



# From government to market and from producer to consumer: Transition of policy mix towards clean mobility in China <sup>☆</sup>



Lei Xu <sup>a,b,\*</sup>, Jun Su <sup>b</sup>

<sup>a</sup> Postdoctoral Research Station, China Merchants Group, Shenzhen 518067, China

<sup>b</sup> School of Public Policy and Management, Tsinghua University, Beijing 100084, China

## HIGHLIGHTS

- This paper shows the change of China's innovation policy mix for the new energy vehicle industry.
- We design a new typology of innovation policy instruments.
- China's policy mix has undergone a transition according to the new typology.
- The transition explains why new energy vehicles have recently diffused quickly in China.
- Rationale and background of such a transition is provided.

## ARTICLE INFO

### Article history:

Received 13 November 2015

Received in revised form

29 March 2016

Accepted 24 May 2016

### Keywords:

Policy instrument

Policy change

New energy vehicle

Typology

China

## ABSTRACT

This paper proposes a new typology that classifies innovation policy instruments into two dimensions: government-selection versus market-selection, and producer-orientation versus consumer-orientation. Such a typology articulates the importance of consumer behavior in the policy design for a transition, and the relevance for the market to select target subjects of policy during the deployment stage of clean technology innovation. We apply this typology to policy instruments of China's new energy vehicle (NEV) industry between 1991 and 2015 in order to explain the industry's rapid growth. The focus of China's policy mix has transitioned from government-selection to market-selection, and from producer-orientation to consumer-orientation. Other than the new typology, this paper traces the entire history of policy transition within China's NEV industry, and finds the transition to be a result of policy learning, thus contributing to future empirical studies of this industry.

© 2016 Elsevier Ltd. All rights reserved.

## 1. Introduction

Faced with the severe challenges of climate change and energy supply shortage, almost every country has been emphasizing clean technology innovation that moves towards sustainability (OECD, 2011). The entire innovation process, comprised of R&D, demonstration, niche market formation and diffusion (Grübler et al., 1999), is confronted with a series of problems (Díaz Anadón and Holdren, 2009; Gallagher, 2013), e.g. costly investment in infrastructure, low capital turnover, lack of political will and conflicts of interest, as well as R&D and market uncertainty. As a result, government policy is necessary for overcoming the associated market and system failures (Weber and Rohrer, 2012). Many countries

have adopted a policy mix consisting of different policy instruments to stimulate clean technology innovation and diffusion (Flanagan et al., 2011). It is crucial to understand the function of policy instruments in the mix so that the government is able to combine policies with complementary function to promote innovation (Borrás and Edquist, 2013; Magro and Wilson, 2013).

There are a good number of studies on the classification of policy instruments in clean technology based on their function. Among them, the following two are most widely recognized: technology-push versus demand-pull, and command-and-control versus incentive-based (Di Stefano et al., 2012; Wachtmeister, 2013). Governments usually adopt a policy mix consisting of both technology-push and demand-pull instruments, or of command-and-control and incentive-based methods (Kivimäki and Virkamäki, 2014; Quitzow, 2015; Veugelers, 2012).

China has also designed a well-crafted policy mix to promote clean technology innovation (Ru et al., 2012; Zhang et al., 2015; Zhi et al., 2014). This paper focuses on the new energy vehicle (NEV) industry in China. NEV is powered by alternative energy other than conventional

<sup>☆</sup>This paper is substantially revised from the one that was included in the proceedings of Portland International Center for Management of Engineering and Technology (PICMET) 2015 Annual Conference.

\* Corresponding author.

E-mail addresses: [sppm.ie.thu@gmail.com](mailto:sppm.ie.thu@gmail.com) (L. Xu), [sujun@tsinghua.edu.cn](mailto:sujun@tsinghua.edu.cn) (J. Su).

gasoline or diesel, and includes hybrid vehicles, fuel-cell vehicles and battery electric vehicles. The Chinese government applies numerous policies to this industry because it provides a platform for opportunities in green transportation, industry upgrades, and even technological leapfrogging (Hao et al., 2014; Howell et al., 2014). The sales of NEVs in China increased from very few in 2008 to more than 330,000 in 2015,<sup>1</sup> making China the largest country in terms of NEV sales in the world.<sup>2</sup> In addition, the growth rates of sales before 2013 were at most 100%, whereas the same figures increased to over 400% after 2014.<sup>3</sup> Two questions thus emerge: What kind of policy mix has China adopted to simulate the growth of the NEV industry at such an unprecedented rate? Why has growth become particularly salient after 2013?

This paper attempts to present a new typology of innovation policy instruments to answer these questions, because conventional typologies are not able to account for the phenomenon, as will be explained in Section 3.1. The new typology categorizes policies as producer-orientation versus consumer-orientation, or as market-selection versus government-selection, which therefore creates a  $2 \times 2$  matrix. The focus of China's policy mix has transitioned from producer-orientation to consumer-orientation and from government-selection to market-selection. This transition may well have resulted in the fast development of the NEV industry.

