

Dominik-Christian Wraneschitz

Electric Mobility Development in the Chinese and Japanese Automotive Industry

A Comparative Study of China and Japan

Topic and Research Question

Both China and Japan claim the status of global automotive superpowers, but still face very diverging realities, which lead them to completely different stages of electric mobility development. This thesis aimed at discovering differences and similarities in terms of electric mobility development within China and Japan's automotive sectors, and further evaluated their respective competitive capabilities concerning the ongoing global automotive EV shift.

The main research objective was challenging the common assumptions of Japan being the technological leader, heavily investing in R&D, and China simply being the mass-producer of relatively uncompetitive EVs for domestic use.

The underlying research question upon which this thesis is being constructed has been formulated as follows:

What are the differences and similarities in terms of electric vehicle development within the automotive industries of China and Japan?

Adding onto the overall research question, two additional sub-questions that this thesis will cover, have been formulated. Firstly, *what are technologies that have been focused upon by the respective country*, and secondly, *how these differing approaches relate to China's and Japan's current competitive status regarding EV development*.

State of the Art

There is a variety of different vehicle-types that can be identified as EVs. As for this thesis, the definition of what EV's contain is based on Yamazaki's (2014) categorization of automotive propulsion technologies. He defines four categories of vehicles, that are produced by Japanese manufacturers, (1) conventional internal combustion engine vehicles (ICEVs), that run with fossil fuels, (2) hybrid vehicles, (HEVs and PHEVs), that combine an internal combustion engine with electric engines, (3) battery electric vehicles (BEVs) or fully electric vehicles, that can be operated without the use of fossil fuels, thus emission-free, and lastly (4) fuel-cell electric vehicles (FCEVs), that operate without lithium-ion batteries (Yamazaki, 2014: 155). The literature review further analyses different approaches and factors, that have been used to research the electric mobility shift. The evaluation of the academic discourse on electric mobility analysis showed, that there are four main

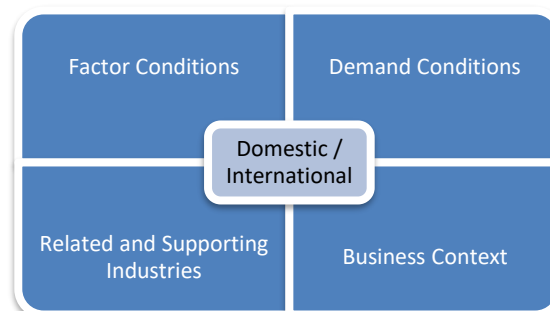
approaches, that are being used for EV-development evaluation: (1) Governmental policy approach, (2) stakeholder approach, (3) Consumer-behavior based approaches, as well as (4) multi-level approaches.

The academic discourse on China's EV market situation is heavily driven by speculations on its potential as mass producer and global EV provider, as well as the importance of governmental policies, five-year plans, and governmental involvement in general. As for the discourse on Japan on the other hand, there is also a notable focus on EV policies, development, and infrastructural development, as has already been observed with China, but publications on EVs in a Japanese context tend to be heavily focused on HEVs rather than BEVs.

Methodology and Approach

The analytical framework of this thesis was based upon Porter's original diamond model, which embodies a main benchmark that finds its influence in numerous related publications. In this model Porter defines four determinants of industry competitiveness: (1) Factor conditions such as the nation's or industry's position in factors of production, such as skilled labor and infrastructure, (2) demand conditions such as sophistication of customers in the home country or market, (3) related and supporting industries, and (4) business context such as conditions for organization of companies and the nature of their domestic rivalry (Porter, 1990).

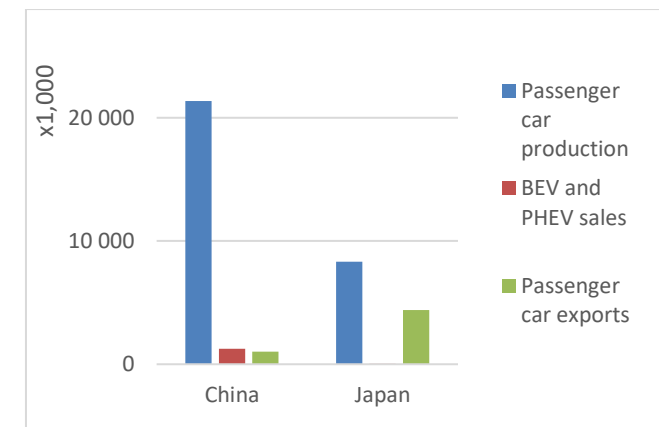
The framework for analysis was mainly based on the revised and adapted version of Porter's diamond model, including domestic and international layers. Additionally, the model was partly modified by extracting relevant EV-specific factors to the frame, such as infrastructure, power and oil generating capabilities, as well as governmental policies.



Source: sources and analysis cited in the study. Author's design.

Main Facts

All four dimensions of the framework show rather extensive differences between the two countries. As for factor and demand conditions, China's enormous power becomes visible in terms of overall passenger car production-capabilities. The country's manufacturers produce nearly three times the number of cars than Japan. In terms of **BEV and PHEV share of sales**, China has already reached around 5% of total sales, whereas Japan has not yet seen any significant rise so far. HEVs are traditionally very strong in Japan, accounting for nearly half of all newly registered passenger cars. Japan does count these as NEVs, whereas China does not.



Source: sources and analysis cited in the study. Author's design.

Both countries differ strongly regarding **export**. Japan exports more than half of its produced cars, Japanese OEMs thus maintain large production facilities overseas, whereas China's export capabilities are fairly low. As far as **infrastructural development** goes, both countries are situated quite well, showing significant improvement over the last years. **Research and Development** differs greatly, as in Japan OEMs tend to contribute largely by their own incentives, whereas in China the government's influence is much more determining.

Results

Although China and Japan are two very opposing countries in many ways, analysis of the EV-shift within their automotive industries was possible. China has been tackling the ongoing EV-shift, and its powerful government is taking on active initiatives. The country's high oil dependency, weak automobile exports,

technological improvement through thriving joint/venture activities contribute to substantial structural changes.

So far, the Japanese government has not promoted the EV-shift towards BEVs, to the same extent. The country's numbers of oil imports remain very high, especially in a post-Fukushima-period. Japanese OEMs follow their own strategic agendas, which makes it difficult for the government to interfere. In terms of infrastructure, the Japanese government has shown enormous commitment, showing that there is significant potential for future BEV use.

The EV-shift has shown its potential for China already. The government is investing heavily in the development of EV capabilities, lithium-ion battery manufacturing, infrastructure, and incentives for consumers. Japan's domestic manufacturers have been heavily relying on their HEV technology. This technology has been seen as a bridge between keeping the system of combustion engines and combining it with partial electrification. A very famous business concept, by Toyota is kaizen (改善), meaning to continuously improving the current situation and processes by setting minor changes, such as to further improvement of efficiency or replacing minor parts for smoother processes, etc. The current situation on the Japanese market perfectly fits this concept, as the herd-effect has not yet led to a collective approach towards BEVs, compared to the situation where this had happened towards HEVs.

References

All references can be found in the full version of the MA thesis available at <http://othes.univie.ac.at/>

About the Author

Dominik-Christian Wraneschitz earned a bachelor's degree in Japanese Studies, and has already spent five years living, studying and working in Japan. He has been focusing his academic and professional career on Japan ever since. Amongst others, he worked in diplomacy, as well as for an international automotive company in Tokyo, where the initial idea for this research topic is rooted.

Contact information:

Dominik.wraneschitz@gmx.at

Examination Date: 23 November 2020

