MACROECONOMIC EFFECTS OF A FOSSIL FUEL INDEPENDENT VEHICLE FLEET IN SWEDEN

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Research Institutes of Sweden

INTRODUCTION

- Background
  - 1/3 of CO_2 emissions originate from the transport sector
  - 80% of oil consumption is used in road transport
  - Political agreement on goals:
    - Reduce CO_2 impact from domestic transports by 70% until 2030
    - Fossil fuel independency by 2045

- Project
  - Explores different **technology pathways** for fossil independency for the Swedish **vehicle fleet** and their **effects on the Swedish economy**

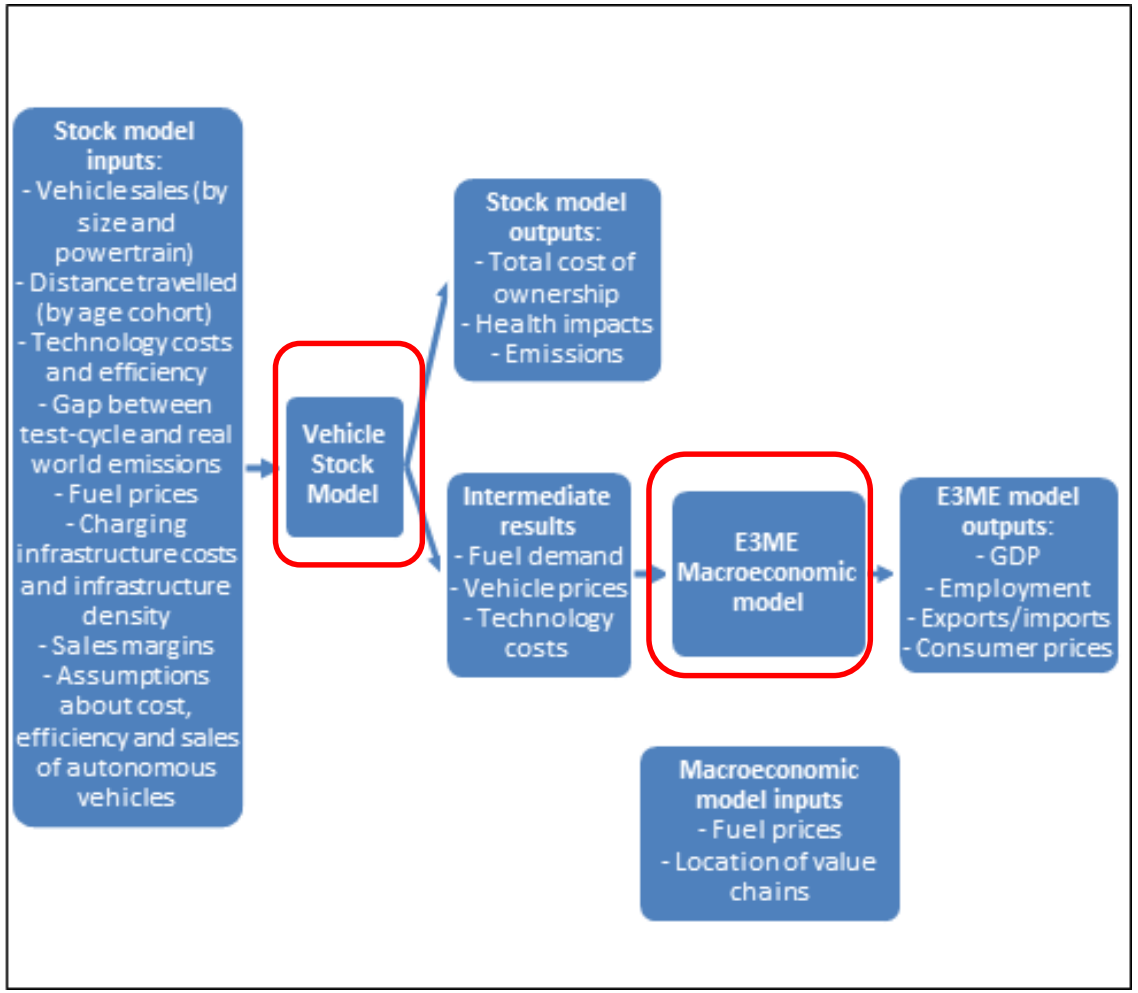
Research questions:

- What technology pathways are possible?
- What are their effects on Swedish economy?

