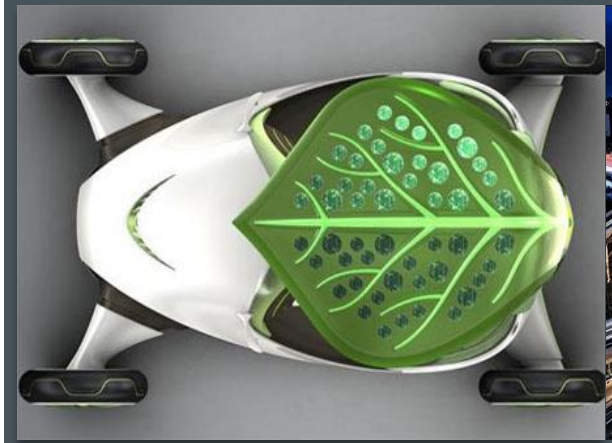
NEW ENERGY PASSENGER VEHICLE MARKET OPENNESS INDEX RELEASE REPORT

Innovation Center for Energy and Transportation (*i*CET)

May 2018



BACKGOUND

In 2012, the State Council officially launched the "Energy-saving and new-energy automotive industry development plan (2012-2020)," stating that pure electric mobility is the main strategic direction for China's auto industry. EV and PHEV sales were targeted at 500,000 units by 2015 (which went down in 2016); by 2020, the target will be 5 million units with estimated capacity to produce up to 2 million units per year.

The rapid development of China's new energy automotive industry is one result of the pro-EV policies made at the national and local levels. China is now transitioning from pilot- and policy-directed development and a more meaningful engagement with industry.

Over 1.5 million new energy vehicles (PEVs, PHEVs) have been sold in China so far, accounting for over 50% of the global market. Between 2015 and 2017, the number of NEV brands doubled and the number of NEV models available in the Chinese market tripled.

Note: As early as 2013, four ministries and committees specified in the "Notice on Continuing the Promotion and Application of New Energy Vehicles" that no obstacles should be imposed on foreign NEVs.

GOAL

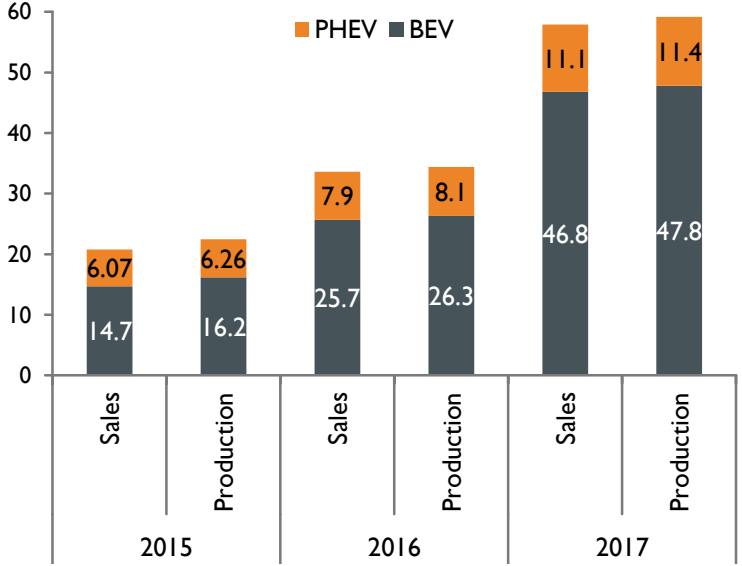
While challenges to NEV commercialization consist of phasing out of subsidies, improvement of product reliability, supply chain development, and charging and after-sale services, **this study focuses on local protectionism.**

By identifying issues that curtail the diversity of NEV models and then issuing recommendations, it is our hope that some of the institutional barriers to NEV commercialization may be lifted.

METHOD

- The NEV Market Openness Index was developed on the basis of conventional diversity combined with penetration indexes, both adopted from biological studies.
- Passenger NEVs are at the focus of this research, based on the way urban diversity is evaluated and ranked.
- Data from 23 Cities and 20 provinces data was considered in the ranking analysis.
- 2015 data is based on license plate registration while 2016-2017 data is based on insurance registrations (cumulated annual sales and production figures are presented in the figure on the right).

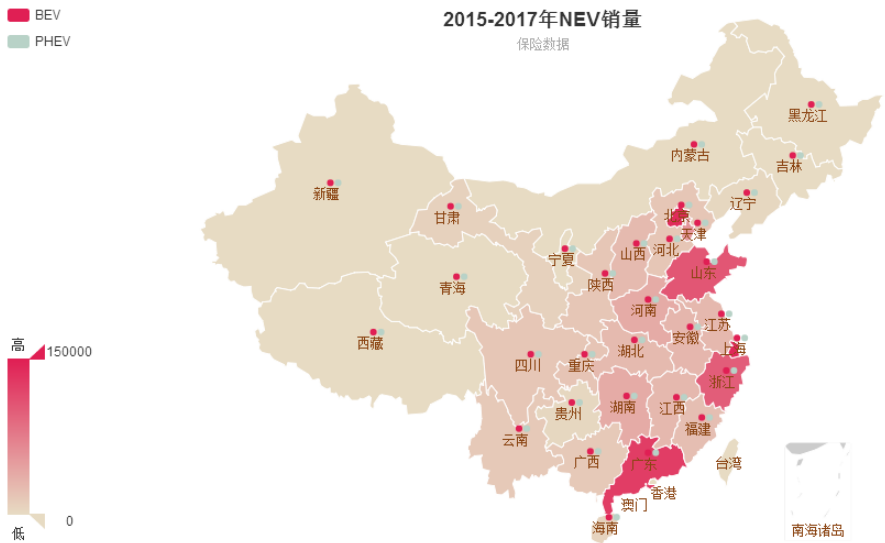
NEV Sales and production in 2015-2017



NEV MARKET AND SHARES DURING 2015-2017

- Shanghai, Beijing, and Guangdong province are ranked as the top three regions in NEV sales between 2015 and 2017, while northeast and northwest regions are below average.
- China's NEV sales in 2017 were 579,000, of which 468,000 were PEVs and 111,000 were PHEVs.

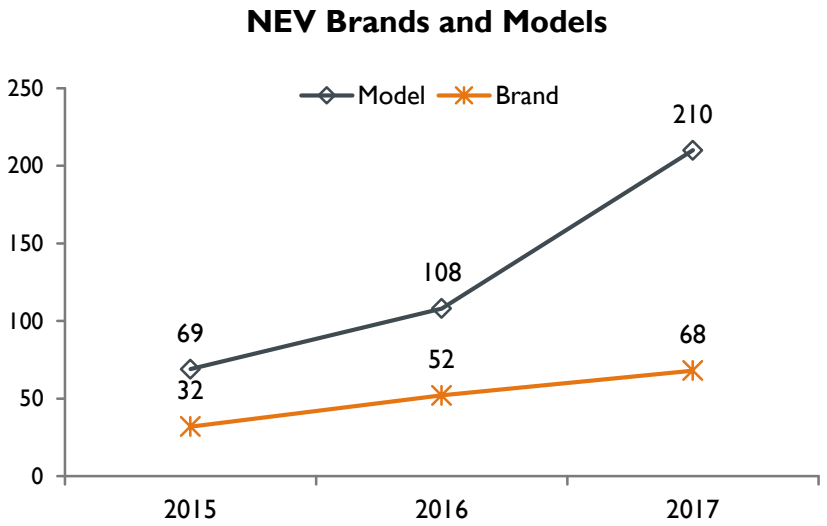
NEV total sales per province/municipality (2015-2017)



Region	*10^4 Volume	Region	*10^4 Volume	Region	*10^4 Volume
Shanghai	14.14	Hubei	2.64	Hainan	0.63
Beijing	13.72	Shanxi	2.64	Guizhou	0.44
Guang-dong	12.52	Fujian	2.38	Liaoning	0.31
Shan-dong	10.60	Chong-qing	1.85	Inner Mengolia	0.11
Zhejiang	9.96	Shaanxi	1.79	Jilin	0.11
Tianjin	5.46	Hebei	1.74	Xinjiang	0.05
Hunan	3.85	Sichuan	1.69	Heilong-jiang	0.04
Henan	3.75	Yunnan	1.45	Ningxia	0.04
Anhui	2.97	Guangxi	1.42	Qinghai	0.02
Jiangxi	2.83	Gansu	0.82	Tibet	0.01
Jiangsu	2.75				

2015-2017 NEV MARKET TRENDS

- The number of NEV brands increased from 32 (2015) to 52 (2016) and, later, 68 (2017)
- The number of NEV models increased from 69 (2015) to 108 (2016) and, later, 210 (2017).
- The number of models sold per brand increased significantly (BAIC and BYD tripled their model sales during this period).
- Some NEV brands have 1-2 models ensuring technology advancements, e.g. Tesla



Brands	2015	2016	2017
BAIC	4	8	14
BYD	3	4	10
Zotye	7	5	7
Chang'an	1	2	7
Chery	2	5	6
SAIC	2	3	5
JAC	4	5	5
Geely	3	3	4
ZD	1	3	4
JMC	2	3	3

NEV Market Openness Index

NEV MARKET OPENNESS INDEX

- The NEV Market Openness Index (and subsequent city/province ranking) assesses the level of local NEV competitiveness based on two indexes: brand diversity and market penetration. The greater NEV models variety and the higher the NEV volume sold in the market, the greater local market competitiveness ("openness"):

NEV Openness Index= NEV Brand Diversity (SW) + NEV Market Penetration (M)

- The Shannon-Wiener index was developed to characterize biodiversity, considering species richness and evenness, is adopted here for

NEV Brand Diversity (SW):

$$SW = -\sum_{i=0}^{n} Pi,j * \ln Pi,j$$

where:

n is the number of brand ***i*** in the area; ***j*** is the city /region;

$P_{i,j}$ is the sales percentage of brand ***i*** in the region ***j*** as portion of total annual sales of NEV;

- NEV Market Penetration (M) represents the coverage of new energy passenger vehicles in the region in the total sales volume of local passenger vehicles:

M = 10 * Passenger NEV Sales volume / Total Passenger Sales in City ***j***

- In this study, the cities with NEV sales > 5000 in 2017 will be taken into ranking, including 23 cities and 20 provinces.

