START2030

Macroeconomic & distributive effects of a transformation towards 100% RES-E in Austria

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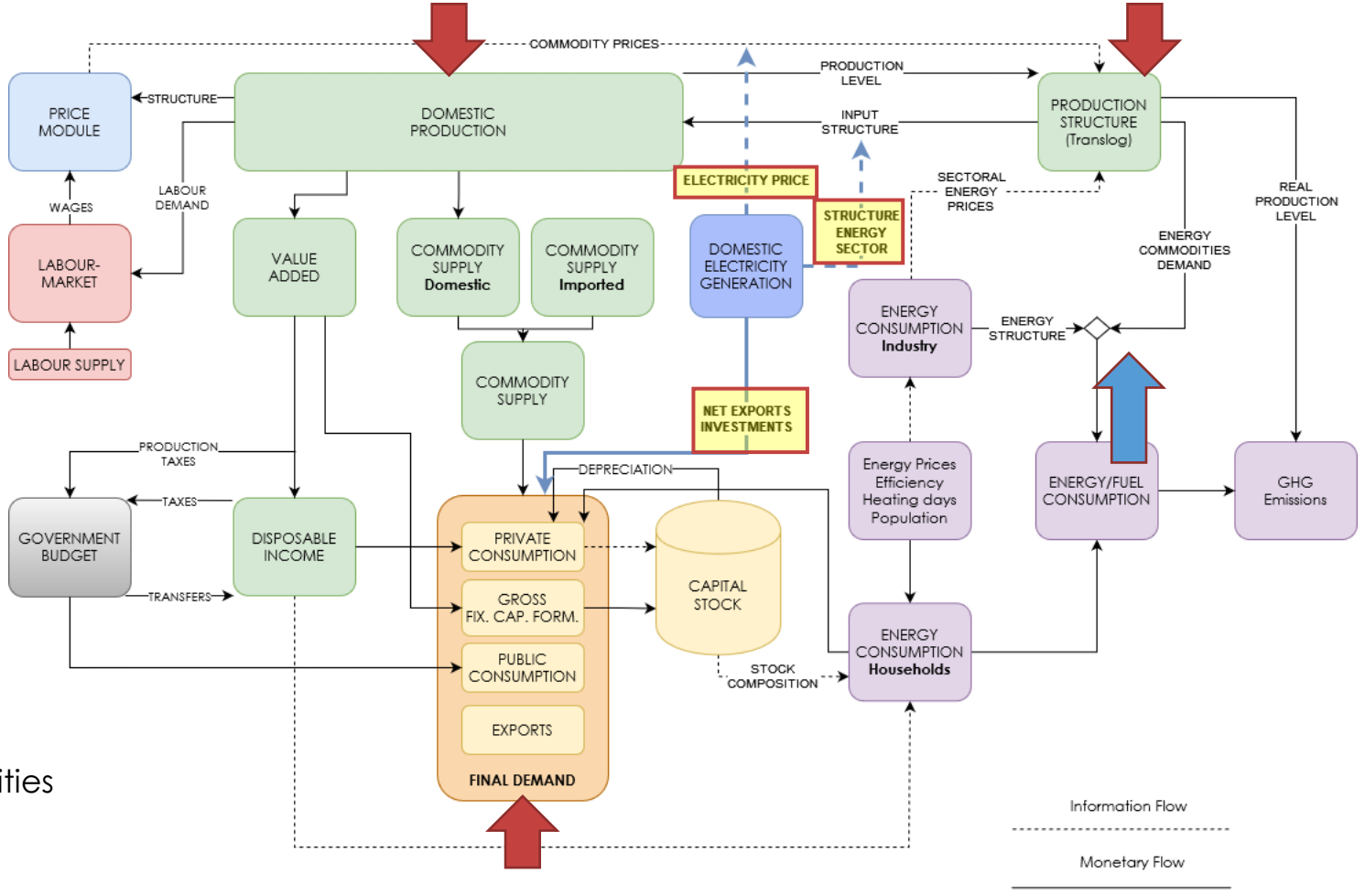
WIFO TU Graz CESAR Centre of Economic Scenario Analysis and Research

