



Explaining variance in national electric vehicle policies



Joeri H. Wesseling*

Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE), Lund University, Sweden

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ABSTRACT

Transition studies' understanding of differences in public policy is limited due to its tendency to focus on single-country cases. This paper assesses differences in plug-in electric vehicle (PEV) policies, comprising RD&D subsidies, infrastructure investments and sales incentives, across 13 countries over the period 2008–2014. I explore three conditions that may influence these policy expenditures. Content and statistical analyses show that national PEV policies differed drastically across countries in intensity and orientation, ranging from a focus on supply-side innovation policy to a focus on demand-side environmental policy. The government's role across national political economies only explain differences in PEV infrastructure investments, while the government's PEV diffusion targets for 2020 surprisingly do not correlate with any PEV policy. Economic interest in the car industry shows and explains why car countries focus their policy on technology development, and non-car countries on technology diffusion. These findings enhance the understanding of national policies in transitions.

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1. Introduction

Transition studies have made significant contributions to understanding the complex, multidimensional processes of change from one socio-technical system to another. Such transitions entail co-evolution between industry, technology, markets, policy, culture, infrastructure and civil society (Geels, 2012). An example is the decarbonization of the transport sector. Transition studies have however recently received criticism for having an underdeveloped spatial perspective (Bergek et al., 2015; Markard et al., 2015; Truffer and Battistini, 2015; Truffer and Coenen, 2012; Quitzow et al., 2014). Both within the approaches of Technological Innovation Systems (TIS) and the Multi-Level Perspective (MLP), the geographical context has received little attention (Coenen et al., 2012).

Within TIS studies, national boundaries tend to be used as starting point of the analysis, “without making explicit why these boundaries were chosen and how they affect the findings and the generalizability of the results” (Markard et al., 2012; p. 962). The Multi-Level Perspective equally fails to incorporate the spatial differences in a systematic way, sometimes conflating the conceptual levels of structuration with territorial levels (Coenen et al., 2012). Although various contributions to incorporate the spatial dimensions in transition studies have recently been made (Coenen et al., 2012; Murphy, 2015), more empirical research is needed that explains how spatial context matters in transition processes (Hansen and Coenen, 2014).

Public policy is an important means of organizing the innovation system and influencing transition processes (Borrás and Edquist, 2013; Schot and Geels, 2008; Rotmans et al., 2001; Coenen et al., 2010). Particularly environmental innovations

* Corresponding author.

E-mail address: joeri.wesseling@circle.lu.se

that support sustainability transitions are strongly dependent on public policy support (Stern, 2006; Geels, 2011). Truffer and Battistini (2015, p.2) argue that because many policies supporting innovation and transition processes are formulated at the country level, most transition studies assumed that relevant transition processes would also take place within national boundaries. Such national policies may however differ significantly between countries. Because transition studies have mostly focused on cases in a small number of European countries (Markard et al., 2012), the extent of differences in policy support for innovation between countries has been understudied and perhaps underestimated. To assess these differences in public policy and to reflect on the generalizability of single-country transition studies, this paper analyses policies supporting environmental innovation across a broader set of countries.

Policy making is a highly political process and influenced by various economic and political conditions that affect the legitimacy of public policy as well as its orientation towards supply or demand side measures (Borrás and Edquist, 2013; Schmidt, 2002; Weber and Rohracher, 2012). In the context of sustainability transitions it is relevant to distinguish between innovation policy, which aims to enhance economic growth by stimulating the innovative performance of new and existing domestic industries (Alkemade et al., 2011), and long-term environmental policy, which aims to reduce global and local emissions by for example facilitating the adoption of new, cleaner technologies¹ (Sandén and Azar, 2005). These issues have for a long time been addressed by separate policy regimes (Foxon and Pearson, 2008). Innovation policy focuses on overcoming market failures that relate mostly to the supply-side, through supply-side measures like R&D subsidies (Weber and Rohracher, 2012; Foxon and Pearson, 2008). Environmental policy, on the other hand, focuses on overcoming the demand-side market failure of negative externalities, like unpriced environmental impacts. To internalize these externalities, environmental policy tends to focus on demand-side measures like taxes, sales incentives and standards (Weber and Rohracher, 2012; Foxon and Pearson, 2008). In sum, effective and legitimate policy support for environmental innovations with high-growth potential yield both economic and environmental benefits; these double benefits may be enhanced by including both supply (innovation) and demand-side (environmental) policy measures (Weber and Rohracher, 2012; Foxon and Pearson, 2008; Alkemade et al., 2011).

Transition studies and particularly the TIS literature however do not adequately address the conditions that are influential to policy making (Bergek et al., 2015; Markard et al., 2015), how it affects a focus on innovation or environmental policy, and consequently what the consequences are for technology development and diffusion. To better understand the geographical component of transition processes, I follow the recommendations of Kern (2015) and Markard et al. (2015) in exploring, across countries, how underlying economic and political conditions influence national policy support measures for environmental innovations with a high growth potential.

As discussed in the following Section, the conditions studied in this paper include, first, the effect of the political economic context and how this shapes perceptions about the role of government in terms of the extent and types of policy support measures that are legitimate to apply (Schmidt, 2002; Borrás and Edquist, 2013). Second, it includes how economic interest resulting from the relative size of an established industry shapes innovation policy support. Third, it includes how political commitment to sustainability targets affects environmental public policy support. I quantitatively and qualitatively analyze the role of these economic and political conditions in relation to different types of supply and demand side policy support measures and explore potential other relevant conditions.

Finally, this paper also contributes to the literature on demand-based policy that argues that demand-side policy support measures are underutilized in innovation policy (Edler and Georghiou, 2007; Hommen and Rolfstam, 2009; Edquist and Zabala-Iturriagoitia, 2012), by analyzing how and why supply and demand side policy support measures differ across countries.

The focus of this study is on public policy measures that support plug-in electric vehicles (PEVs). PEVs include battery electric vehicles and plug-in hybrid electric vehicles. They require significant technological and systems change due to their reliance on a drivetrain and infrastructure that are different from the established internal combustion engine vehicle. PEVs are also an important means of reducing local air pollution and, depending on the way the electricity is generated, constitute an important solution for reducing greenhouse gas emissions (Uherek et al., 2010). Since PEVs may replace part of the demand for conventional cars, the PEV and related industries (such as battery manufacturing, infrastructure development and services) have the potential for high-growth. PEV policy support is therefore legitimized from both an innovation and environmental policy perspective. Finally, the automotive industry has been a global industry for decades, underlining the importance of an international, preferably global, perspective. The timeframe of study is 2008–2014 because during this period the first PEVs became available on the mass market (Wesseling et al., 2013), which coincides with the effectuation of policy support for not only PEV development, but also for PEV diffusion (Zhang et al., 2014). Studying the differences in national PEV-support policies and the underlying causes of these differences, thus provides a good case to learn more about the national policy dimension in sustainability transitions.

¹ Long-term environmental policy in this sense resembles that of transitions policy in the context of sustainability transitions, although transitions policy is less applied by policy makers and may be more multi-facetted (Alkemade et al., 2011).

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