2017 CITY INDEX

Level	Rank	City	SW Score	M Score	NEV Index
1st Tier	1	Tianjin	2.56	1.24	**3.80**
	2	Hangzhou	2.42	1.03	**3.45**
	3	Beijing	2.13	1.10	**3.23**
2nd Tier	4	Guangzhou	2.31	0.39	**2.70**
	5	Shanghai	1.76	0.94	**2.70**
	6	Chengdu	2.49	0.16	**2.65**
	7	Shenzhen	1.70	0.93	**2.63**
	8	Zhengzhou	2.30	0.31	**2.61**
	9	Wuhan	2.23	0.31	**2.54**
	10	Xian	2.29	0.21	**2.50**
3rd Tier	11	Changsha	2.04	0.44	**2.48**
	12	Jining	1.84	0.53	**2.37**
	13	Xiamen	1.70	0.64	**2.34**
	14	Nanjing	1.93	0.32	**2.25**
	15	Weifang	1.28	0.97	**2.25**
	16	Huzhou	1.48	0.64	**2.12**
	17	Qingdao	1.43	0.66	**2.09**
4th Tier	18	Chongqing	1.77	0.21	**1.98**
	19	Ningbo	1.66	0.31	**1.97**
	20	Kunming	1.45	0.35	**1.80**
	21	Hefei	0.85	0.37	**1.22**
	22	Liuzhou	0.32	0.88	**1.20**
	23	Nanchang	0.53	0.64	**1.17**

Note: The greater the SW score, the higher the brand diversity; the larger the M score, the deeper the local market penetration;

2017 PROVINCE INDEX

Level	Rank	City	SW Score	M Score	NEV Index
1st Tier	1	Tianjin	2.56	1.24	**3.80**
	2	Beijing	2.13	1.10	**3.23**
2nd Tier	3	Zhejiang	2.60	0.38	**2.98**
	4	Hubei	2.57	0.15	**2.72**
	5	Shanghai	1.76	0.94	**2.70**
	6	Sichuan	2.54	0.09	**2.63**
	7	Henan	2.34	0.17	**2.51**
3rd Tier	8	Fujian	2.20	0.27	**2.47**
	9	Suzhou	2.31	0.11	**2.42**
	10	Shaanxi	2.29	0.13	**2.42**
	11	Guangdong	2.17	0.25	**2.42**
	12	Shandong	2.03	0.32	**2.35**
	13	Hebei	2.23	0.08	**2.31**
	14	Hunan	2.11	0.19	**2.30**
	15	Shanxi	2.07	0.09	**2.16**
4th Tier	16	Chongqing	1.77	0.21	**1.98**
	17	Yunnan	1.63	0.16	**1.79**
	18	Anhui	1.36	0.14	**1.50**
	19	Guangxi	0.75	0.23	**0.98**
	20	Jingxi	0.69	0.26	**0.95**

Note: The greater the SW index, the higher the brand diversity; the larger the M index, the deeper the local market penetration;

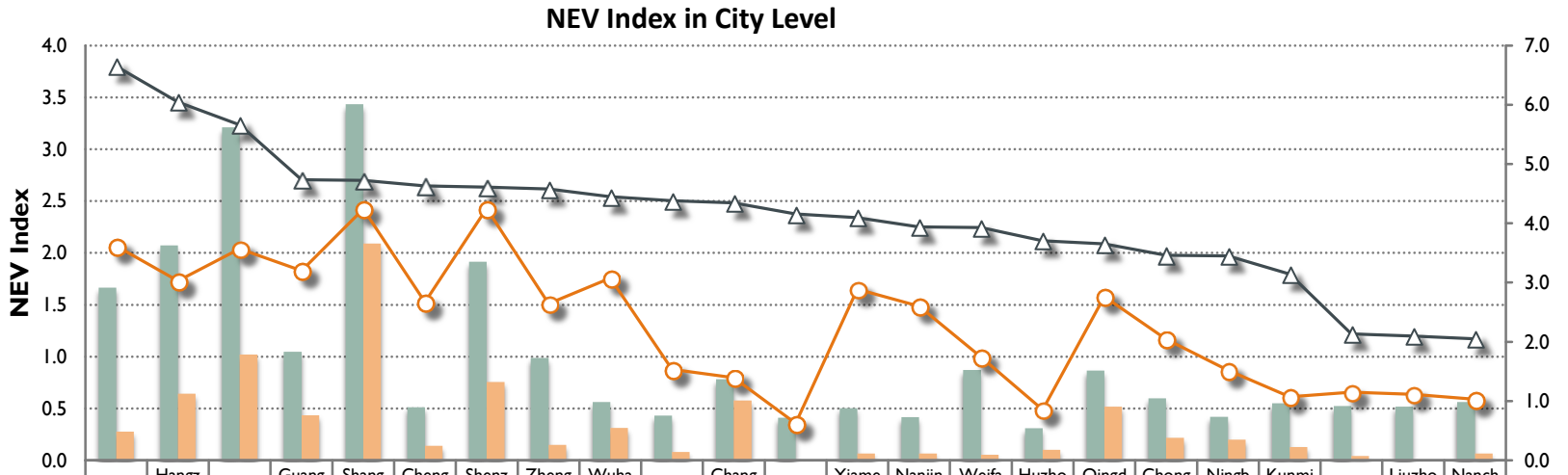
NEV MARKET OPENNESS INDEX

- In 2017, three cities and provinces were listed in the 1st tier. But in 2015, none were listed under the 1st or even the 2nd tier.

Category	2015		2017	
	City	Province	City	Province
1st Tier	-	-	Tianjin, Hangzhou, Beijing	Tianjin, Beijing
2nd Tier	-	-	Guangzhou, Shanghai, Chengdu, Shenzhen, Zhengzhou, Wuhan, Xi'an	Zhejiang, Hubei, Shanghai, Sichuan, Henan
3rd Tier	Shenzhen, Shanghai, Tianjin, Beijing	Shanghai, Jiangsu, Tianjin, Beijing	Changsha, Jining, Xiamen, Nanjing, Weifang, Huzhou, Qingdao	Fujian, Jiangsu, Shaanxi, Guangdong, Shandong, Hebei, Hunan, Shanxi
4th Tier	Wuhan, Guangzhou, Chengdu, Zhengzhou, Xiamen, Qingdao, Nanjing, Chongqing, Hangzhou, Xi'an, Ningbo, Weifang, Hefei, Nanchang, Kunming, Changsha, Huzhou, Jining, Liuzhou	Hubei, Fujian, Henan, Zhejiang, Sichuan, Zhejiang, Shandong, Chongqing, Hebei, Guangxi, Jiangxi, Hunan, Shaanxi, Anhui, Yunnan, Shanxi	Chongqing, Ningbo, Kunming Hefei, Liuzhou, Nanchang	Chongqing, Yunnan, Anhui, Guangxi, Jiangxi

2017 NEV Market Openness Index

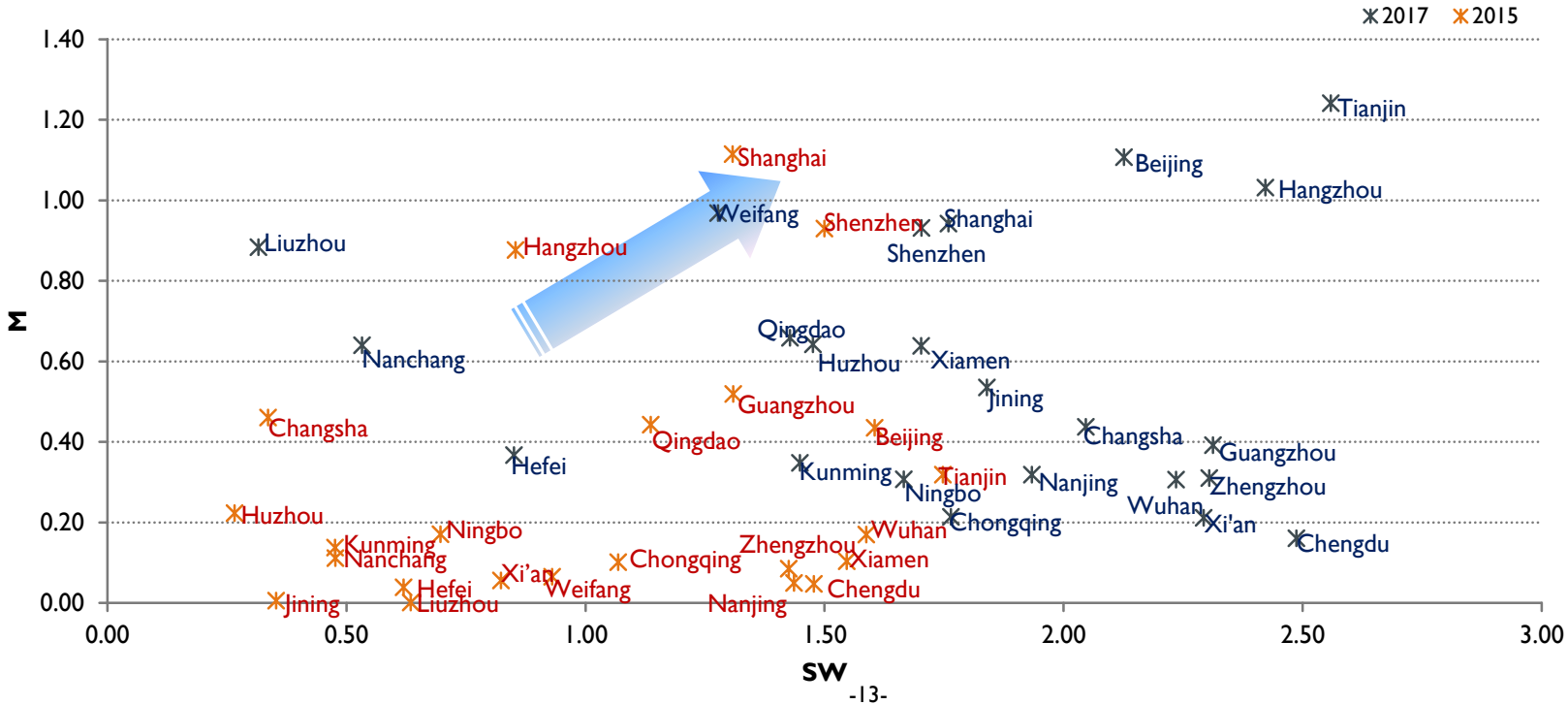
- A total of 23 cities with NEV sales volume > 5000 in 2017 were selected, covering over 75% of the total NEV sales for that year;
- 68 NEV brands were available for sale, while in 12 cities the number of available NEV brands reached just 30;
- Compared with 2015, the year 2017 saw development in NEV diversity, spearheaded by Tianjin, Hangzhou, Changsha, Xian, and Jining.
- Tianjin and Hangzhou are the most open markets in China; while the two cities with most NEV sold, Beijing and Shanghai, ranked as 3rd and 5th. Hefei, Liuzhou and Nanchang are the least open markets.