START2030 Modelling Tool
The DYNK model

- Macroeconomic model (IO)
- 20 Household groups
- Commodity market
- Final demand
- Price system
- Labour market
- Energy (monetary & physical)
  - Energy intensity
  - Final Energy (Austrian energy balance)
- CO_2 emissions
  - acc. to energy demand & economic activities
- Electricity Generation Module
  - Change model parameters in 4 positions



TECHSWITCH / LINKING

ATLANTIS

- Electricity output & costs components
- Investment needs
- Spot price
- Net exports value

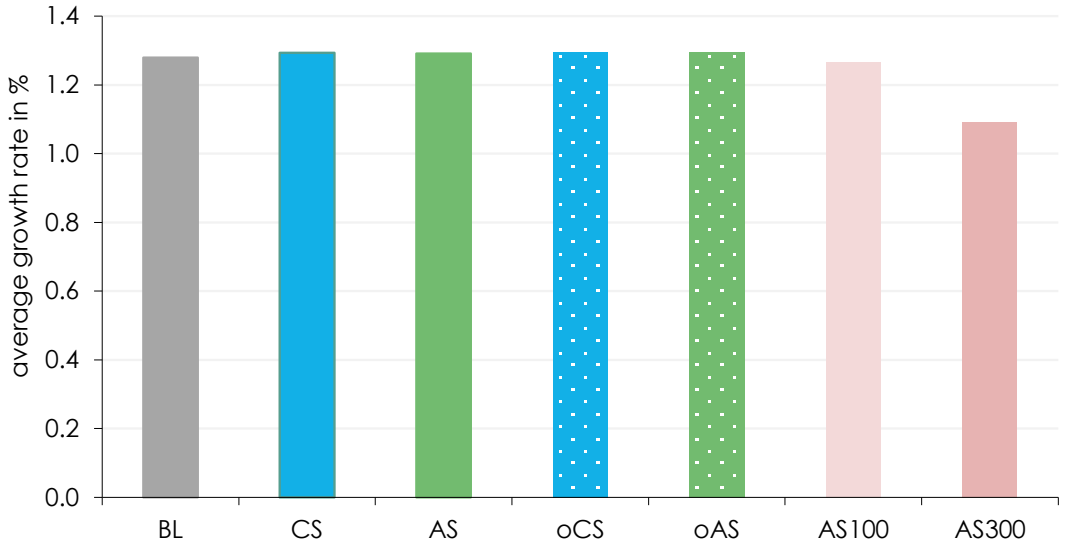
DYNK

- Energy sector structure (Techswitch)
  - Commodity structure per cost component (Exiobase)
  - Structures weighted by electricity generation mix
  - Profits: revenues - costs
- Investments
  - Additional investments w.r.t. baseline
  - Structure of investments via literature review
- Electricity price
  - Spot-price → final consumer price & elec. sector price
  - Prices set exogenously
- Net exports
  - In accordance with net electricity export value

Final public electricity demand

Simulation Results GDP

- **Main & Cost optimized scenarios**
  - GDP levels around **+0.2%** in comparison to Baseline
    - Revenues from electricity export
    - Additional Investment in electricity generation
  - Higher **export** revenues in oCS & oAS
  - Higher **investment** in electricity generation in CS & AS
  - ➔ Similar overall impact on GDP
- **Sensitivity analysis**
  - GDP levels **-0.2 to -2.4 %** in comparison to Baseline
    - Increase in natural gas import costs
    - Increase in production prices (inflation)

