Macroeconomic Impacts of Connected Autonomous Electric Vehicles

ABSTRACT
This study explores the potential macroeconomic and environmental impacts of various future mobility scenarios encompassing the deployment of Automation, Connectivity, Electrification and Shared Mobility technologies in road transport, using a global energy and environment focused Computable General Equilibrium Model (the JRC-GEM-E3).

1. Automation, Connectivity, Electrification and Sharing – Future Mobility Revolution?

What may be the implications of ACES on road transport demand?

- Connectivity
  - + improved road traffic management

- Sharing
  - - reduced private ownership

- Automation
  - + new users, modal shifts
  - + lower travel costs

- Electrification
  - + / - depending on costs

What could the future look like?

- Alternative future 1: Mobility as a service but high emissions, lack of transport system optimization
- "Dream" future: Mobility as a service, low congestion, integration with public transport, low/zero emissions

2. What are the potential economic implications?

Vehicle manufacturing
- Type of vehicles produced and supply-chains? Labour intensity?
- Number of vehicles produced/sold and where?

Private transport
- Private ownership (stock implications)?
- Maintenance requirements, fuel consumption, fuel switching?
- Vehicle use and modal shifts (transport services)?

Freight transport
- Fuel efficiency, fuel switching, labour intensity?
- Modal shifts?

Further questions
- Infrastructure investment, electric system

3. How to capture them?

- Need to assess impacts on:
  - GDP
  - Output
  - Employment
  - Trade balance
  - Economy-environment linkages

- Supply-chain impacts and international competitiveness are key
- CGE Modelling of alternative deployment scenarios of various vehicle types in a global setting
- Technical input on vehicle manufacturing cost structure
  - Inputs from bottom-up energy system models (stock deployment, fuel use)

4. Modelling new vehicles in the JRC-GEM-E3

Demand side: Varying deployment levels and speed by technology
- Private cars: adjusting the consumption matrix
  - Increasing share of new vehicle type in household consumption of private vehicles

Supply-side: Vehicle manufacturing sectors
- New cost structure: For EVs?
  - "Model testing observation": battery costs represent 45% of non-services inputs & less reliance on own inputs (own estimate based on BNEF, 2017) and AVs?

5. Further work

- Convert employment impacts into occupations and skills
  - Links to separate tool at NACE-2 level (University of Warwick)

References
- Authors: Tambu, M., Saveyn, B. Wojtowicz, K.