THE MODELS

- Vehicle Stock Model
  - Partial model, based on annual vehicle cohort
  - Includes passenger cars, buses and heavy goods vehicles
  - Assumptions on future development of technology, power trains and fuel types

- E3ME
  - Econometric (non-equilibrium) model
  - Input/output model
  - Complete integration of energy and economy modules
  - 53 regions, 77 economic sectors



General assumptions

- New vehicle sales are kept constant at 2015 year's level
- Vehicle life time is calibrated from historical data
- Sweden's competitiveness regarding vehicles is assumed constant vs the rest of the world
- All expenses are financed by "the market".
  - Public finances always in balance
- Investments do not crowd out other investments
- Assumptions regarding oil prices and electricity price and mix are based on external sources

- There will be a full list of assumptions in the Project report

METHOD

1. Three technology scenarios, which reduce CO_2 impact by 80% (targets from an earlier report)
   - BIO – Biofuel based
   - ELEC – Battery electricity based
   - FCV – Fuel cell based

2. Update to Swedish policy development
   - ELEC_BB – ”Biofuel quota” policy and 70% reduction target
   - Addition MaaS/car sharing
   - Sensitivity analysis - oil and electricity price
   - Sensitivity analysis - import of biofuels

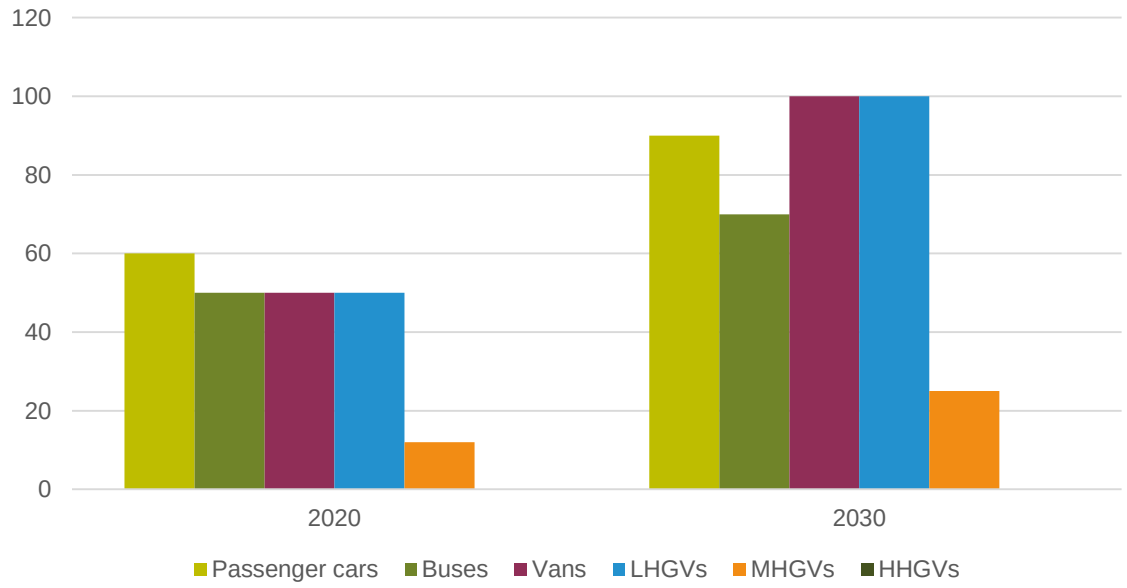
- All scenarios are based on biofuels, which can be mixed with fossil fuels (**drop in fuels**)

Assumptions for "Biofuel quota" and 70 % target

- CO_2 reduction per year according to "Biofuel quota"

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Petrol:	3%	3%	4%	4%	5%	8%	10%	15%	20%	25%	30%	35%	38%	40%
Diesel:	17%	19%	20%	21%	24%	26%	28%	30%	32%	34%	36%	38%	39%	40%

