

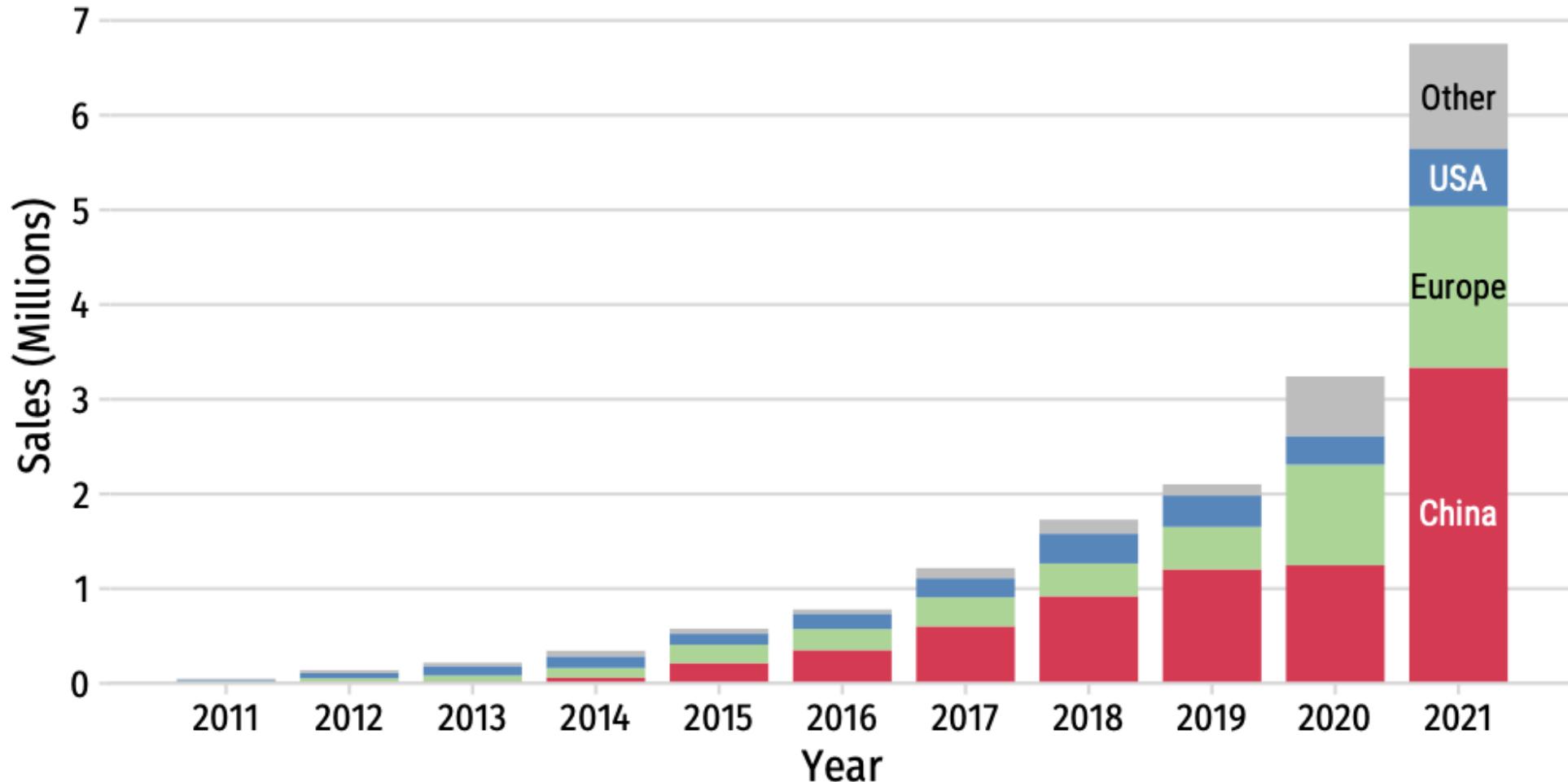
The Rise of Chinese Leadership in the Plug-in Electric Vehicle Industry

