Exploring policies for the transition towards electric vehicles

What are the consequences of industrial policies on the automotive sector during the transition towards electric cars (EVs)?

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Topic
This PhD project examines:
• the transition process leading to the shift from conventional vehicles towards sustainable private vehicles, such as hybrids, electric and fuel cell light duty vehicles (LDV),
• the effects and consequences of governmental policies on industrial actors with respect to their behaviour (e.g. company behaviour),
• the success of policies in reaching policy goals (e.g. industrial goals, growth, employment, diffusion and emission targets),
• and policy making in United Kingdom, Germany and Europe.

The Problem

Actors in the Socio-technical system²

Production system, industry structure (suppliers, car manufacturers)

Automobile (artifact)

Regulations and policies (traffic rules, car tax emission standards)

Aspects of the Socio-technical system²

Fuel infrastructure (fuelling stations)

Road infrastructure and traffic system (lights, signs)

Markets & user practices (mobility & driver patterns)

Policy measures

Evaluation / Interpretation

Discrepancies

Results & Outcomes

Complex system:
• many stakeholders/actors
• Many interrelations
• Individual strategies
• feedback loops

Targets & Goals

Nature of the system leads to high uncertainty for the expected results of policies or industry.

Theory
• Innovation management and system theory for company level.
• System thinking for system description.
• Transition science for description, decomposition and understanding of the transition of socio-technical systems.
• Diffusion economics for quantification of transition results.

Methods and tasks
• Formalization and definition of system (boundaries) with insights from theory.
• Modelling of system (e.g. system dynamics, agent-based).
• Extraction of parameters from empiric data and theory.
• Interviews with experts from industry and policy.
• Differentiation between individual stakeholders (e.g. single supplier or OEMs) and whole sectors/branches.
• Simulation of different scenarios, cases and policies.

Expected outcomes
• Understanding of system and its nature.
• Consequences of specific policies on the system, its stakeholders and policy goals.
• Assessment of industrial policies.
• Assessment of industry’s strategies.
• Recommendations for policy makers and industry to take advantage of transition towards electric vehicles and meeting goals.

Example: Effects of policies on a small electric vehicle enterprise

Case study:
Effects of policy measures on R&D, sales and employment.
Test cases with cost of GBP 5,000,000 each:
• Procurement (100 cars per anno for two years)
• Direct R&D subsidy
Focus on product quality and manufacturing. (Economies of scale, learning curves, etc.)

REFERENCES

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Economies of scale, learning curves, and technology lock-ins.
(e.g. missed diffusion targets, lack of EVs)