

MACROECONOMIC EFFECTS OF A FOSSIL FUEL INDEPENDENT VEHICLE FLEET IN SWEDEN

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Research Institutes of Sweden

20-FIFTY



INTRODUCTION

■ Background

- 1/3 of CO₂ emissions originate from the transport sector
- 80% of oil consumption is used in road transport
- Political agreement on goals:
 - Reduce CO₂ 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?

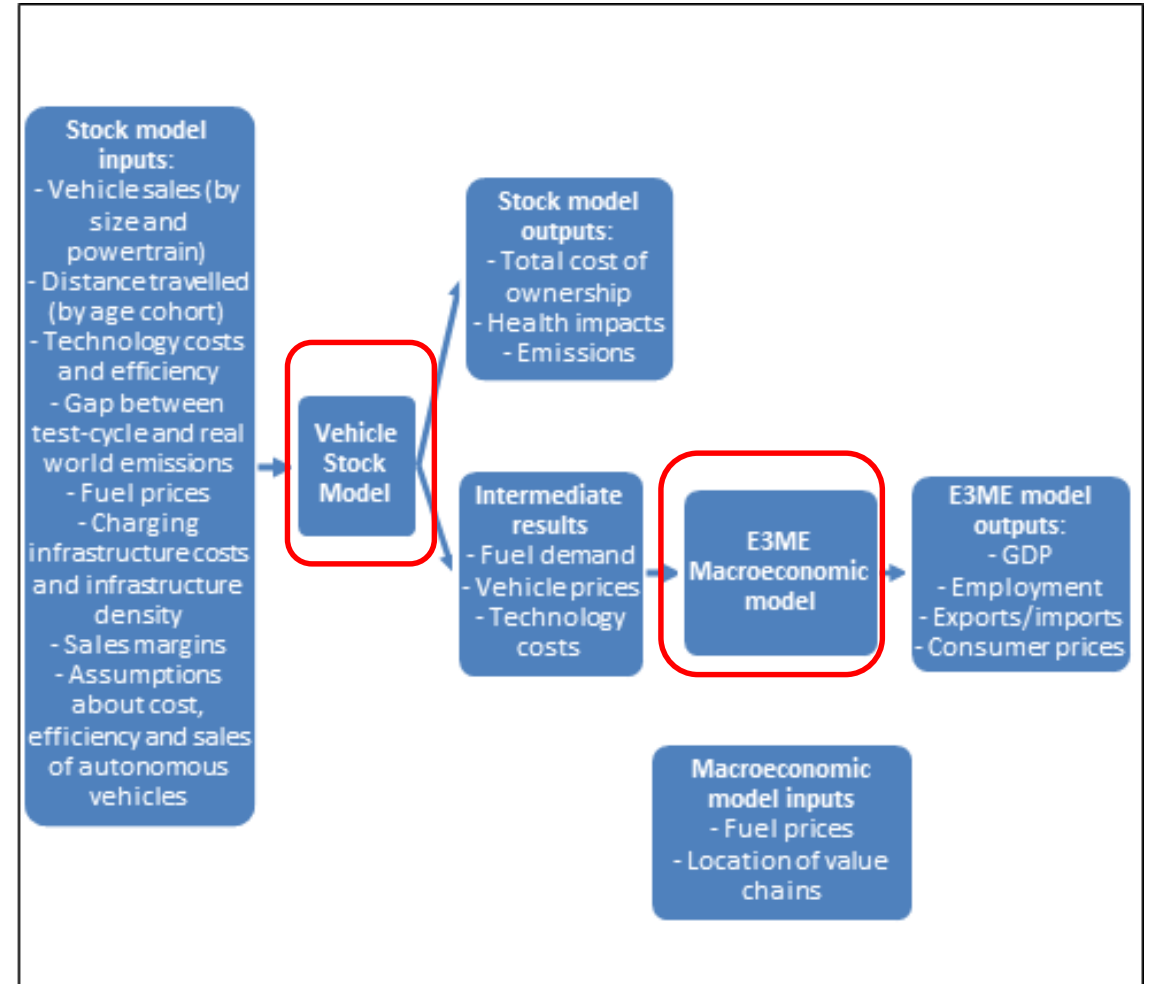
THE MODELS

■ 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

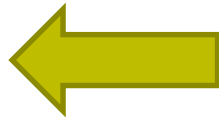
- Econometric (non-equilibrium) model
- Input/output model
- Complete integration of energy and economy modules
- 53 regions, 77 economic sectors



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 CO₂ 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