	Tianjin	Hangzhou	Beijing	Guangzhou	Shanghai	Chengdu	Shenzhen	Zhengzhou	Wuhan	Xi'an	Changsha	Jining	Xiamen	Nanjing	Weifang	Huzhou	Qingdao	Chongqing	Ningbo	Kunming	Hefei	Liuzhou	Nanchang
2017NEV sales volume	2.92	3.63	5.62	1.83	6.01	0.89	3.35	1.73	0.98	0.76	1.37	0.72	0.88	0.73	1.53	0.54	1.52	1.05	0.73	0.97	0.91	0.91	0.98
2015NEV Sales Volume	0.48	1.12	1.78	0.76	3.66	0.24	1.32	0.26	0.55	0.14	1.01	0.01	0.12	0.12	0.10	0.18	0.91	0.38	0.35	0.22	0.07	0.00	0.11
NEV Index of 2017	3.80	3.45	3.23	2.70	2.70	2.65	2.63	2.61	2.54	2.50	2.48	2.37	2.34	2.25	2.25	2.12	2.09	1.98	1.97	1.80	1.22	1.20	1.17
NEV Index of 2015	2.07	1.73	2.04	1.83	2.42	1.53	2.43	1.51	1.76	0.88	0.80	0.36	1.65	1.49	0.99	0.49	1.58	1.17	0.87	0.61	0.66	0.64	0.59
Brands in 2017	42	43	38	37	35	32	36	38	30	32	31	29	28	30	23	26	24	23	21	19	21	23	15

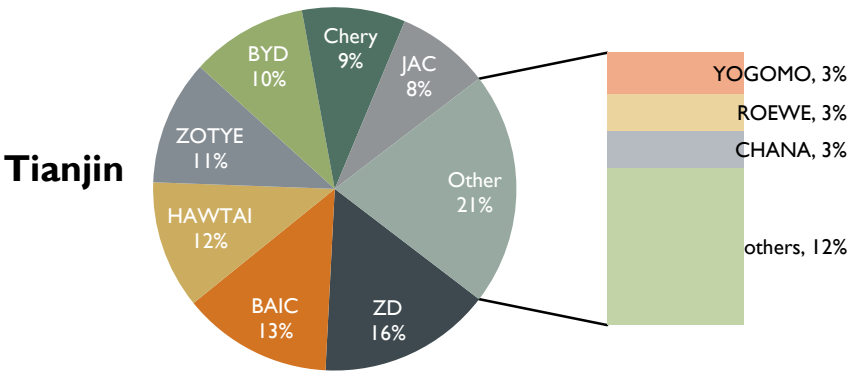
2017 NEV Market Openness Index

- The greater the SW index, the higher the brand diversity will be; the larger the M index, the deeper the local market penetration;
- Cities have been divided into four tires, the cities in the 1st tier performed the best with both high grades on SW and M index; on the contrary, the 4th tier cities were those that did not perform as well.
- In 2015, the selected cities were mostly distributed in the lower left, where the market is less open than the average; in 2017, there was a great shift to the upper right, where the diversity index and market coverage rate all increased;



2017 NEV Index Results Detailed-1st Tier

- **Tianjin is most open city for NEVs:**
  - Tianjin ranked 5th in NEV sales in 2017 (mainly A0/A00 models, e.g. ZD D1/D2, BAIC EC180, Zotye E200, Chery eQ; PHEV account for only 12.4% of sales) .
  - There are nine NEV manufacturers in Tianjin, including BAIC and BYD, a relatively high number.
  - Tianjin puts no obstacles on NEV commercialization. The local directory of NEV models eligibility for tax purposes was only set up in August 2017, requiring non-local auto manufacturers to form a legal local entity. Local government recently announced a plan to convert the city's entire taxi fleet to NEV by 2020.



2017 NEV Index Results Detailed -1st Tier

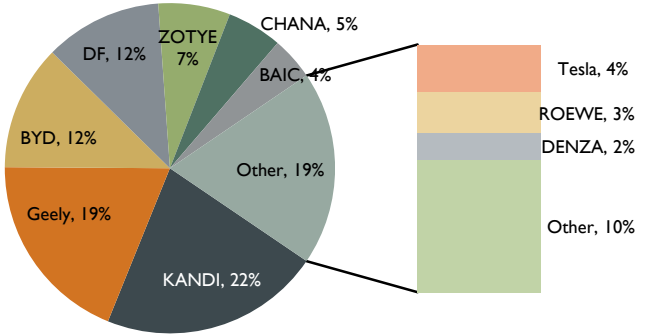
➢ **Hangzhou, the 2nd most open NEV market**:

- From 2015 to 2017 the Hangzhou NEV brand diversity increased from 0.85 to 2.42. NEV brands sells in Hangzhou are relatively evenly distributed, however, the local brand Kandi and Geely still dominate market sales; PHEV account for 16.8% of the NEV market.
- Hangzhou started promoting NEV in its early stages as one of the 13 pilot cities, and Hangzhou initiated its local NEV market beginning in 2009.
- Hangzhou is one of the cities that launched a NEV business (including leasing business) earlier than most cities in China. Non-private passenger vehicles (taxies and car sharing) accounted for 28% of total NEV sales in 2017, mainly for rental and internet service, such as Caocao Express by Geely; meanwhile, BEVs with battery renewal are also available in Hangzhou.

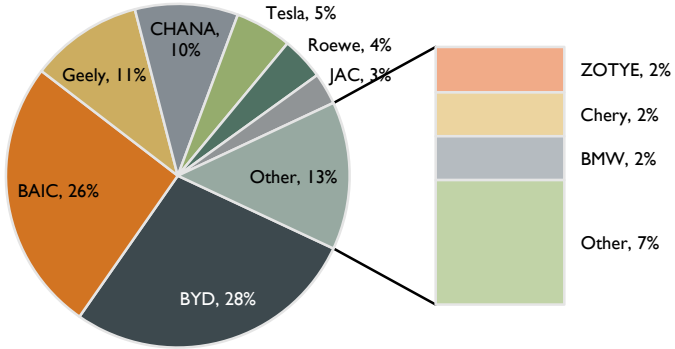
➢ **Beijing, the 3rd most open NEV market**:

- The promotion of NEVs in Beijing was mainly driven by policies, primarily the license registration limit policy enacted in 2010.
- In 2017, the diversity and market coverage of NEVs in Beijing increased significantly compared to 2015 by 1.54 times. The number of NEV brands increased from 16 to 38, and the diversity index increased by 32.5%.
- As a result of the subsidy policy, 89% of Beijing's PEV market is dominated by five brands: BYD 28%, BAIC 26%, Geely 10%, CHANA 10%, and Tesla 5%;

Hangzhou



Beijing



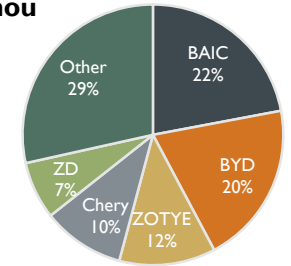
2017 NEV Index Results Detailed -2nd Tier

- **Guangzhou** is one of the first pilot cities for new energy vehicles. It has gradually developed the new energy automobile industry and is now home six NEV companies and a full supply chain of manufacturers. PHEV sales accounted for 16.1%; commercial vehicles accounted for 15.2%. In 2017, the NEV brand diversity in Guangzhou was significantly higher than it was in 2015. The number of brands increased from 14 to 36 while brand distribution remained relatively even. The five brands with the highest sales volume were: BAIC 22%, BYD 20%, Zotye 12%. Chery 10%, ZD 7% (sales for these top five brands accounted for 71% of the total).

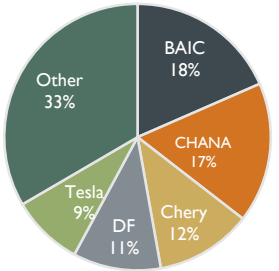
- **Chengdu** is the second largest city in terms of car ownership, but its NEV market coverage is relatively low, and there is still much room for improvement in NEV marketing. In terms of brand diversity, Chengdu has performed well and sales of brands have been relatively evenly distributed. In 2017, NEV top five brands were BAIC 18%, CHANA 17%, Chery 12%, Dongfeng 11%, and Tesla 9%. The proportion of commercial vehicles is 12.6%, dominated by CHANA, Denza and BAIC. Chengdu is actively developing its NEV industry, charging infrastructure and new operating models, and has also introduced a series of incentives, such as purchase subsidies, parking fees, and restrictions.

- **Shanghai** has a local subsidy allocation quota, of which 72% was allocated to non-Shanghai local car companies. However, the index is in the middle and lower levels. In 2017, there were 28 NEV brands in the Shanghai market, with sales topping at 46% for SAIC Roewe, 17% for BYD, 14% for BAIC, 6% for Tesla, and 5% for JAC. Top five brands accounted for 88% of total sales. Non-private passenger vehicles (taxies and car sharing) sales accounted for 20% of the total, with BAIC 42%, SAIC Roewe 24%, and JAC 16%. The main operating platforms are EVCARD and DiDi. As the largest PHEV market in China, Shanghai's NEV vehicle products are mainly PHEVs. In 2017, PHEVs accounted for 60% of NEVs, 66% of which by Roewe and 29% by BYD.

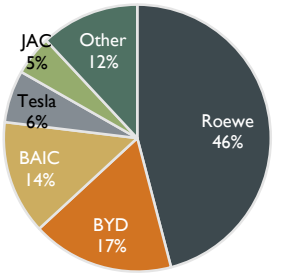
Guangzhou



Chengdu



Shanghai

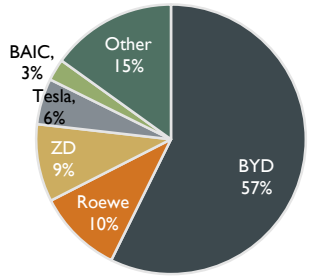


(Reference: https://www.d1ev.com/kol/63328)*

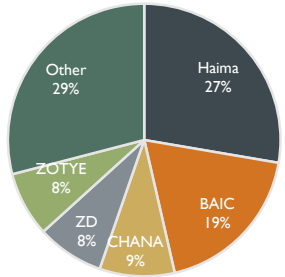
2017 NEV Index Results Detailed -2nd Tier

- **Shenzhen** ranked fourth in NEV sales in 2017, with 30 NEV brands. The top five selling companies were BYD 57%, Roewe 10%, and ZD 9% respectively, Tesla 6%, BAIC 3%; these top five brands accounted for 85% of total sales; BYD's dominance is related to local taxi fleets operations. Preferential policies include purchase subsidies, and it is planned that all taxis will be replaced by pure electric vehicles by 2020 (likely BYD E6);
- **Zhengzhou** NEV is dominated by electric buses, such as Yutong and Shaolin coaches; the development of passenger NEVs is relatively weak. There were 37 NEV brands in Zhengzhou in 2017. On average, the five brands with the highest sales were Haima 27%, BAIC 19%, CHANA 9%, ZD 8%, Zotye 8%, all of which were dominated by A0/A00 models;
- **Wuhan** has a robust traditional automotive industry base. BYD, JAC, Dongfeng, Honda, and NIO Automobile have announced the establishment of a NEV production R&D, following several encouraging policies announced in support of the promotion of NEVs. In addition to purchase subsidies, policies such as toll exemption, public charging exemption fees, and government procurement were introduced. There were 32 NEV brands and although sale volumes weren't high, the market distribution was relatively even. Top five selling companies were Dongfeng Fengshen 24%, BAIC 17%, ZD 12%, Chery 12%, Geely 10% - accounting for 75% of the total sales;
- **Xi'an** had 31 models in 2017, with the top five selling brands being ZD 16%, BYD 16%, Chery 16%, BAIC 14%, and Geely 13% - accounting for 75% of total sales; Adding to purchase subsidies, Xi'an has introduced incentives such as license fees exemption, exemption from the first-time strong insurance, parking and other concessions.