John Paul Helveston

The George Washington University

September 30, 2022

Half of global PEV sales are in China



Institutions

Market Conditions

Policies

Institutions

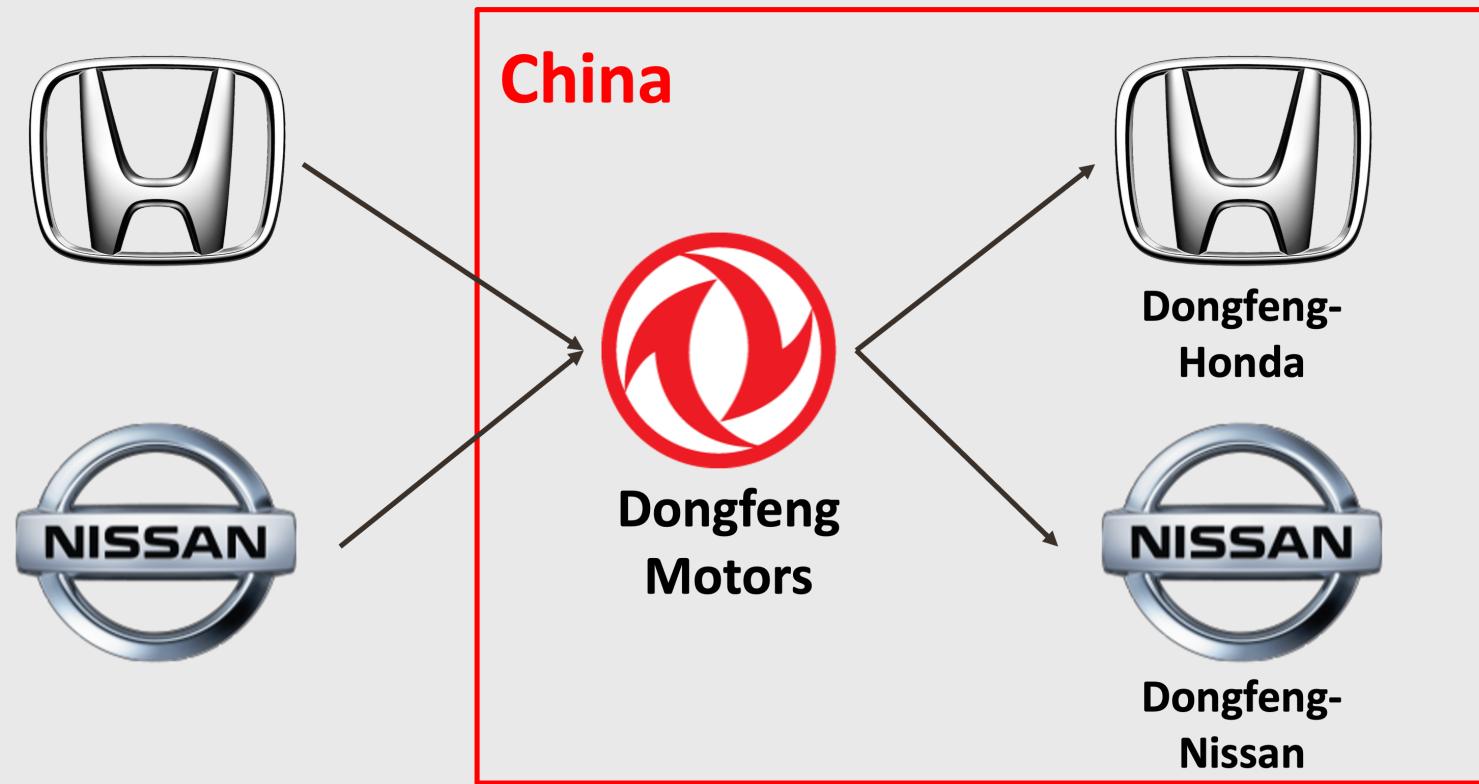
Market Conditions

Policies

- 1) The Joint Venture System
- 2) Local Protectionism

The Chinese Joint Venture System

1980s: 以市场换技术 = “Exchange market for technology”



“这就像吸食鸦片一样，一旦你沾染上了就永远也无法戒掉。”

何光远, 中国前机械工业部部长

“It's like opium. Once you've had it you will be addicted forever.”