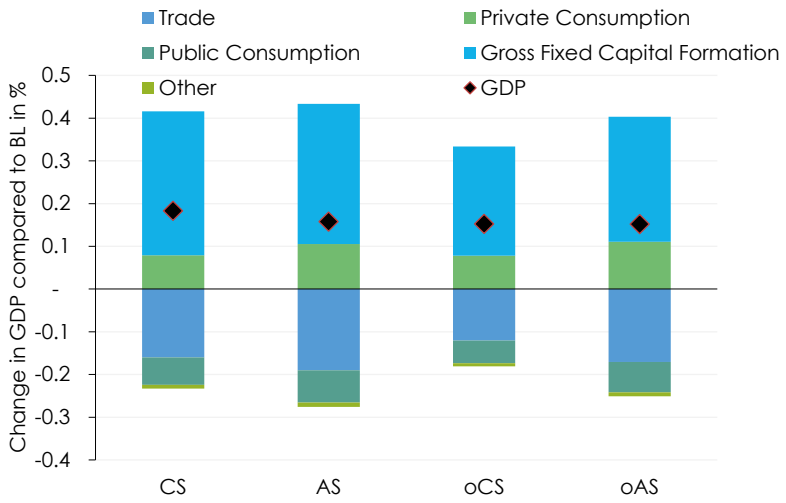


GDP growth, average 2017-2030, by scenario

Simulation Results
GDP decomposition

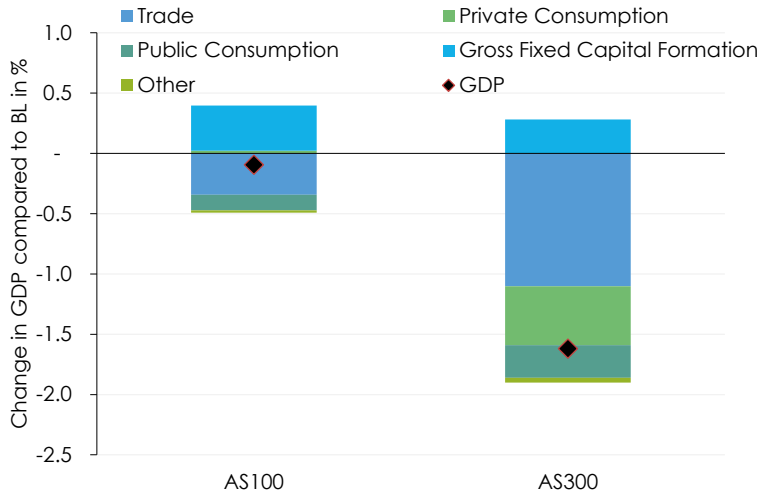
Main & Cost optimized scenarios

- GDP impact positive
  - Main net contributor **Investment**
  - **Exports** contribute positively, but
  - **Imports** linked to RES-E Investments lead to negative "Trade" contribution



Sensitivity analysis

- GDP impact negative
  - Rising natural gas import costs lead to negative Trade contribution
  - Economic Feedbacks multiplier increase primary impact

