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Who does what in China's new energy vehicle industry?

Yingqi Liu [a,*], Ari Kokko [b]

[a] School of Economics and Management, Beijing Jiaotong University, Beijing 100044, PR China
[b] Department of International Economics and Management, Copenhagen Business School, DK-2000 Frederiksberg, Demark

HIGHLIGHTS

- Government support is needed to balance the cost advantages of traditional cars.
- Main enterprises owned by state makes hard to balance collaboration with competition.
- The state has established some industry alliances to develop technologies for NEV.
- There is close collaboration within each alliance, but competition between them.
- Private firms fall outside the alliances and rely on foreign collaborations.

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ABSTRACT

This paper provides an overview of the Chinese new energy vehicle industry and discusses the role of state in the industry's development. Chinese policies have aimed to promote the development of new energy technologies and to reduce the consumer price of new energy vehicles. Chinese authorities have also been concerned about the balance between collaboration and competition in the sector, since most key actors are owned by the state. One solution has been the establishment of a number of industry alliances linking auto enterprises, universities and research institutes, to promote both collaboration (within each alliance) and competition (between alliances).

1. Introduction

New energy vehicles (NEVs) – vehicles using non-traditional fuels (ethanol, biogas, biodiesel), electric vehicles, fuel cell vehicles, and various hybrids of these – are of particular strategic importance for China for several reasons. Reducing the dependence on fossil fuels is considered important because of concerns for self-sufficiency and energy safety, as well as environmental arguments related to CO_2 emission and other air pollutants (particular in densely populated urban areas). The development of new energy industries – including not only autos but also wind power, solar power, and cleaner technologies for using China's abundant but polluting fossil fuel, coal – is also strategically important from a technological perspective. China lags behind Japan and the major Western economies in most traditional technology areas, but hopes to close the gap in new sectors, where competitors have not yet been able to establish any strong advantages. To promote the country's strategic objectives, the Chinese government has therefore identified the NEV industry as one of the sectors that qualify for special incentives and public support. For example, the sector is included in the "National High Technology Research and Development Program" (the so-called 863 Program), which is China's flagship program in the strategic high-tech area.

During the last couple of years, China's NEV industry has begun to move from research towards commercialization and mass production. China's first own-brand hybrid cars – BYD's F3M and Chana's Jiexun – appeared on the market between December 2008 and June 2009. By the end of 2010, half a dozen major Chinese auto companies – FAW, SAIC, Dongfeng, Chery, Chana, and BYD – had established commercial production of own-brand NEVs, and many other Chinese firms were investing in the development of various hybrids and electric vehicles (Yang et al., 2010).[1] In addition, foreign companies like GM, Toyota, and Honda were producing their own hybrid models in joint ventures with Chinese partners. The production target for hybrid and pure electric vehicles, formulated in an action plan for the

[1] In addition, there are over 100 companies producing low-speed electric vehicles in China. Most of these are produced for sale in rural areas and do not require registration or a driving license. Many of the producers have diversified into electric cars from electric bicycles—there are more than 2400 producers of electric bicycles in China (Sun Lin, 2010; Zhang et al., 2009). The discussion in the main text focuses on the "conventional" new energy vehicles produced by the main auto companies.

* Corresponding author. Tel.: +86 13501125524; fax: +86 10 51688590.
E-mail address: liuyq@bjtu.edu.cn (Y. Liu).

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auto industry by the Ministry of Science in 2009, stated that production capacity should reach 500,000 vehicles in 2011.

In perfectly functioning markets, it could be expected that the direction of search for new technologies is guided primarily by market signals. Scarce resources have high prices, which stimulate the development of technologies that use the specific resources less intensively or technologies that substitute the scarce resources. However, given that energy markets are imperfect – the prices for fossil fuels do not fully reflect their impact on the environment – it is clear that pure market forces are not sufficient to guide the direction of development in the energy sector: new energy alternatives are more costly than traditional technologies (US Department of Energy, 2007). Policy intervention, e.g. in the form of tax and monetary incentives, is needed to promote both research efforts and the use of new technology (Nakata, 2000; Diamond, 2008; Choi and Oh, 2010).

Numerous questions arise every time policy interventions are used to substitute market forces as guidelines for the development of new technological solutions. An obvious question is "Which kinds of interventions are most efficient?". Other relevant questions are "Who decides which interventions to use?", "Which of several competing technologies should be promoted?" and "How are policies adjusted to take into account new knowledge about market conditions or technological innovations?". These questions are not easy to answer in any political context, but appear particularly difficult in China, where the relatively opaque decision making processes of the one-party state make it hard to trace who influences what. The purpose of this paper is to begin exploring some of the questions by analyzing the interactions between the actors in the NEV industry.