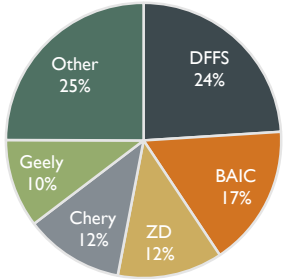
Shenzhen



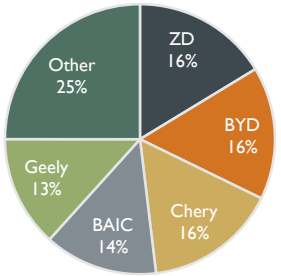
Zhengzhou



Wuhan

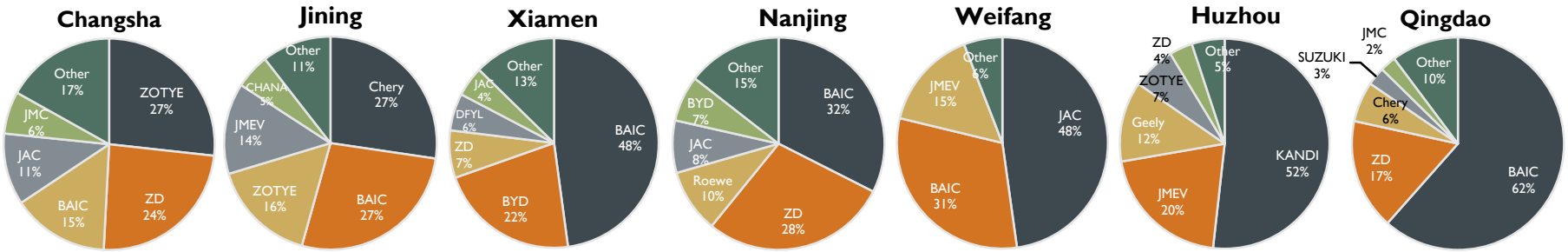


Xi'an



2017 NEV Index Results Detailed-3rd Tier

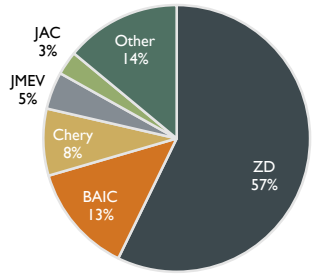
- **Changsha** NEV models are dominated by A0/A00, and NEV brands are 31. The top five sales are: Zotye 27%, ZD 24%, BAIC 15%, JAC 11%, JMEV6%, total sales of top five brands reached 83% of sales; There are 26 Xiamen NEV brands. The sales volume in 2017 was relatively low. The top two brands were BAIC 48% and BYD 22%;
- **Xiamen's** operating vehicles accounted for 22%; BYD 70% and BAIC 15%; Fujian, as the location of the first battery supplier CATL, the largest passenger car customer in the CATL was BAIC New Energy (approximately 1.54 million Kwh was installed in 2017);
- **Nanjing's** five highest-selling brands were BAIC 32%, ZD 28%, Roewe 10%, JAC 8%, BYD 7%, together accounting for 85% of the total sales. Huzhou is one of Kandi's production bases, and Kandi sales accounted for 52% of the city's sales.
- **Huzhou** proposes that the production or sales of new energy vehicles in this city can additionally enjoy municipal or district-level financial subsidies*;
- **Shandong** province's NEV market (e.g. **Jining, Qingdao,** and **Weifang**) is dominated by A0/A00 models, such as BAIC EC180, ZD, Zotye E200, etc.; 23 Jining NEV brands, the highest-selling brands are Chery 27%, BAIC 27%, Zotye 16%, JMEV14%, CHANA 5%, together accounting for 89% of total sales; Qingdao had 24 NEV brands, dominated by BAIC 62%, followed by ZD17%; Weifang had 21 NEV brands, dominated by JAC 48%, BAIC 31 %, and JMEV 15%.



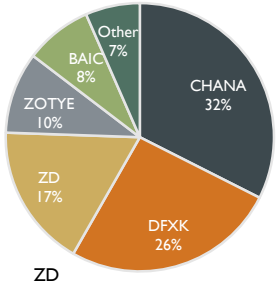
2017 NEV Index Results Detailed -4th TIER

- **Six cities are in the 4th tier of the NEV diversity index**: Ningbo, Chongqing, Kunming, Hefei, Nanchang, and Liuzhou – their market coverage and brand diversity are all relatively low;
- **Ningbo** had 30 NEV brands in 2017, and the highest sales volume was of ZD (57%), with one-third for commercial use and lease; Local top five brands accounted for 86% of total sales; Geely initiated a new base in Ningbo in 2015; In 2016, Geely launched a NEV collaboration with Volvo.
- **Chongqing** had 27 NEV brands, producing mainly A0/A00 models. The top five brands sold were CHANA 32%, DF Xiaokang 26%, ZD 17%, Zotye 10% and BAIC 8 %, accounting for 93% of sales. Chongqing's NEV industry is mainly supported by traditional infrastructure, such as manufacturers (CHANA and DF).
- **Kunming** had 21 NEV brands with distributions of 45% for BAIC and 36% for CHANA. Kunming was one of the NEV pilot cities; Kunming is planning to build up a new base for JMEV in 2018.

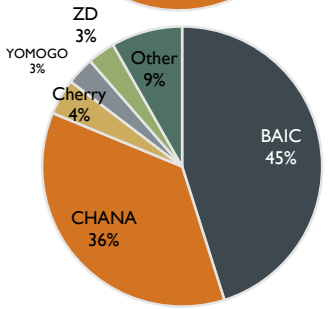
Ningbo



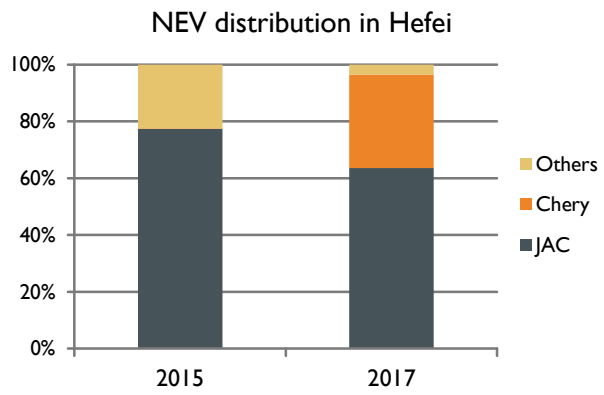
Chongqing

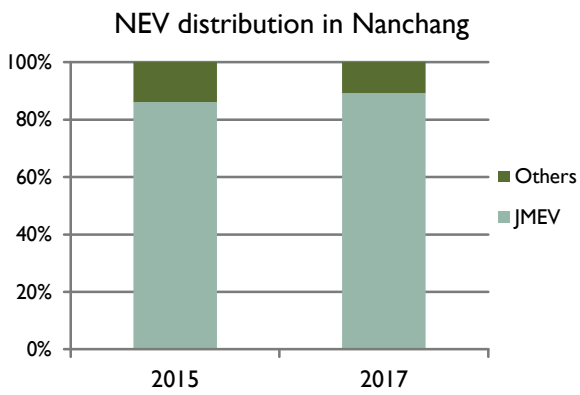


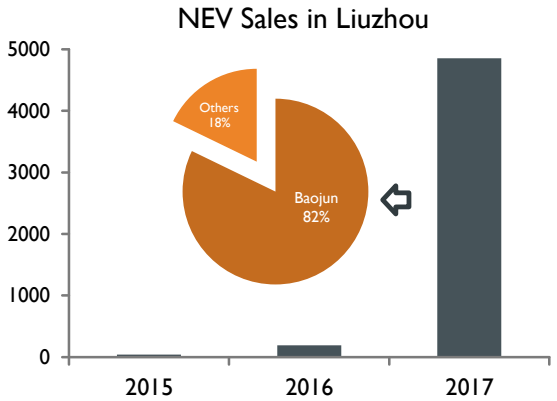
Kunming



2017 NEV Index Results Detailed -4th TIER





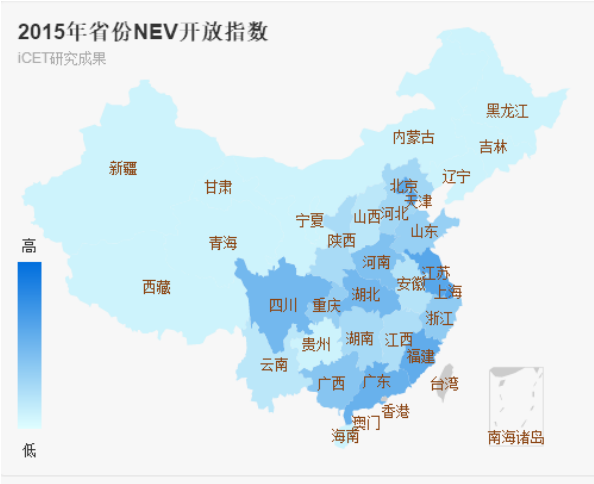


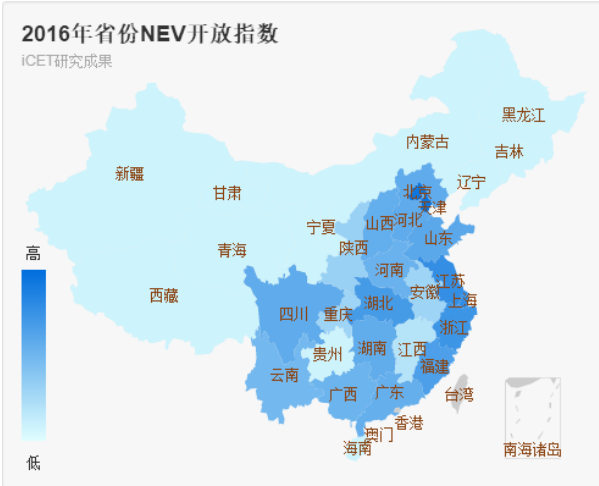
- **Hefei** NEV sales in 2017 was dominated by brands JAC and Chery by 97%, while in 2015 JAC brand sales accounted for nearly 80%; JAC Automobile is headquartered in Hefei and Chery Automobile is headquartered in Wuhu.
- **Nanchang** city launched a series of policies for the development of new energy vehicles, such as unlimited number of driving and parking fees. There are a series of preferential policies yet strong protectionism exists as well. In 2016, the Nanchang Finance Bureau announced the promotion and application of provincial-level subsidies for new energy vehicles. 17.75 million yuan, of which Jiangling Motors Co., Ltd. received 17.29 million yuan; Jingma Motor Co., Ltd, a subsidiary of Jiangling Motors Co., Group received a grant of 360,000 yuan.*
- **Liuzhou**, one of the top five automobile cities in China, is the sole manufacturing base of FAW, Dongfeng, SAIC, and CNHTC. In 2015-2016, NEV sales were scarce and only in 2017, under Guangxi Province plans, sales volume climbed to nearly 10,000 vehicles. The "government-enterprise linkage" mechanism includes the construction of charging infrastructure and formation of favorable policies for NEVs yet does not create brand diversity.

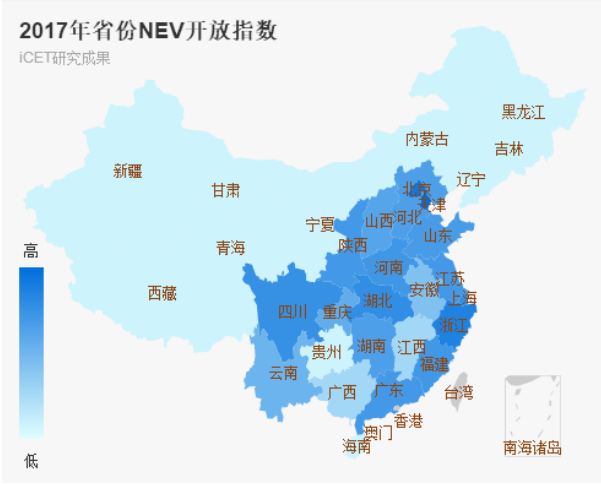
*refer to http://finance.china.com.cn/roll/20170222/4107804.shtml

NEV DIVERSITY INDEX GEOGRAPHICAL TRENDS

- In this study, 20 provinces with sales of NEV passenger cars >5000 in 2017 were selected for analysis.
- The NEV market has been improving in its openness from 2015 to 2017, with the index increasing from 1.38 to 2.33;
- The level of diversity of NEVs in the western and northern regions is relatively low;
- Central region shows more rapid change, likely because of its well established NEV industrial clusters.