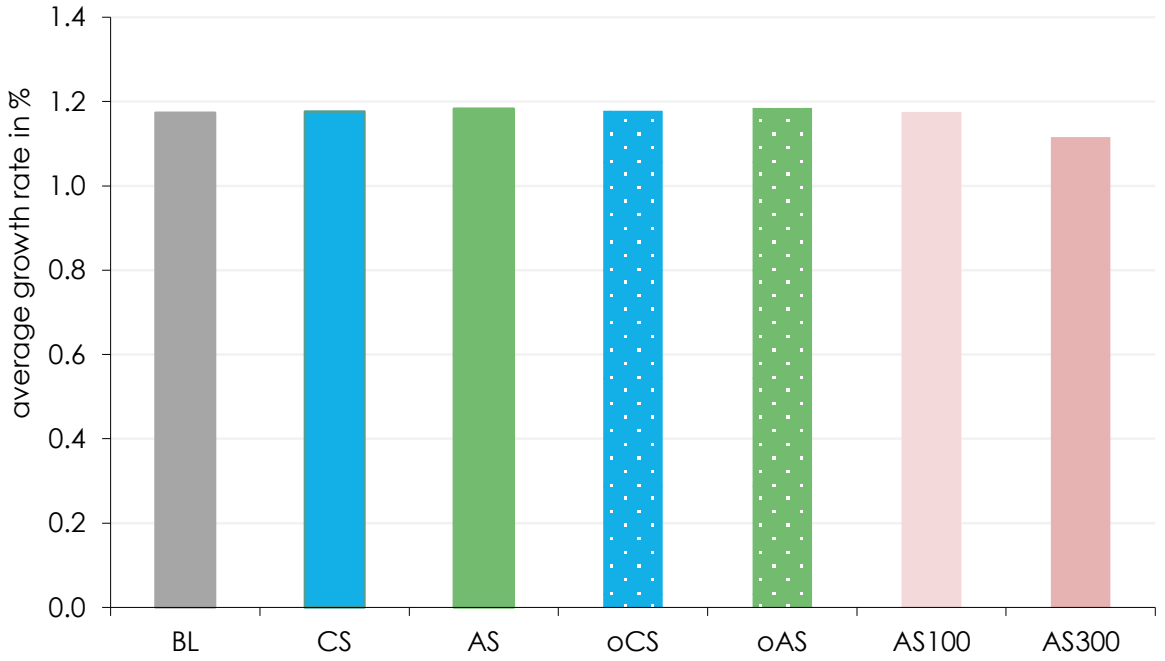


Change in GDP compared to Baseline in 2030, decomposed, per scenario

Simulation Results Employment

- **Main & Cost optimized scenarios**
  - Employment **1,800 to 7,000** persons (+0.0 / 0.1 %)
  - AS scenarios slightly better
    - AS more investments than CS
    - CS more electricity export revenues than AS
    - Investments have higher employment multiplier
- **Sensitivity analysis**
  - Employment **+800 to -40.000** persons (+0.0 / -0.8 %)

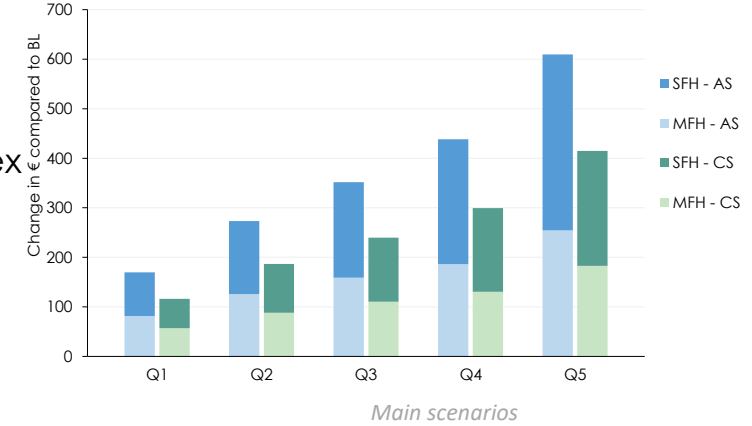
    in comparison to Baseline
    - Employment reacts similar to economic impact