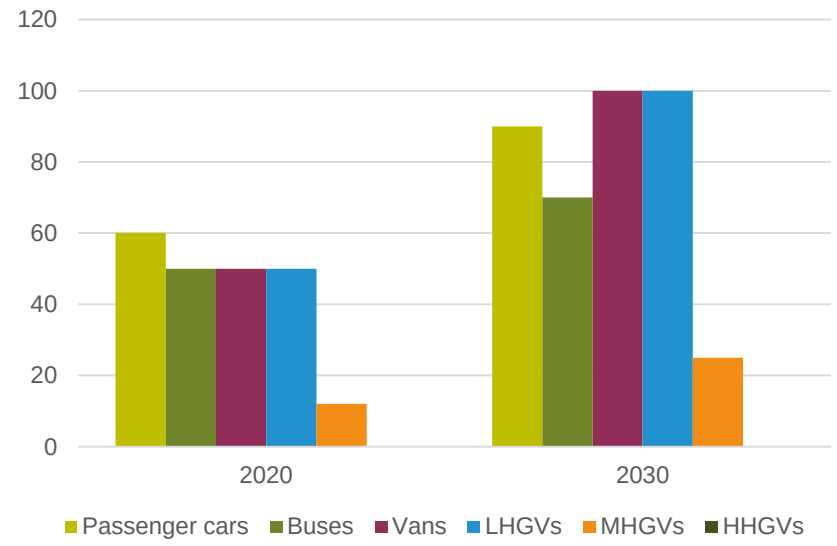
- NECESSARY pace of electrification (BEV + PHEV + HEV) per vehicle type



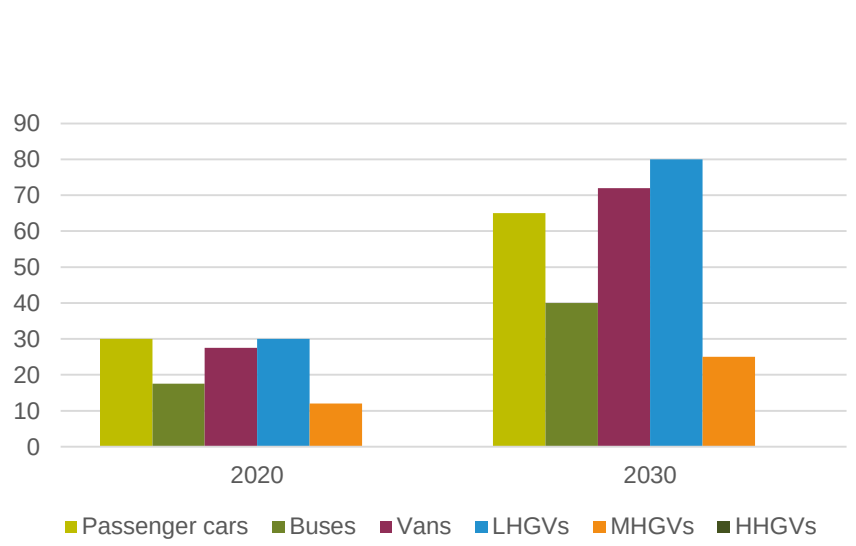
% of new car sales	2020	2030	2050
Cars	60	90	100
Buses	50	70	80
Vans	50	100	100
LHGVs	50	100	100
MHGVs	12	25	55
HHGVs	0	0	0