In terms of theoretical contributions, this paper suggests a new typology of innovation policy instrument, particularly the dichotomy of producer-orientation and consumer-orientation. The conventional demand-pull type or market-formation policy only emphasizes the significance of creating market demand for clean technology with public policy (Gallagher, 2014), but do not touch on the key issue of how to induce potential demand or to uncover the exact determinants of consumers' decisions. Many policies, such as purchase rebates, only leverage economic incentives for consumers and consider their one-time purchase cost, while neglecting other aspects that also influence product adoption. The consumer-orientation view reveals the importance of consumer behavior for policymakers, and an effective consumer-orientation policy instrument must address a range of factors that influence consumers' decision during the entire lifecycle of the product. The dichotomy of market-selection and government-selection underscores the importance of mechanisms to select target subjects of innovation policy (Markard et al., 2012; Schot and Geels, 2008). Market-selection policy is particularly significant because it aims to create an equal environment for innovation to compete, whereas government-selection policy selects targets decided by the government. Market-selection policy may provide consumers with plenty of choices for products and services without government intervention and selection that might be unnecessary or wrong, especially during the deployment stage of innovation.

We analyze policy texts to show China's transition of a policy mix from producer-orientation/government-selection to consumer-orientation/market-selection. The transition is a result of changes in the international and domestic economic environments, the practical experience of previous demonstration and deployment work, as well as requirement of technical progress. It is therefore a policy learning process. Based on our knowledge so far, this paper is one of the few academic works that introduce the policy history of China's NEV industry in detail (Hao et al., 2014; Howell et al., 2014). It contributes to the empirical literature of this industry not only by collecting a complete set of China's policy documents, but also by explaining the rationale and background of the policy change. It will be valuable for future researchers who are interested in this industry.

The article is organized as follows: Based on a literature review of China's current taxonomy of innovation policy instruments, Section 2 proposes two new ways to classify the current innovation policy instruments, which forms the framework of the main argument. Section 3 describes the data and method. Section 4 uses the case study of the NEV industry to illustrate our framework and the policy mix transition in China. We discuss the reasons for the transition in Section 5, followed by concluding remarks.

## 2. Methodology

### 2.1. Two main conventional typologies

Technology-push policy instruments usually include public R&D programs, educational and training investment, government-funded demonstration projects, and enterprise R&D input tax credit. They aim to stimulate supply with new knowledge and reduce the cost of generating innovation. Demand-pull policy instruments, such as intellectual property protection, purchase rebate, public procurement, technology standards and feed-in-tariffs, aim to increase payoff to successful investments in innovation through a variety of measures such as expanding the market size (Di Stefano et al., 2012; Nemet, 2009). Inspired by the theory of innovation economics, the technology-push and demand-pull dichotomy focuses on the process of technical change that is a consequence of science- and technology-based innovation (STI) or learning by doing, using and interaction (DUI) (Mowery and Rosenberg, 1979; Parrilli and Alcalde Heras, 2016).

The command-and-control and incentive-based dichotomy considers how government changes firm behavior. By applying the command-and-control instrument, the government directly intervenes in private activities, imposes obligations on individuals or organizations, and forces individuals or organizations to abide by policy through potential negative consequences. On the contrary, the government provides positive incentives to intentionally induce individual or organizational behavior, thereby creating opportunities rather than obligations to internalize revenue and cost of innovation by applying incentive-based instruments (Park, 2015; Wachtmeister, 2013). This typology can also be similarly labeled as regulatory and economic dichotomy (Bergek and Berggren, 2014).

These two typologies are so dominant that they have generated many variants. Based on the technology-push and demand-pull dichotomy, there is another three-fold typology consisting of upstream investment, market creation and interface improvement, for example, which identifies the interface process between technology and demand (Taylor, 2008). Another triple typology divides innovation policy instrument into supply-side, environmental-side, and demand-side. Environmental-side or institutional-side policy instruments create a favorable competitive environment that stimulate the creation of invention and adoption of innovation (Rothwell and Zegveld, 1985; Steinmueller, 2010). Departing from the command-and-control and incentive-based dichotomy, Park adds information instruments as a third category (Park, 2015). Borrás and Edquist (2013) put forward another similar triple typology, namely, regulatory instruments, economic and financial instruments, and soft instruments.

### 2.2. Producer-orientation and consumer-orientation typology

The previous two main typologies ignore two significant distinctions, which leaves opportunities for more nuanced exploration. Primarily, they fail to emphasize the consumer when attempting to stimulate demand through policy. The technology-push/demand-pull dichotomy emphasizes how to induce firms to innovate truly high performing products by decreasing R&D costs and increasing potential

<sup>1</sup> Data source: China Association of Automobile Manufacturers.

<sup>2</sup> Refer to the report of EV Obsession, <http://evobsession.com/1-4-china-auto-market-2015/>, and <http://insideevs.com/monthly-plug-in-sales-scorecard/>.

<sup>3</sup> Data source: China Association of Automobile Manufacturers.

Download English Version:

<https://daneshyari.com/en/article/7399038>

Download Persian Version:

<https://daneshyari.com/article/7399038>

[Daneshyari.com](https://daneshyari.com)