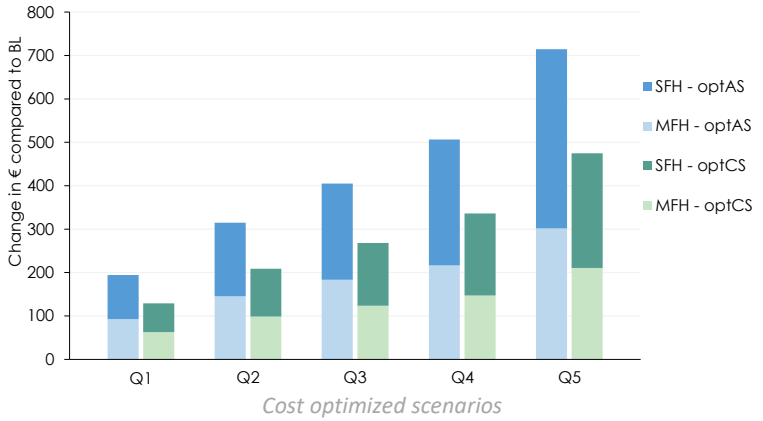


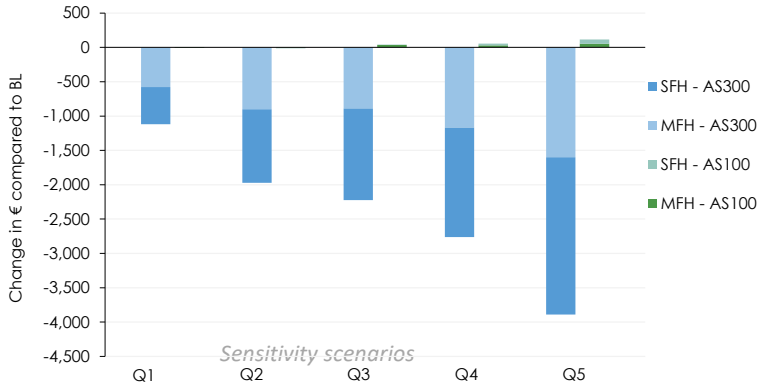
Employment growth, average 2017-2030, by scenario

Simulation Results
Households disposable income

- **Five household income quantiles**
  - as Single- and Multifamily homes
  - Income is deflated by consumer price index
  - Consumer price index is weighted by
    - Commodity prices
    - Consumption structure of quantile
  - Income in real terms is determined by
    - Wages & Surplus of economy
    - Price levels of commodities
    - Consumption structure
  - Results show **(absolute terms)**
    - **+110 to +600 €** per household in 2030 in main scenarios
    - AS100 income borders negativity
    - AS300 shows **-1,000 to – 3,900 €** per household
    - High income houses **gain** more from increasing **wages** (absolute terms)
    - High income houses **lose** more from increasing **prices** (absolute terms)
    - Results in relative terms will be analysed, we assume that these impacts are more equally distributed



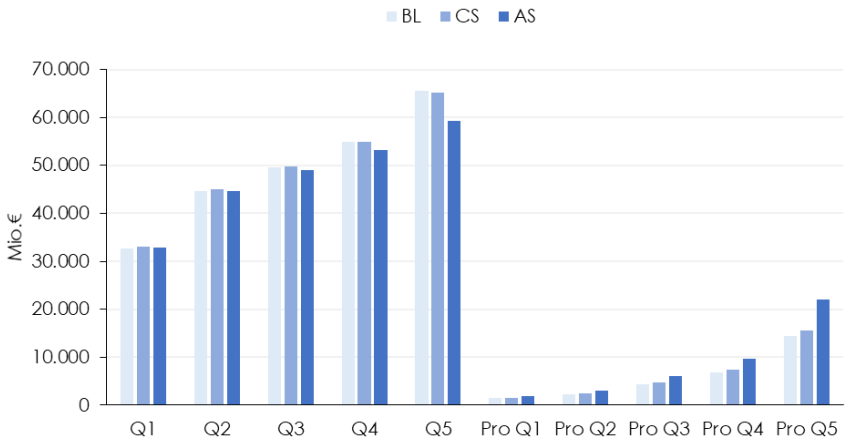




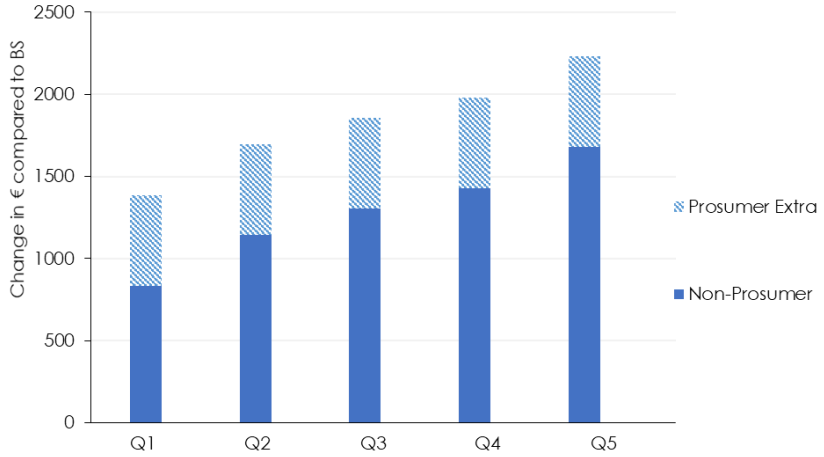
Change in real disposable income in 2030 in €, by scenario

