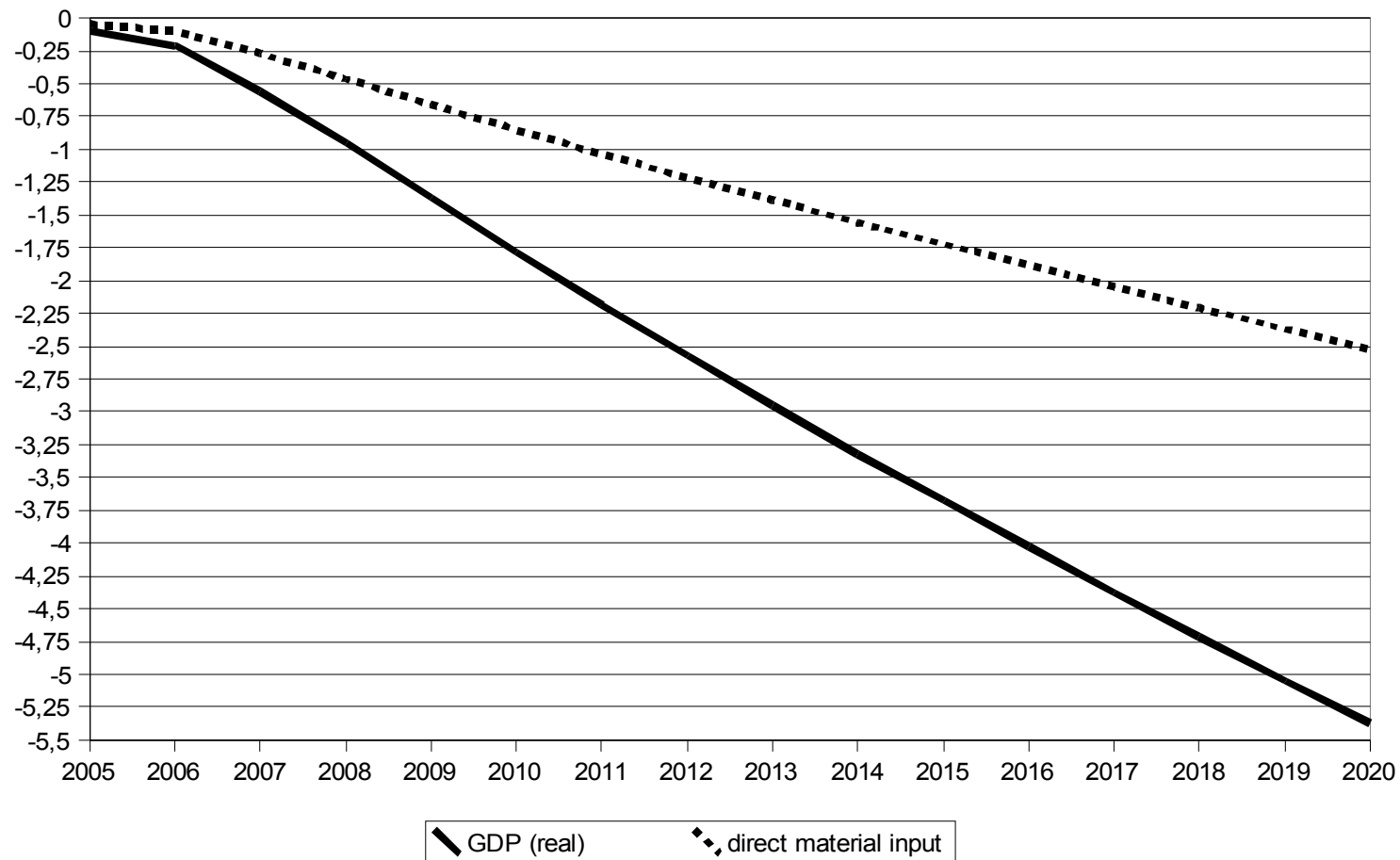
Consumption scenario: Results

- Development of private consumption (in billions EUR)



Consumption scenario: Results

- Development of GDP and material input (deviations from baseline scenario in %)





Consumption scenario: Results

- Effects on Employment:
 - Employment reduces by 1.6% in 2020 compared to the baseline scenario
 - less jobs in the sectors “construction“ and “hotels and restaurants“
 - more jobs in the sectors energy and water supply and in the manufacturing sectors

Scenario “Working time reduction“: Outline

- A damped growth of demand can be supported by a reduction of working time and a re-distribution of labour
- Distribution of less employment on more capita
- Less employment causes less market production and consumption, resulting in reduced resource consumption
- Assumption of a 1% reduction of working time across all economic sectors until the year 2020 (linear slope until the year 2020 of 1%) compared to the baseline scenario.

Scenario “Working time reduction“: Results

- Effects of a decrease of working time across all economic sectors:
 - at first a reduction of wage per employee compared to the baseline scenario;
 - thus, the disposable income is lower and consumption decreases;
 - therefore, the GDP and the material use slightly drop;
 - the number of employees increases by about 1% or 37,400 persons;
 - finally, the wages are 1.2 % above those of the baseline scenario, and increase the prices.

Scenario “Working time reduction“: Results

- Employment for different qualification levels (in 1000 persons)

	Unemployed per qualification	Employees per qualification	Employees per qualification
in 1000 Personen	2005	2005	2020
Elementary school	89,08	692,28	747,06
Apprentice training, Lower secondary schools	103,91	1597,91	1695,43
Secondary academic schools	15,31	160,47	177,85
Secondary technical and vocational education	15,31	290,07	324,66
College, education for teachers	8,14	198,54	214,21
Universities, vocational universities	16,16	260,61	309,54
Total	250,60	3199,89	3468,75

Scenario “Working time reduction”

- So far, only rough analysis of working time reduction possible
 - Current version of the simulation model contains only basic functions for the illustration of the labour market
 - Segmentation of the labour demand as well as an improved modelling of labour supply are essential
 - Classification of age and sex is necessary
- In further analyses we have to deal with the question whether it is possible to cover labour demand at the end of the simulation period, due to demographic changes.

Conclusions

- Savings on resource costs may lead to substantial economic improvements and employment increases
- However, due to **rebound effects**, the efficiency gains do not provide savings in the use of resources
- Thus, increasing resource efficiency is not enough to achieve a sustainable development and must be **accompanied by other activities and measures**
- A reasonable package of measures must equally include firms, private households and basic political conditions (e.g. taxes or certificates).
- How such a mix may look like, has to be examined in further research projects in more detail

Conclusions

- For a detailed analysis of changed consumption patterns more sophisticated scenarios have to be developed
 - A change of consumption patterns, for instance, should focus on goods that are particularly resource intensive
- Also, a more elaborated investigation of working time reductions is necessary
- The economic advantages of increased resource efficiency seem to allow reductions in working time without losing economic competitiveness.

End

Thank you for your attention!

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