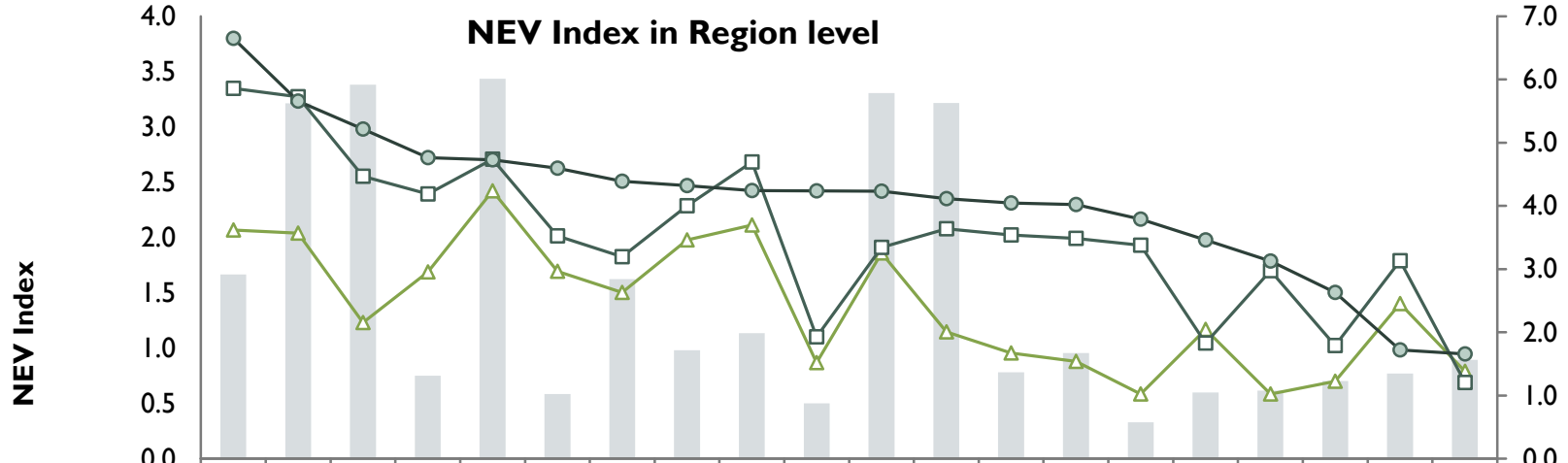




Source：Insurance data collected and analyzed by iCET

NEV Market Openness Index Trends 2015-2017

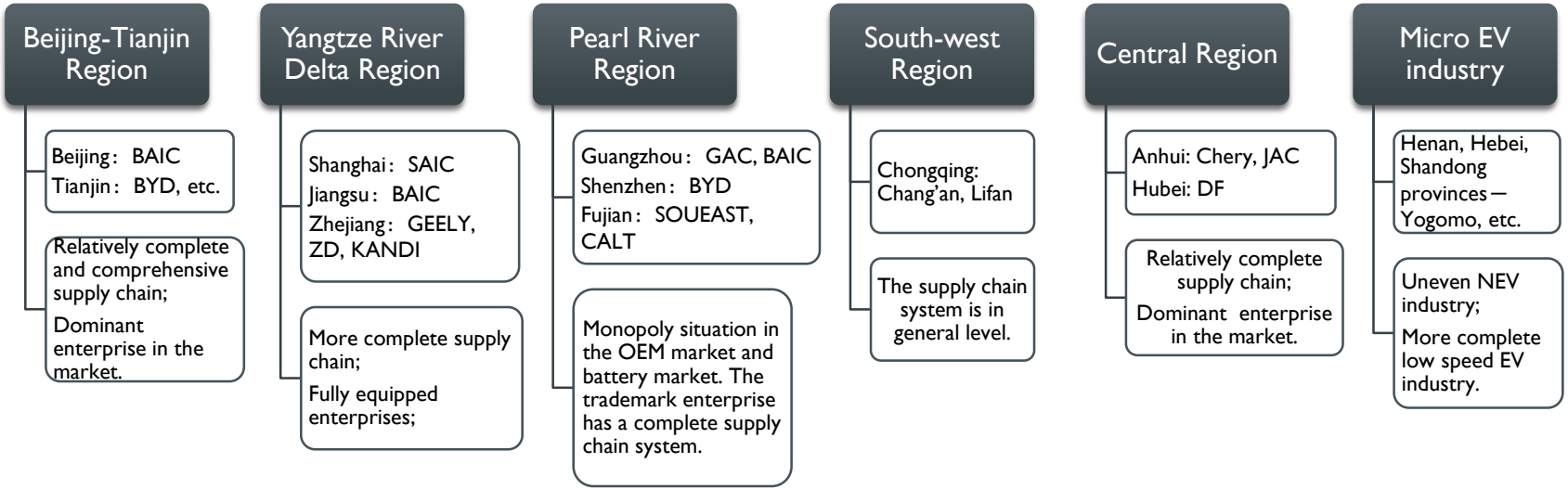
- In 2015, the average index score was low; the provinces with the highest diversity index were Jiangsu, Guangdong, Shanghai, and Hubei.
- In 2016, scores have improved; provinces with the highest scores were Zhejiang, Jiangsu and Tianjin.
- In 2017, the diversity index continued to improve, with over six provinces suppressing 0.5: Zhejiang, Guangdong, Jiangsu, Tianjin, Henan, and Shandong;
- From 2015 to 2017, Hebei, Hunan, Shanxi and Zhejiang Provinces have all improved their NEV's diversity, which can be directly linked to policies.



	Tianjin	Beijing	Zhejiang	Hubei	Shanghai	Sichuan	Henan	Fujian	Jiangsu	Shanxi	Guangdong	Shandong	Hebei	Hunan	Shanxi	Chongqing	Yunnan	Anhui	Guangxi	Jiangxi
NEV Sales Volume of 2017	2.92	5.62	5.92	1.31	6.01	1.02	2.84	1.71	1.98	0.87	5.79	5.63	1.37	1.67	0.58	1.05	1.08	1.23	1.35	1.56
NEV Index of 2015	2.07	2.04	1.23	1.69	2.42	1.69	1.50	1.98	2.11	0.87	1.86	1.15	0.96	0.88	0.58	1.17	0.58	0.70	1.40	0.79
NEV Index of 2016	3.35	3.27	2.55	2.39	2.71	2.01	1.83	2.29	2.68	1.10	1.91	2.08	2.02	1.99	1.93	1.05	1.70	1.02	1.79	0.69
NEV Index of 2017	3.80	3.23	2.98	2.72	2.70	2.63	2.51	2.47	2.42	2.42	2.42	2.35	2.31	2.30	2.16	1.98	1.79	1.50	0.98	0.95

NEV DOMINANT CLUSTERS

Local protectionism is meant to promote local NEV development and protect local manufacturers. Although China's NEV supply chain continuous to grow, a regional concentration can be observed. **Major NEV players can be clustered into the following groups:**



Review of China's NEV Policy Environment

NATIONAL POLICIES

China's advocating for NEVS began in 2009 with the "Ten cities, Thousand cars" project. In 2014, the State Council, the Ministry of Science and Technology, the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Transport, and the State Administration of Taxation introduced policies that promoted the development of the NEV industry.

Phase	Period	Aim	Content
Blueprint	2007-2009	Recover economy	Came up with blueprint for strategic industry in future 10 years.
Trial Test	2009-2010	Support NEV development with subsidies	Initiated via public service in 13 cities for NEVs promotion.
National Promotion	2011-2013	Control air pollution by stimulating NEV development	Expand trial cities to the whole country for NEV promotion; launched national subsidy strategy and tax waiver.
Fast Development	2013-2015	Continuation of NEV development, along with consideration of size effect and technology advancement; subsidies begin to wane	Initiated the tax-free and subsidy waning strategy for the NEV industry.
Post-subsidy	2016-2020	Keep NEV industry development stable. Policy was replaced by market which became the dominant factor in NEV development.	A new subsidy system was developed with the gradual decline of waivers and subsidies for NEVs. Subsidy strategy turns to be refined in consideration of manufacturing cost, size effect and technology advancement by 2020.
Market era	2017-present	Established market scheme and encourage technology development	Established "Dual Credit Scheme," led manufacturers to NEV production; encouraged technology upgrades by drawing a blueprint for NEV development.

NATIONAL NEV MODEL PRODUCTION AND SALE ELIGIBILITY

NEVs can be sold in the market once they have met the following national requirements:

Other requirements:
《Standard of automobile dynamic battery》
《Certificate of fossil fuel consumption》 (PHEV required)
…

Sale & Subsidy

- 《Category of encouraged NEV brands》
- 《Category of NEV with tax waiver on purchase》
- Other local categories

Eligible for national NEV subsidy:
404 for passenger vehicles, 361 for BEV, 43 for PHEV;

Waiver for automobile purchase tax
593 in total, 516 for BEV, 87 for PHEV

《Beijing pilot NEV on record》
《Shanghai NEV record information table》
…
Required to be deleted in the new regulation released in 2018

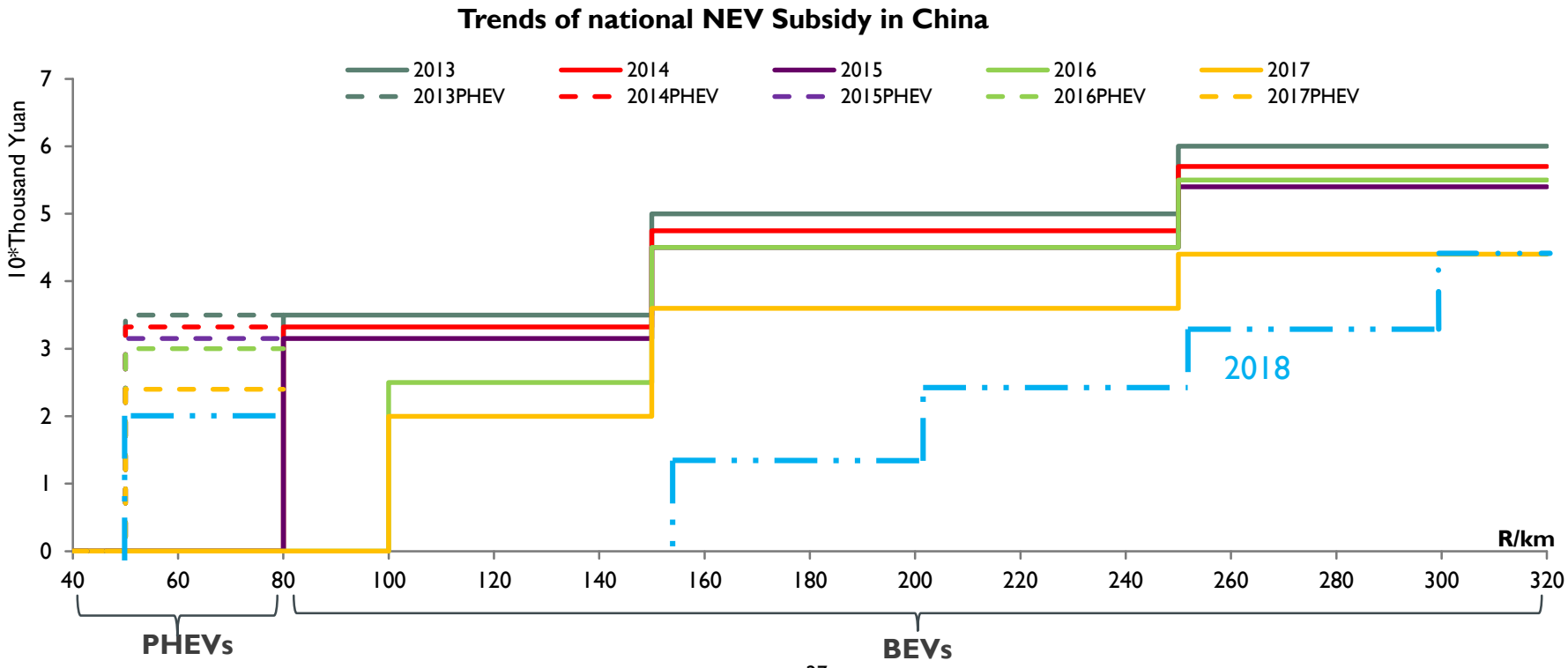
Manufacture

- 《Announcement of on-road automobile manufacture and product》
- 《Issue on corporative investment standard and record management》
- 《Issue on New-established NEV corporation management》

Application of NEV manufacture will be approved after publicity

SUBSIDY REVIEW

- NEV subsidies in China are being phased out beginning in 2013.
- From 2017 onwards, specifications such as battery intensity and energy consumption have been required for subsidy eligibility.