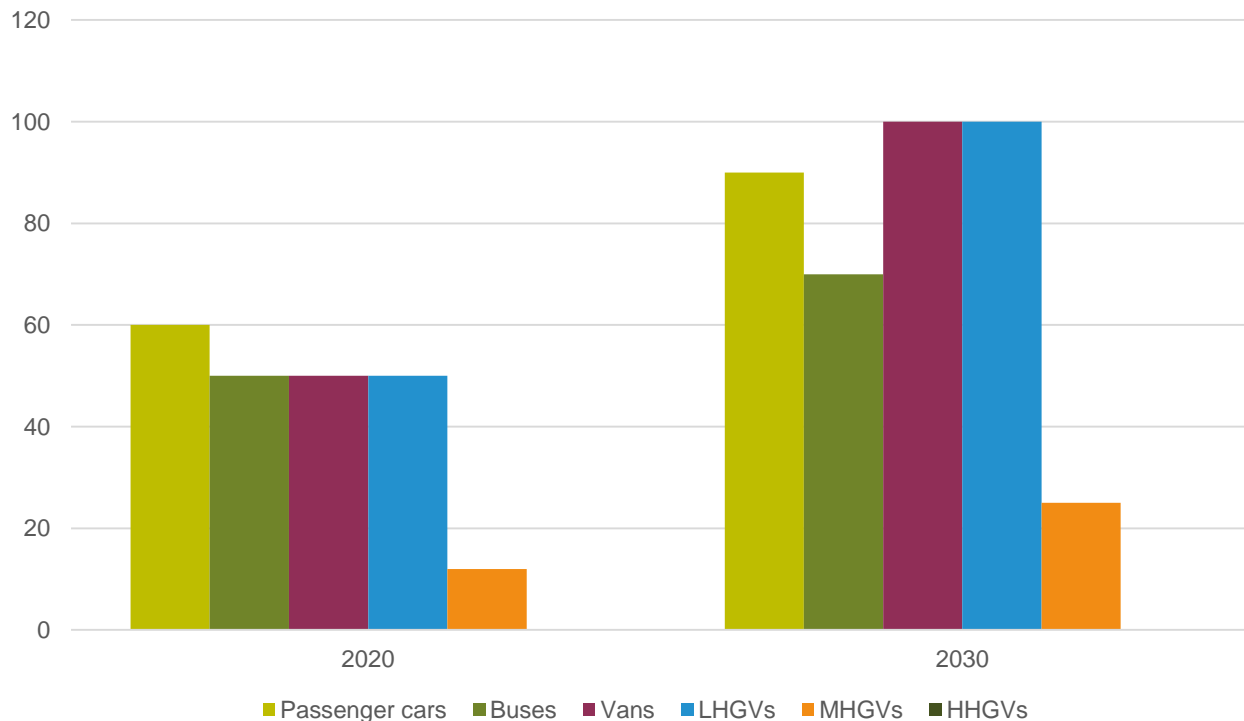
- All scenarios are based on biofuels, which can be mixed with fossil fuels (**drop in fuels**)

ASSUMPTIONS FOR "BIOFUEL QUOTA" AND 70 % TARGET

- CO₂ 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%

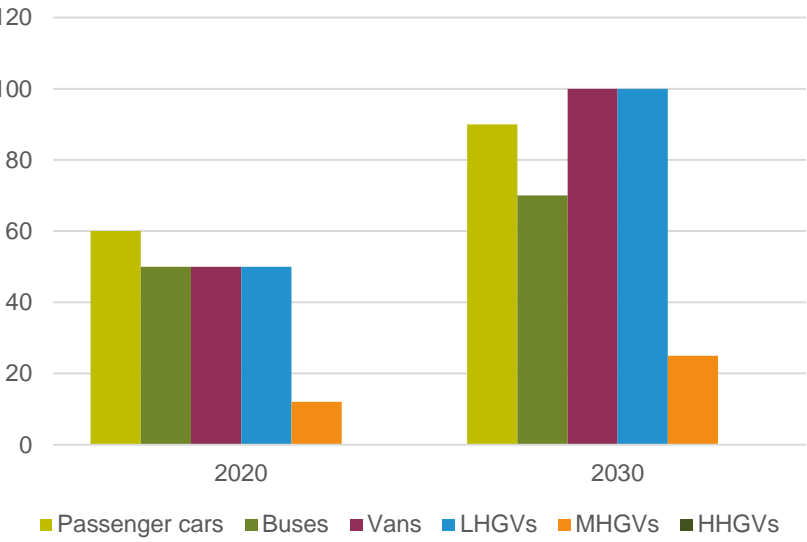
- NECESSARY pace of electrification (BEV + PHEV + HEV) per vehicle type