More specifically, the focus is on the interrelations between different parts of the Chinese state. A prominent feature of the Chinese state sector is that it includes many different actors at different hierarchical and functional levels, as well as "hybrid" forms, where public and private ownership are mixed. The next two sections summarize some of the policies in NEV industry and identify the main actors in the sector. Section 4 looks at the interaction between the actors and provides an overview of how responsibility is shared between them. Section 5 focuses the discussion on the problems of interaction between actors in the Chinese NEV industry. Section 6 concludes.

2. The development of the Chinese new energy vehicle industry

The first new energy car model sold in the Chinese market was Toyota's Prius, introduced in 2005. Since that time, the technical capacity of the Chinese NEV industry has developed rapidly. By 2010, nine other new energy passenger car models were available in the Chinese market—about half of them were domestic brands. However, the size of the domestic NEV market is still very small. In particular, private consumers have been discouraged by the high cost of hybrid and electric cars, which are several times more expensive than corresponding traditional car models. For example, in late 2010, when BYD's traditional F3 car cost 59,800 yuan, the hybrid model F3DM had a price tag of 149,800 yuan.

If market demand has not been the main force behind industry's growth, what has then generated the rapid advances in technology? The unambiguous answer is government intervention. The Chinese state has provided various types of support to encourage the actors in the NEV industry to improve their capabilities in order to close the gap with respect to the international technology frontier—in fact, the explicit objective has been to take a lead in new energy technology. It is possible to distinguish three distinct stages of development in the industry's policy environment.

2.1. The first stage, 2001–2009: research on electric vehicles, fuel cell vehicles, and hybrids

The first major steps in the Chinese NEV industry's development were taken in 2001. The 863 Program, the Ministry of Science and Technology's key program for the promotion of strategic R&D, identified NEVs among its priority areas and began to finance projects in this area. During the following 10 years, the 863 Program provided a total of 2 billion yuan to support the research efforts of Chinese car manufacturers, universities, and research institutes.

The 863 Program has provided funding for research on core technologies, key components, and system integration in three "vertical" and three "horizontal" schemes. The "vertical" scheme identified hybrid electric vehicles, pure electric vehicles, and fuel cell vehicles as strategic target products, while the "horizontal" distinction referred to vehicle control systems, motor drive systems, and power battery/fuel cell technologies. A notable point regarding the "vertical" scheme is that it does not include biofuel technology, which has been prominent in the first generation of NEV technology in both Europe and the US—a likely reason is China's limited capacity to produce biofuel in an environment where the agricultural sector is already struggling to meet food production targets.

Most of the leading Chinese auto companies that entered the NEV industry during the following decade received support from the 863 Program. Likewise, many of the leading component producers have taken part in the research projects funded by the 863 Program. The most notable component manufacturers in the NEV industry are battery producers, like Shenzhen Desay Battery Technology, Wanxiang Group, and Shanghai Fuel Cell Vehicle Powertrain.

2.2. The second stage, 2009–2010: hybrid electric and pure electric vehicles for public sector users

The introduction of two prominent policy packages for the NEV industry in 2009 marks a second stage in the sectors policy environment. While the first stage focused on the promotion of R&D, the second stage also included measures intended to establish markets for NEVs. Apart from subsidies to consumers purchasing NEVs, particular efforts were made to promote the adoption of new energy technologies in the public sector. Moreover, the policies gradually took on a stronger focus on hybrid electric and pure electric vehicles: fuel cell vehicles were given lower priority, presumably because of the slower technological progress in that niche.

The first of these policy packages was the "Automotive Industry Readjustment and Revitalization Plan" in January 2009. It included four main components: targets for the development of production capacity, development of technical expertise, R&D resources, and measures to raise demand for NEVs.

The short-term target was to raise the production capacity for NEVs in general to 500,000 units by 2011. The targeted market share of NEVs the same year was set at 5% of total sales. All the main auto companies were encouraged to offer new energy automotive products by that year. On the technology front, the government pledged to provide 10 billion yuan for research during the period 2009–2011, with the aim to develop domestic knowledge and capability in all key areas including motors, battery technology, management systems, and design. To raise demand, the plan mainly included measures to promote use of NEVs in public sector organizations and government agencies in