Local Strategies

Apart from national policies, there are local policies, including economic (subsidy on tax, charging, parking, etc.) and regulatory (local category, limitation on traffic, etc.). These vary between cities, as this tables indicates.

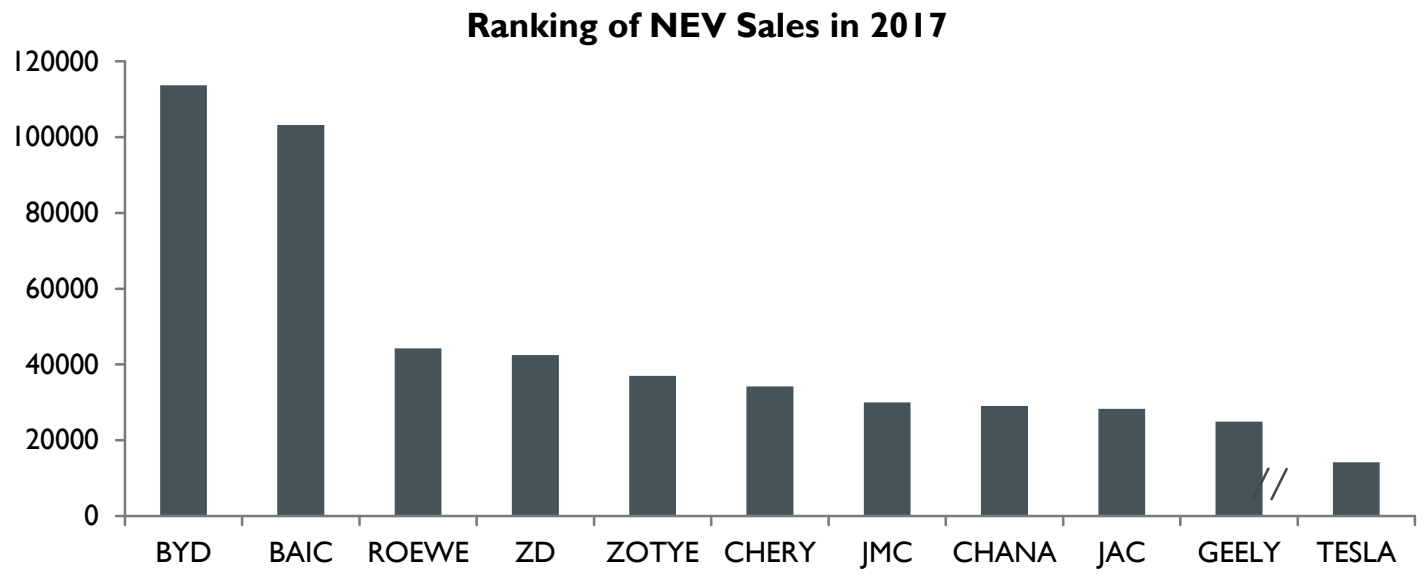
	Shanghai	Shenzhen	Hangzhou	Guangzhou	Wuhu	Lanzhou	Xiangtan	Qingdao	Changsha	Beijing	Tianjin	Linyi	Haikou	Zhuzhou	Huzhou	Yichun	Wuhan	Ningbo	Kunming	Xi'an	Nanchang	Chongqing	Xiamen	Taiyuan	Zhengzhou	Nanjing	Chengdu	Heifei	Nanton
BEV purchase subsidy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
PHEV purchase subsidy	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
Vehicle and vessel tax reduction	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Free parking		✓														✓				✓	✓			✓				✓	
Charging preferential	✓	✓	✓		✓					✓	✓						✓				✓								
Subsidy for vehicle replacement					✓															✓				✓					
Compulsory insurance reduction																				✓									
Personal charging pole purchase subsidy												✓																	
Public charging infrastructure construction subsidy	✓	✓	✓	✓	✓						✓	✓		✓	✓		✓			✓	✓	✓	✓		✓		✓	✓	
Parking lot																✓				✓									
NEV plate	✓	✓	✓	✓						✓	✓																		
No Traffic restriction						✓				✓	✓						✓				✓						✓		

local NEV strategy (part), refer to <Evaluation of local NEV incentive strategy in China> from ICCT

Characteristics of Selected NEV Brands

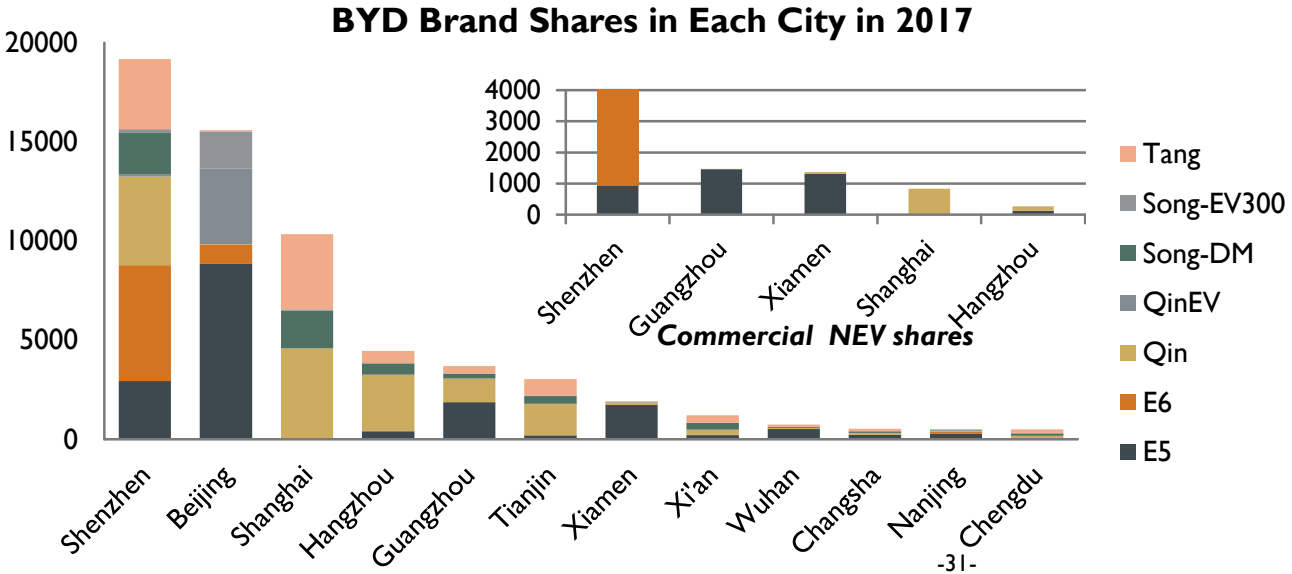
ANALYSIS ON NEV SALES BY BRANDS

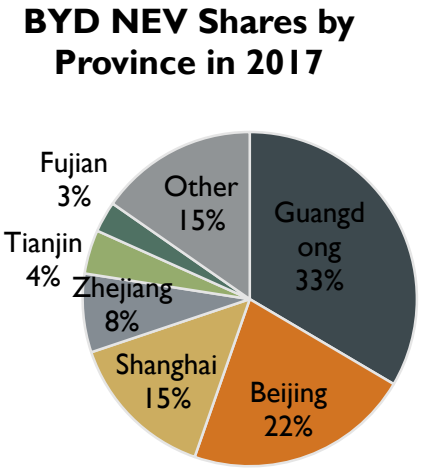
- NEV brands are categorized by various promotion strategies in different regions with local characteristics.
- 2017 sales data for 10 domestic and 1 imported brand were selected for analyzing characteristics of typical NEV branding development in light of local policies.



BYD

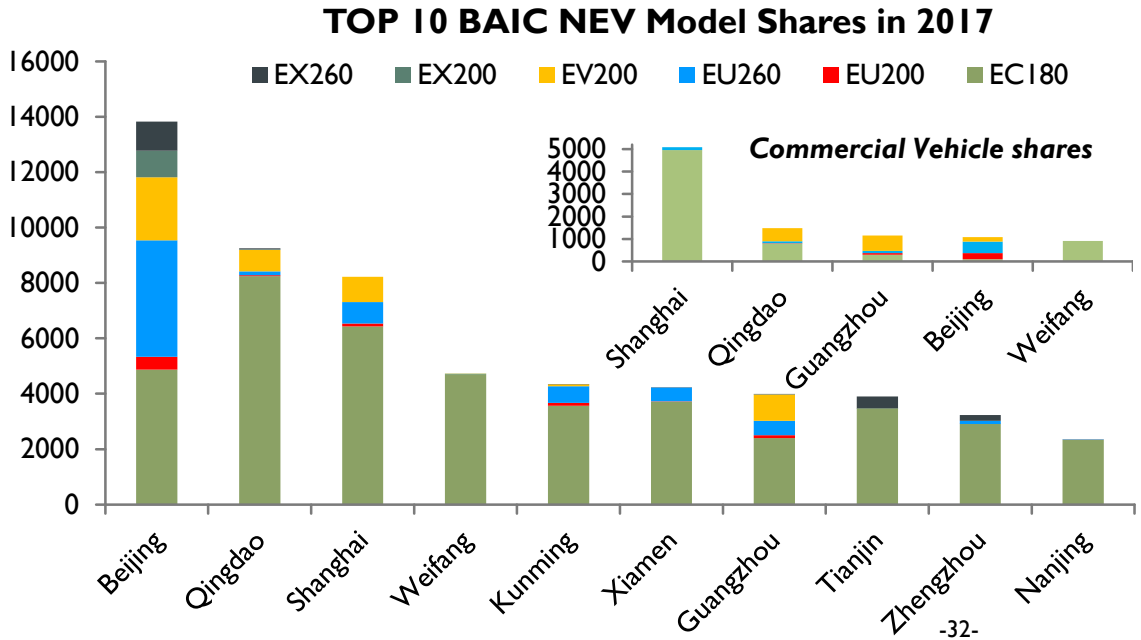
- BYD is one of the earliest domestic NEV manufacturers, and has its own battery IP and manufacturing (the company got its start by producing batteries).
- BYD ranked first in sales of domestic passenger cars in 2017, selling 7 models (3 PHEVs and 4 PEVs). 70% of the company's sales are in Guangdong, Beijing, and Shanghai.
- The company's PEVs are mainly distributed in Beijing, led by the E5 and Qin EV300; PHEV were more common elsewhere, with the majority of demand from Shanghai, Shenzhen, and Hangzhou.
- 15.7% of BYD's total vehicle sales are for leasing operations, of which 54% are in Shenzhen (e.g. E6).