Alternative pathways to 70% target – Electrification pace

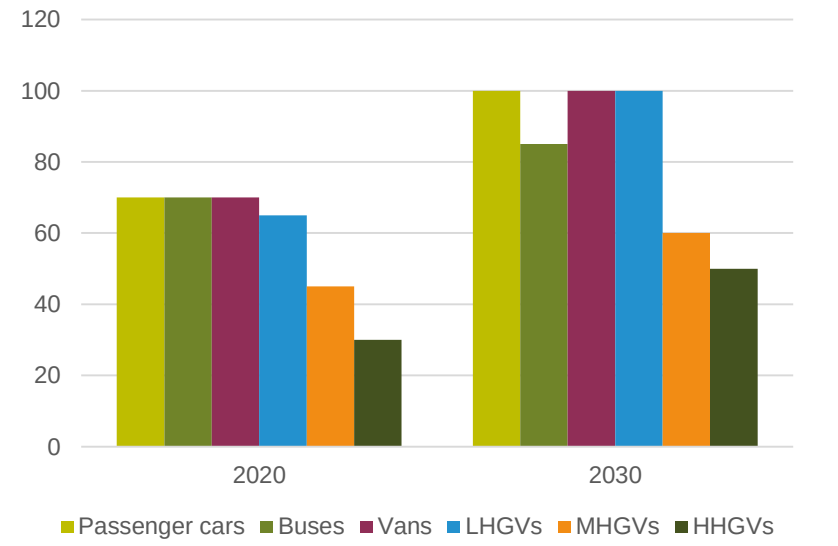
- "Biofuel quota" levels



- More biofuel - less electrification

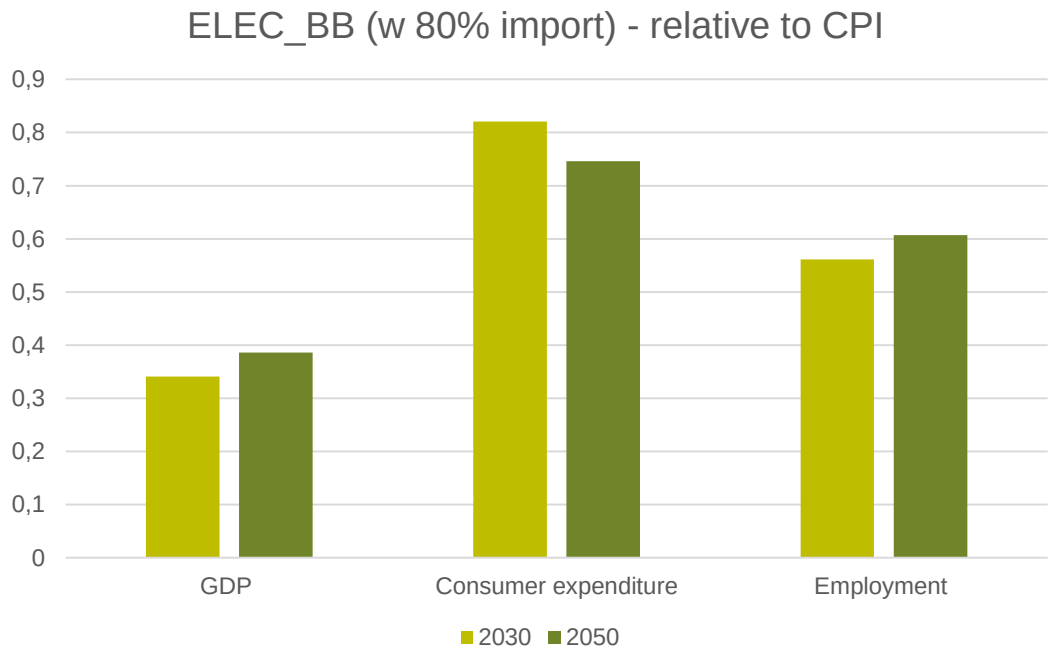


- Less biofuel - more electrification



Macroeconomic Results – ”Biofuel quota” and 70 % target

- Results
  - Positive results for both GDP, consumption, employment and investments, compared to CPI
- Rational
  - Imported fossil fuels are replaced by domestically produced fuel (electricity, biofuel)
  - Lower TCO for car owners results in increased consumer expenditure and increased economic activity across the economy
  - More investments in new infrastructure drive the demand side of the economy