Simulation Results Prosumers

- Prosumer households increase in CS and AS
  - According to scenario definition
  - Slightly more expenses on non-energy goods due to lower grid electricity costs
- Prosumer savings in energy expenses
  - Increases with electricity price
  - ~550 € p.a. in 2030 in all scenarios



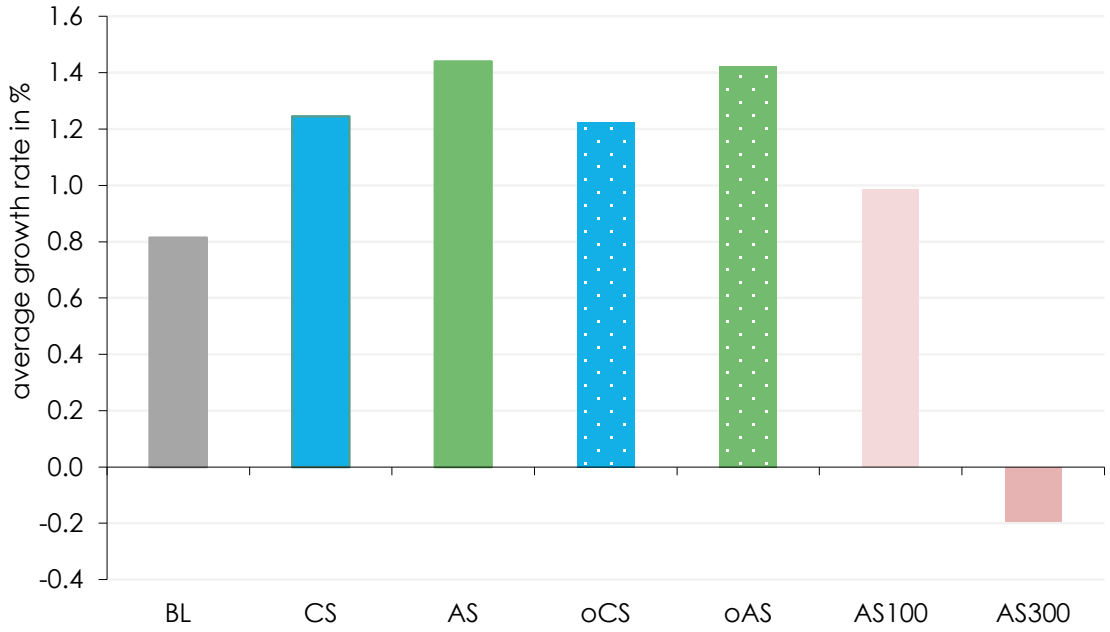
Non-Energy Consumption of Non- and Prosumer households



Change in Non-Energy Consumption in AS scenario; Plus Savings of Prosumer

Simulation Results Electricity demand

- Households electricity demand determined by
  - Scenario definitions in the areas
    - Mobility
    - Appliances
    - Heating
- Industries & Services electricity demand determined by
  - Sectoral production activities
  - Economic feedbacks
- Results show
  - Slightly higher demand in AS
    - Due to higher assumed electrification in households
  - Lower demand in AS100 & AS300 due to economic performance



Electricity demand growth, average 2017-2030, by scenario

Conclusions

- GDP and employment impacts are negligible but positive in the main scenarios
- High natural gas prices in the sensitivity scenarios lead to a lower GDP growth
- All households are better off in the main scenarios in terms of disposable income; and lose in the AS300 scenario
- Redistributive policies seem not to be required except for the high gas price scenario

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Thank you!

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powered by klima+ energie fonds

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