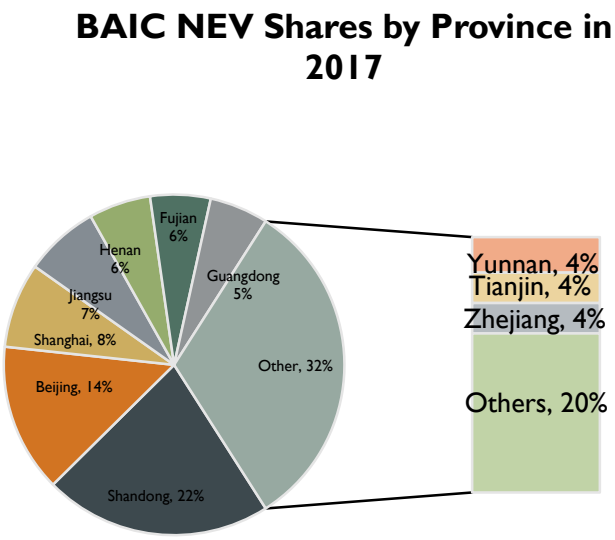




BAIC

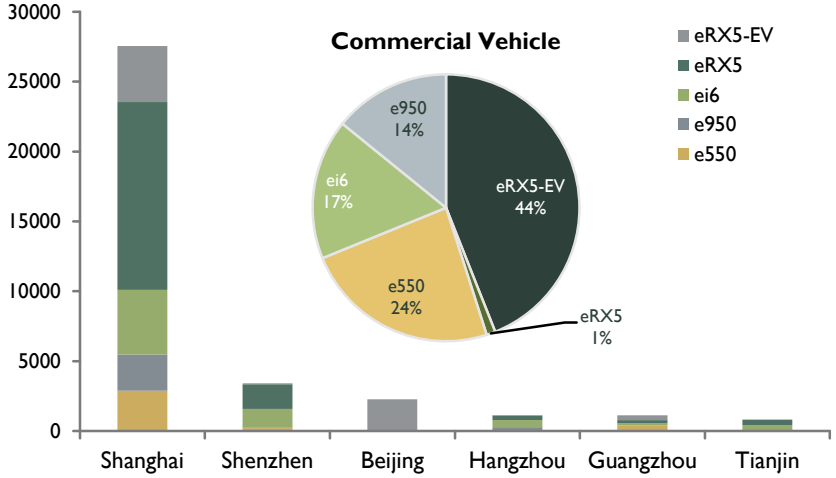
- The distribution of BAIC's 10 top selling models (>500 units) is illustrated in the below figure.
- EC180 was the flagship EV model of BAIC in 2017, accounting for 76.9% of the annual sales of BAIC's EV segment.
- 12% of the total BAIC EV sales were for leased, with EC180 taking up to 73.5% of that total.
- EC180 eligibility for subsidies will be dramatically reduced in 2018 under the new subsidy rule.





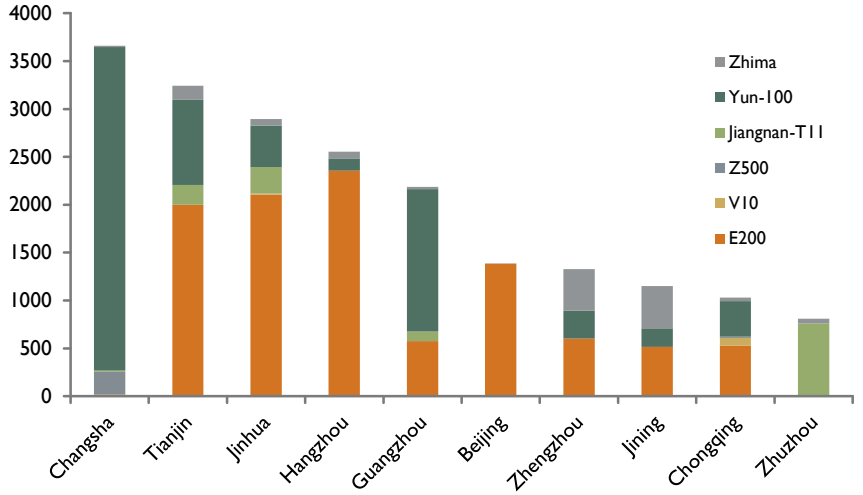
SAIC & ZOTYE

TOP 6 Roewe's Brand Share in 2017



- SAIC is also one of the earliest companies to manufacture NEVs.
- Roewe is SAIC's leading NEV series, accounting for 68.5% of sales; 10.7% of its sales are for rental business - mainly eRX5EV, PHEV models e550, e950 and ei6.
- SAIC Roewe series includes 5 NEV models, of which 4 are PHEVs and 1 is BEV.
- eRX5BEV (PEV) is concentrated in the Beijing area, while cities such as Shenzhen and Hangzhou are dominated by PHEV.

TOP10 Zotye's Brand Shares in 2017

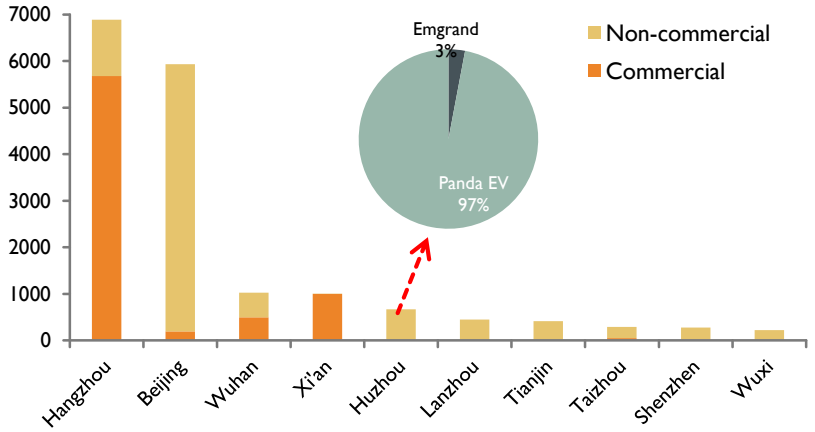


- Zotye is one of the earliest Chinese enterprises involved in the new energy automotive industry, with manufacturing bases in various locations (often through JVs e.g. Ford and Zhidou): Zhejiang, Hunan, Jiangsu, and Shandong Province.
- Zotye plans for NEV to account for 60% of its manufacturing by 2020.
- Zotye's flagship models in 2017 were Cloud (Yun) 100 and E200.

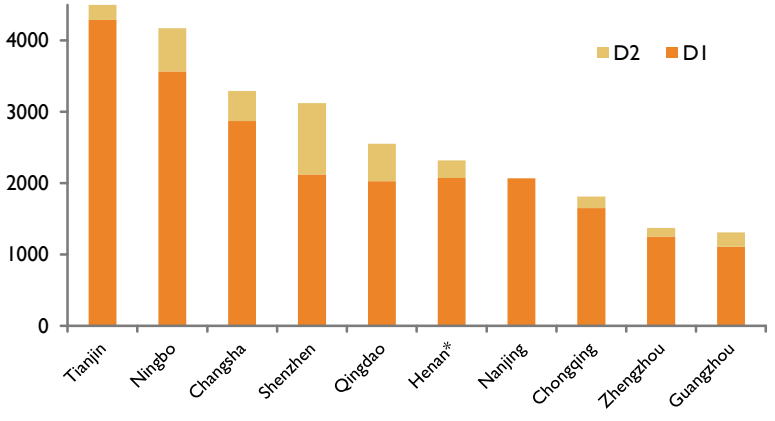
GEELY & ZD

- The flagship brand of Geely in 2017 was Emgrand EV300, which accounted to 99.54% of its total sales in China. In Beijing, the EV300 is mainly sold as a private vehicle models, while in Hangzhou it is sold for commercial services or taxi businesses.
- Caocao Express, a taxi-hailing app with investments by Geely, has used Hangzhou as its headquarter. By Jan. 2018, Caocao Express has expanded to 17 cities in China, with 12,000+ Emgrand NEVs available through its platform.
- D1 and D2 are two flagship models promoted by ZD that entered the national NEV promotion catalogue in December 2017, however, middle-size cities and towns make up the priority markets for these vehicles.

TOP 10 Geely's Brand Shares in 2017

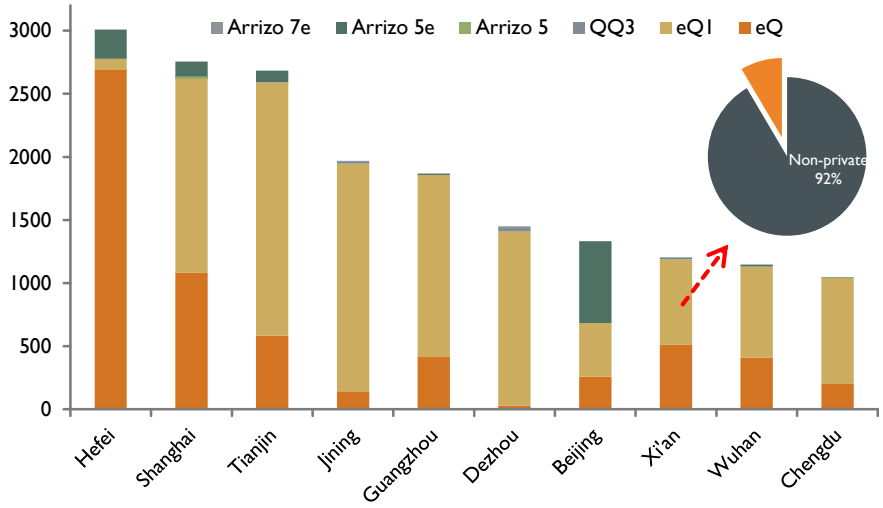


TOP 10 ZD's Brand Shares in 2017



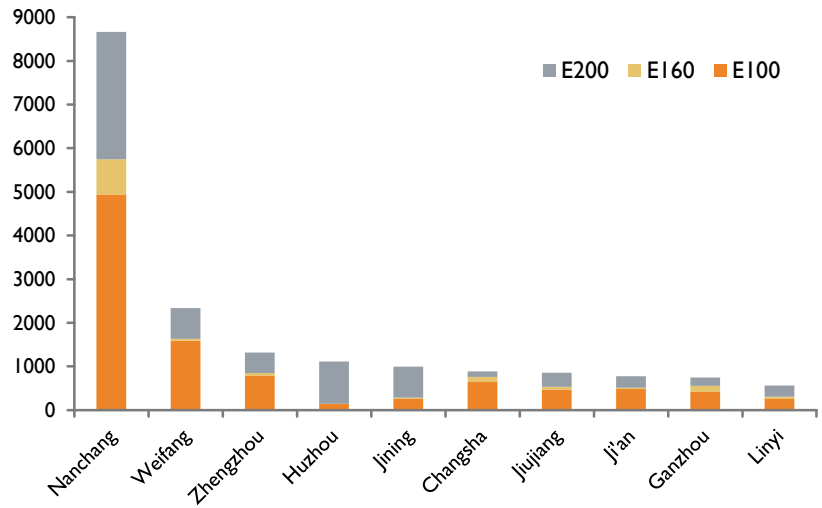
CHERY & JMEV

TOP 10 Chery Brand Shares in 2017



- Chery NEV, China's 4th NEV model to be domestically produced, is rather evenly distributed across different cities, with the eQ and the eQ1 the most popular models in mid-size cities.
- 92% of Chery NEVs (mainly eQ and eQ1) are sold for commercial purposes. For example, Xi'an (92% of rental) and Shanghai (79% of time sharing, e.g. EVCARD and Gofun).