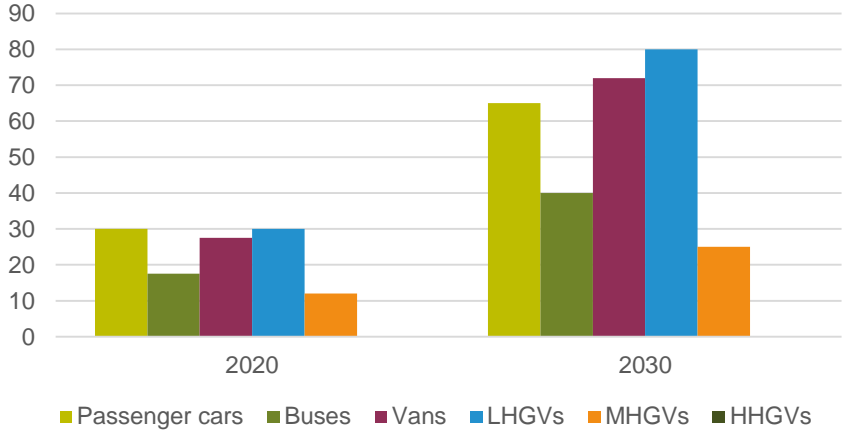
% of new car sales	2020	2030	2050
Cars	60	90	100
Buses	50	70	80
Vans	50	100	100
LHGVs	50	100	100
MHGVs	12	25	55
HHGVs	0	0	0

ALTERNATIVE PATHWAYS TO 70% TARGET – ELECTRIFICATION PACE

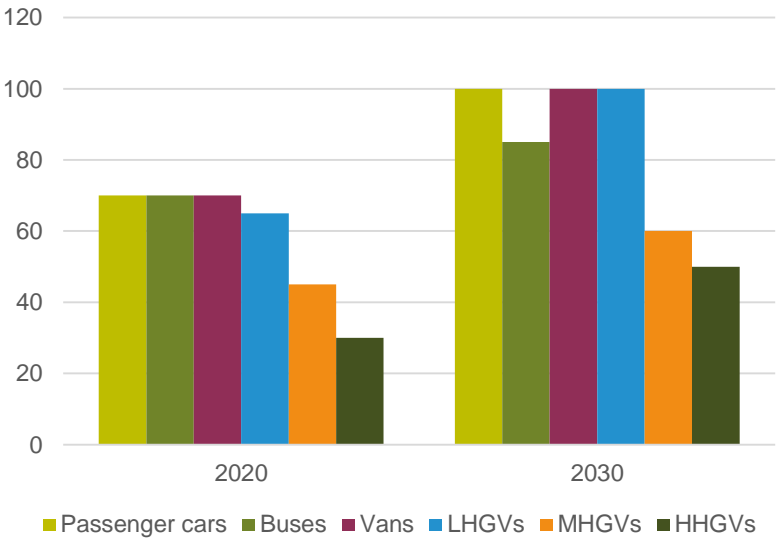
■ “Biofuel quota” levels



■ More biofuel - less electrification



■ Less biofuel - more electrification



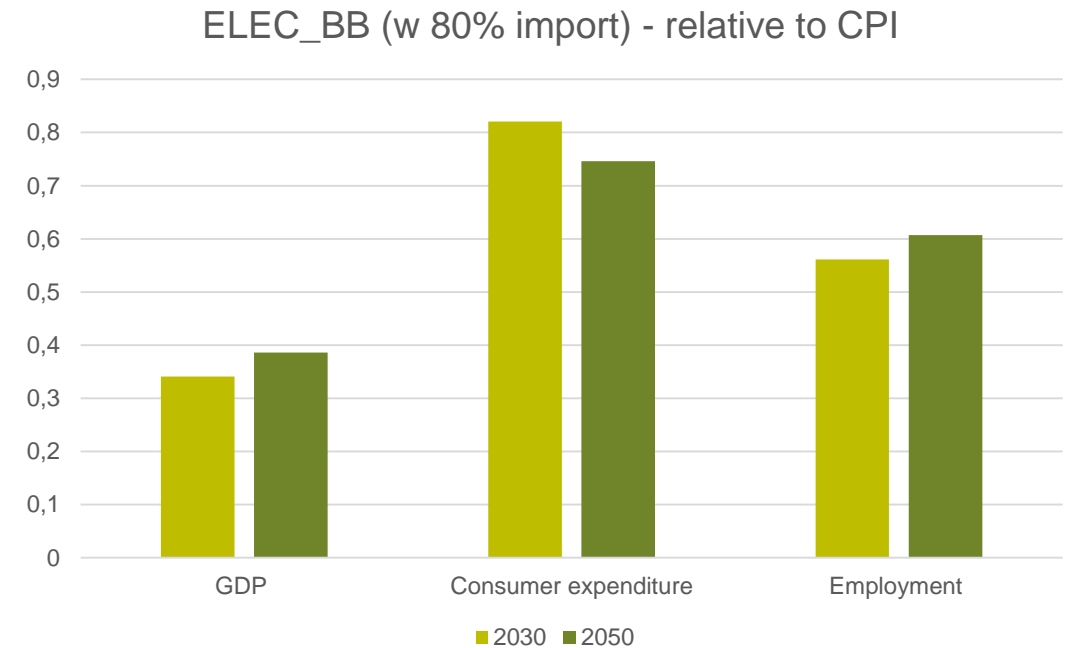
MACROECONOMIC RESULTS – "BIOFUEL QUOTA" AND 70 % TARGET