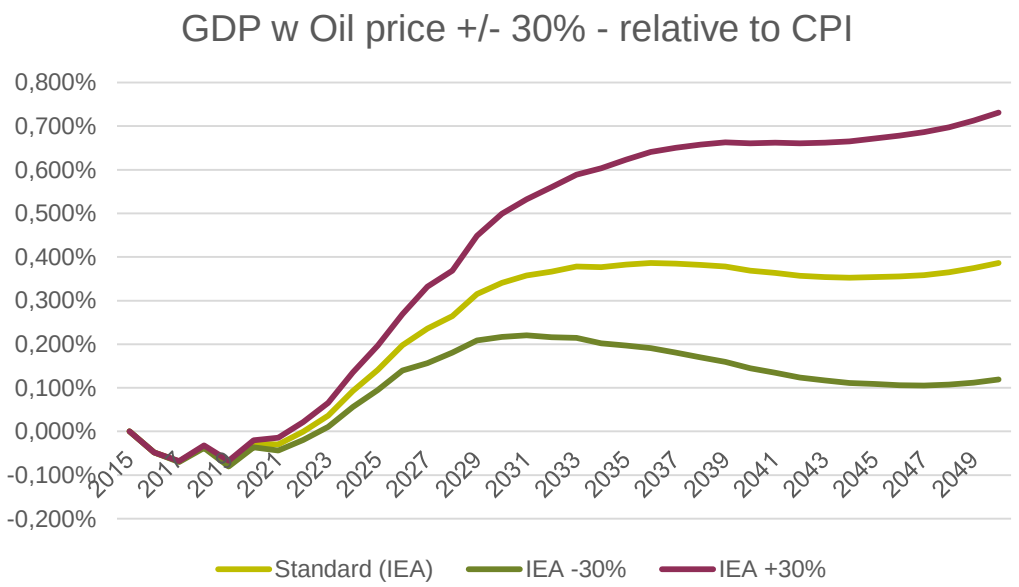
Sensitivity analysis – Oil and electricity price

Method

- Adjust the oil (1) and electricity (2) price upward and downward by 30%

Results

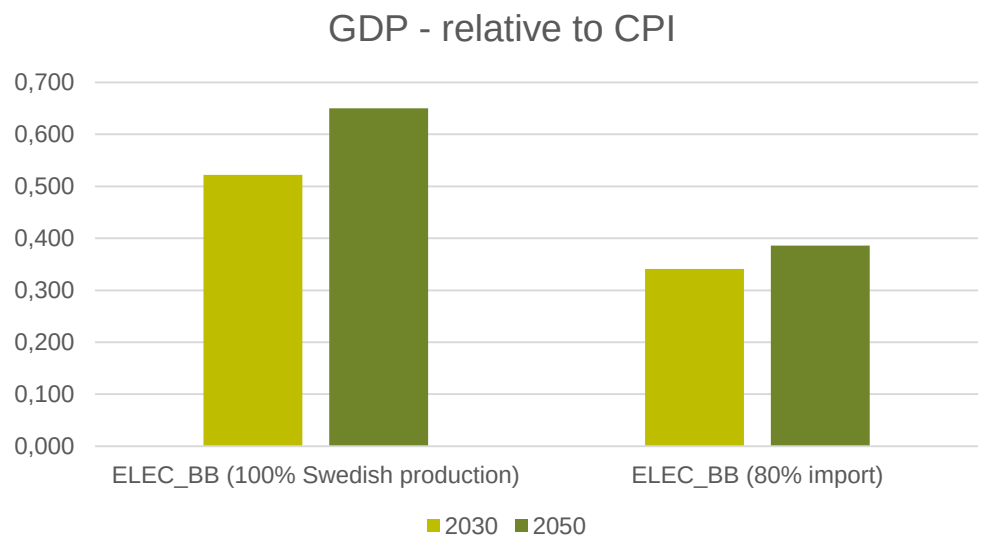
- Effects of (1), in terms of GDP



- Standard scenario – based on IEA's forecast
- Electricity price changes give the opposite results from oil price changes

Sensitivity analysis – Biofuels

- Method
  - 80% import (as today) has been compared to 100% Swedish production
- Results
  - Domestic production results in increased positive economic effects, compared to import (assuming equal cost structure)



- Swedish production of biofuels is needed!

LIMITATIONS

- Behavioural and societal changes
  - Reducing road transport overall would help the transition
- Rebound effects – CO_2
  - Total GDP growth is more important for CO_2 emissions than the rebound effects from the measures in our study
  - It is important to reduce the CO_2 intensity in all sectors
- Potential technologies
  - Autonomous vehicles, hydrogen/fuel cells, electric roads, electro fuels

SUMMARY

- It is possible to reach the targets!
  - A very speedy uptake of new technoclogies and new power trains is needed
  - Drop in biofuels are needed – to impact the current vehicle stock
- The effects can be positive for Swedish economy
  - Technology development, cost efficient mobility and replacement of imported fossil fuels are driving this
  - The price of oil and electricity impact how positive the results will be
  - The level of import and the price of biofuel will also impact how positive the results will be

- **Action is needed now!**

THANK YOU!

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