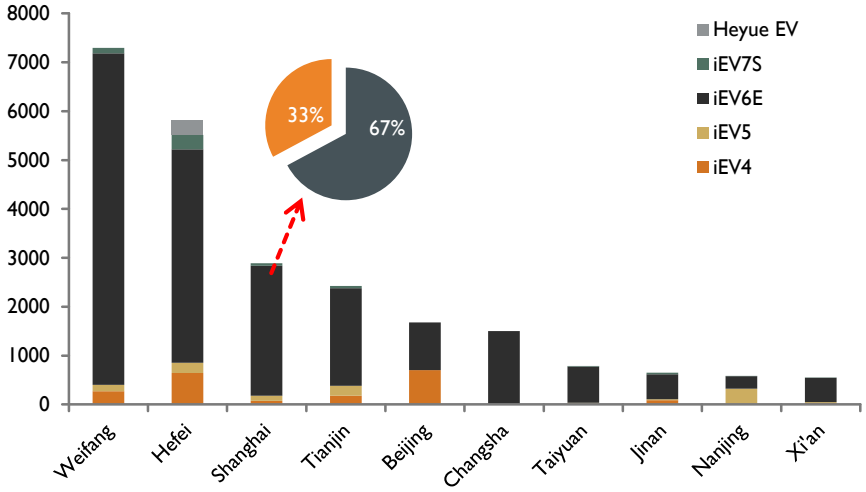
TOP 10 JMEV Brand Shares in 2017



- JMEV, China's 7th NEV model to be domestically produced (in 2016), was established in 2015.
- A majority of JMEV models are for non-commercial use, and are A0/A00-class vehicles for towns and small cities.
- JMEV is highly dependent on local policy and support, therefore its sales are concentrated around Nanchang, where the manufacturer is located.

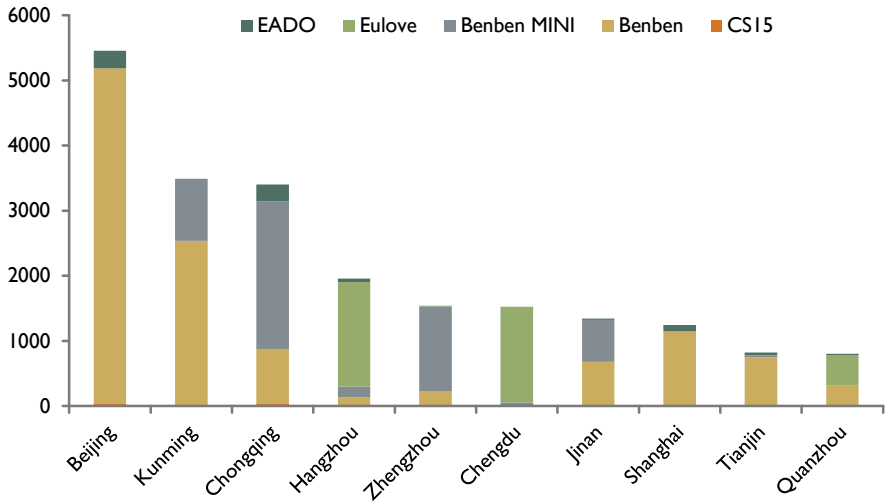
JAC & CHANA

TOP 10 JAC Brand Shares in 2017



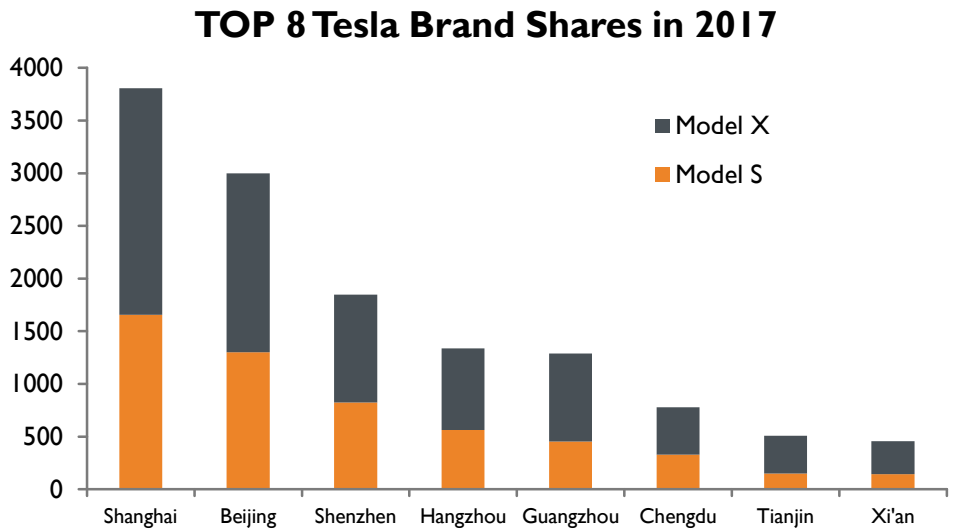
- JAC NEVs were sold in 11 provinces/cities in China by 2017.
- 67% of JAC NEVs are commercial vehicles sold in Shanghai. The promoted models were adopted by several car-sharing platforms, such as Gofun, EVCARD, etc.
- The flagship model of JAC in 2017 was iEV6E, accounting for 90% of total sales, most of which were distributed in Weifang, Shandong province and Hefei, Anhui province.

TOP 10 CHANA Brand Shares in 2017



- CHANA New Energy Automobile produced primarily A0/A00-class NEV models for private use; its flagship models of CHANA in 2017 were Benben and Benben mini, mainly sold as private vehicles.
- As the headquarter of CHANA Auto, Chongqing's NEV market was dominated by CHANA's models; Shanghai, Hangzhou and Chengdu are small markets for the brand.
- CHANA released its Shangri-La Plan in 2017, aiming for NEV to be 100% of its production by 2025.

TESLA



License Plate Strategy:

- Beijing, Shanghai, Hangzhou, Guangzhou, Shenzhen, Tianjin

NEV Promotion Strategy:

- Beijing: no traffic limit
- Tianjin: no traffic limit
- Hangzhou: no traffic limit
- Wuhan: no traffic limit
- Chengdu: no traffic limit and special rate on parking
- Xi'an: privilege on bus-only lane and special rate on parking
- Guiyang: no traffic limit
- Nanjing: special rate on parking

- Although Tesla is not eligible for national subsidies, it was ranked 12th in sales in 2017.
- One of the main reasons for Tesla's success is its endorsement of local policies: Tesla models can be registered with NEV license plates in cities where license plate are capped and expensive such as Beijing, Shanghai, and Shenzhen.
- By offering Tesla owners a life-long free charging service, there are a lot of benefits for private consumers. Furthermore, Tesla has planned to match its vehicles with public charging pilots in the near future, echoing China's recent national requirement.
- Tesla is set to start vehicle manufacturing in Shanghai.

NEV NEW PLAYERS

EV brands	Aiways	Byton	Chehejia	Dearcc	Leapmotor	NIO	Qiantu motor	Singulato	Wm motor	Xiaopeng	Yundo
Base	Shangrao, Jiangxi province		Changzhou, Jiangsu province	Shaoxing, Zhejiang province	Jinhua, Zhejiang province	Wuhan, Hubei province	Suzhou, Jiangsu province	Tongling, Anhui		Zhaoqing, Guangdong	Putian, Fujian province
Types	SUV、MPV	Middle size SUV 400-500KM	short distance & mini NEV	NEV155km	Sport car 360km	ES8/EP9 SUV, Sport car 355km	K50 300km	iS6 SUV 400km	EX5 SUV 600km	G3 SUV 300km	SUV 200-300km
Projected release	2018	2019	2018	2017.11	2019		2018	2018	Released in 2017 expected in 2018	2018	2017/ 2018
Partner	CATL, Navinfo, Starcharge		Battery pack; Aimed for sharing transportation in future	Affiliated to LeEco Auto	Zhejiang Dahua Technology co., Ltd.	Partnered with JAC, GAC, Changan	Subsidiary to CH Auto	Subsidiary to Zhicheauto Technology		Haima Auto	Was co-founded by Fujian Motors Group, etc.
Qualification	In process	In process	In process	In process	None	Manufactured by JAC			Acquired qualification of SUV/MPV by taking over Dalian Huanghai Auto	Listed in national category of product, acquired qualification of sales	Acquired qualification of NEV manufacture

CONCLUSIONS

I. The study develops and employs a novel NEV Market Openness Index, comprised of brand diversity and market penetration, to assess issues of NEV protectionism and evaluate their impact of China's NEV commercialization: from 2015 to 2017, NEV penetration increased in a majority of regions. Of the 23 sample cities selected (with sales >5000 units), the cities with the highest openness score in 2017 were Tianjin, Hangzhou, and Beijing. The worst cities were Hefei, Nanchang, and Liuzhou.

II. Despite the increase in models, protectionism still strongly exists; Cities to date failed to meet the minimum 30% foreign NEV brand target set by the national government in 2013; Regional clusters of supply chain in service of the growing NEV industry have emerged, indicating local NEV market robustness. All protectionism-reducing efforts should include the abolishment of limitations or barriers to supply chain and after-sales services development.

III. However, in 2018 the new policy of financial subsidies for the promotion and application of new energy vehicles emphasized the need to "break down local protection and establish a unified market." As China's NEV policy landscape is changing, from economic instruments that encourage production to regulatory and hybrid instruments that favor quality and sales, it is important to ensure equal market entry is given to all manufacturers for increasing competitiveness, improving NEV quality, and increasing sales.

III. More research into the effects diversity issues have on market competitiveness may be needed to highlight the local benefits of an open NEV market.

THANK YOU!

Acknowledgement

We highly appreciate the financial support provided by The Energy Foundation, as well as experts and colleagues who have made invaluable efforts for this project. We would also like to express our sincere thanks for the invaluable advice and recommendations provided by the following distinguished experts and colleagues: Prof. Hewu Wang, Prof. Xiaoyuan Wu, Dr. Jianhua Chen, Mr. Kaijun Qiu, Mr. Hongyang Cui, Ms. Juan Zhang, and Mr. Baijie Zhang.

Authors

Emma Wang, Feng An, Liping Kang, Maya Ben Dror

Disclaimer

This report is supported by The Energy Foundation. Content shall not be interpreted as the opinion of our sponsors.