■ 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



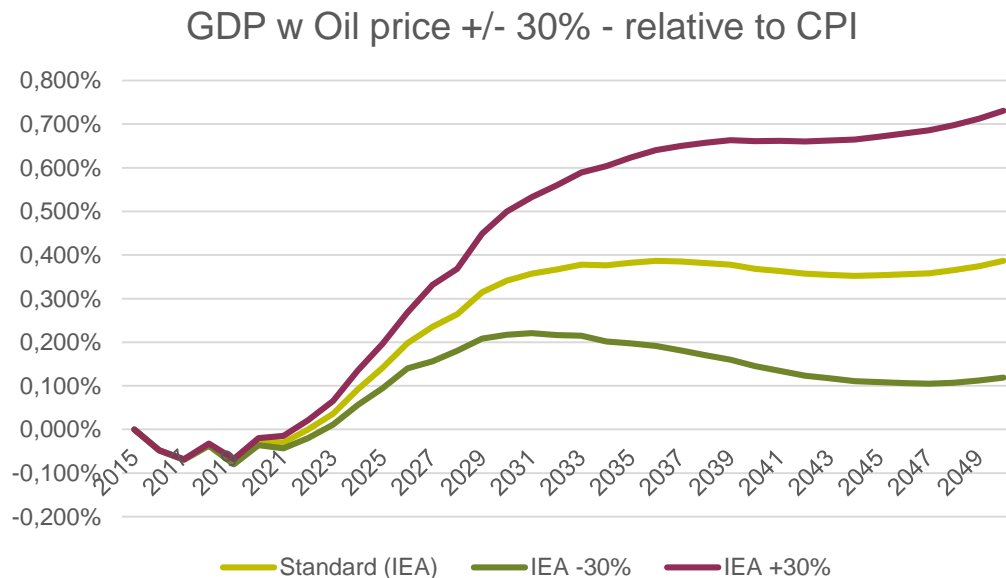
SENSITIVITY ANALYSIS – OIL AND ELECTRICITY PRICE

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

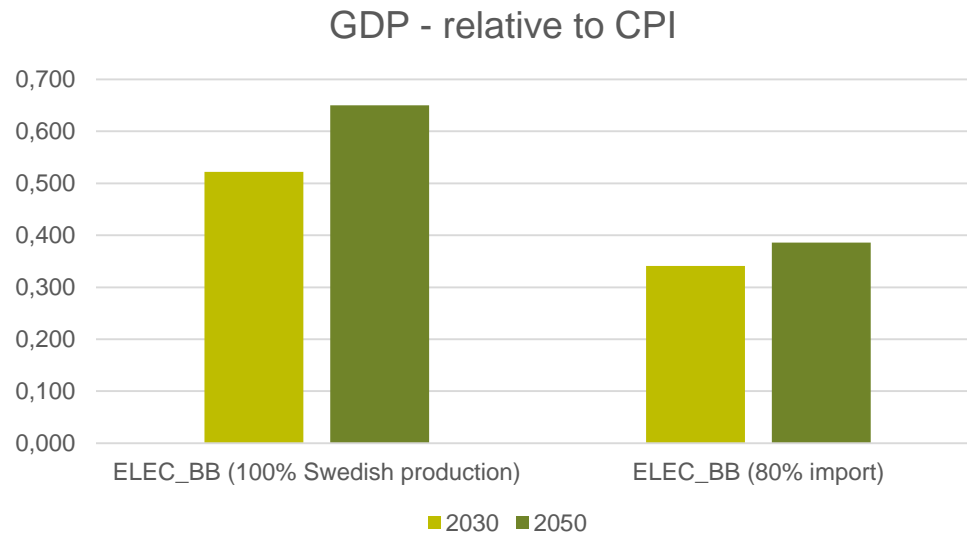
SENSITIVITY ANALYSIS – BIOFUELS

- 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 – CO₂
 - Total GDP growth is more important for CO₂ emissions than the rebound effects from the measures in our study
 - It is important to reduce the CO₂ 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 technologies 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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