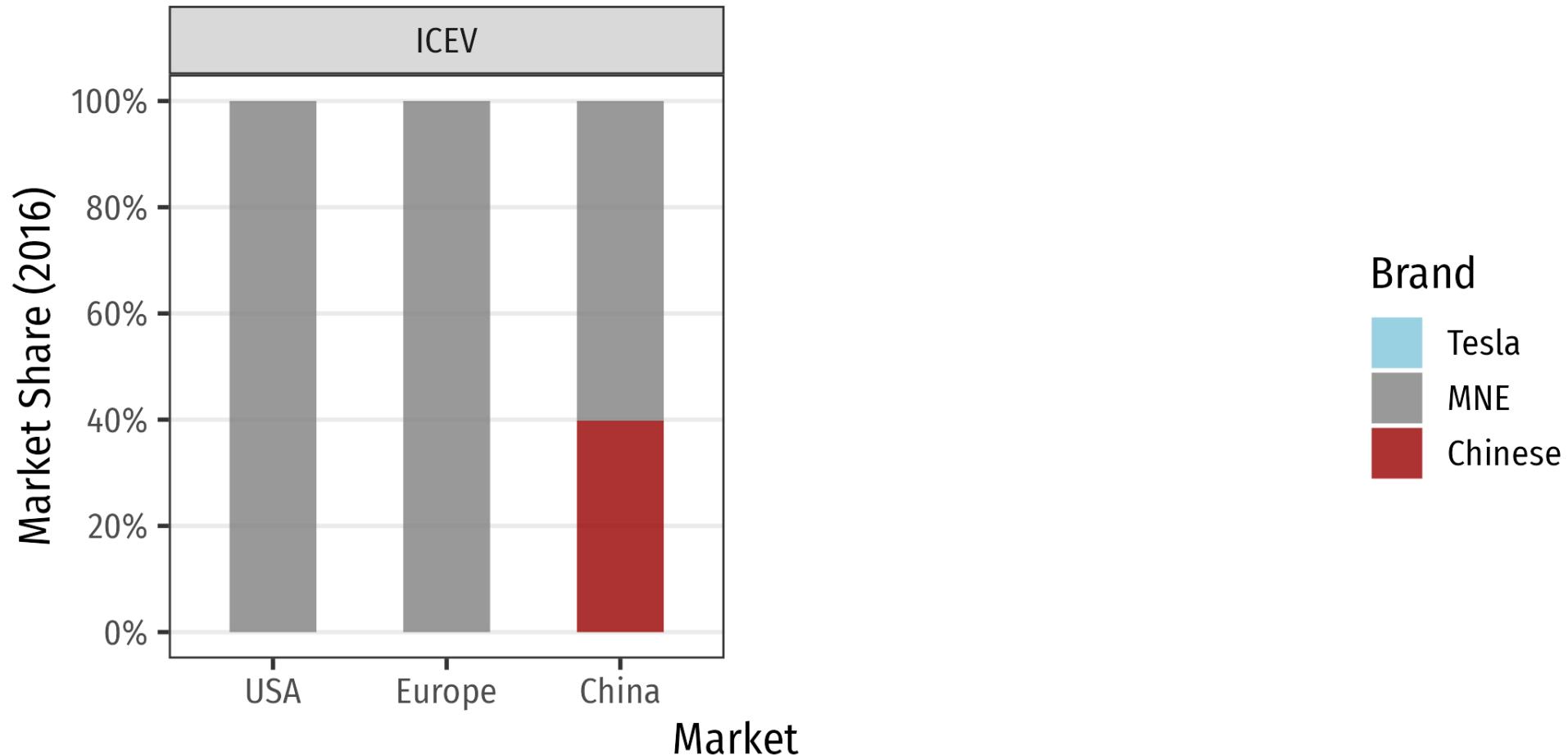
Guangyuan He, Former Minister of Machinery and Industry (Reuters, 2012)

JV system creates disincentives for industry incumbents to innovate

Multinational OEMs lack incentives to bring cutting-edge technologies

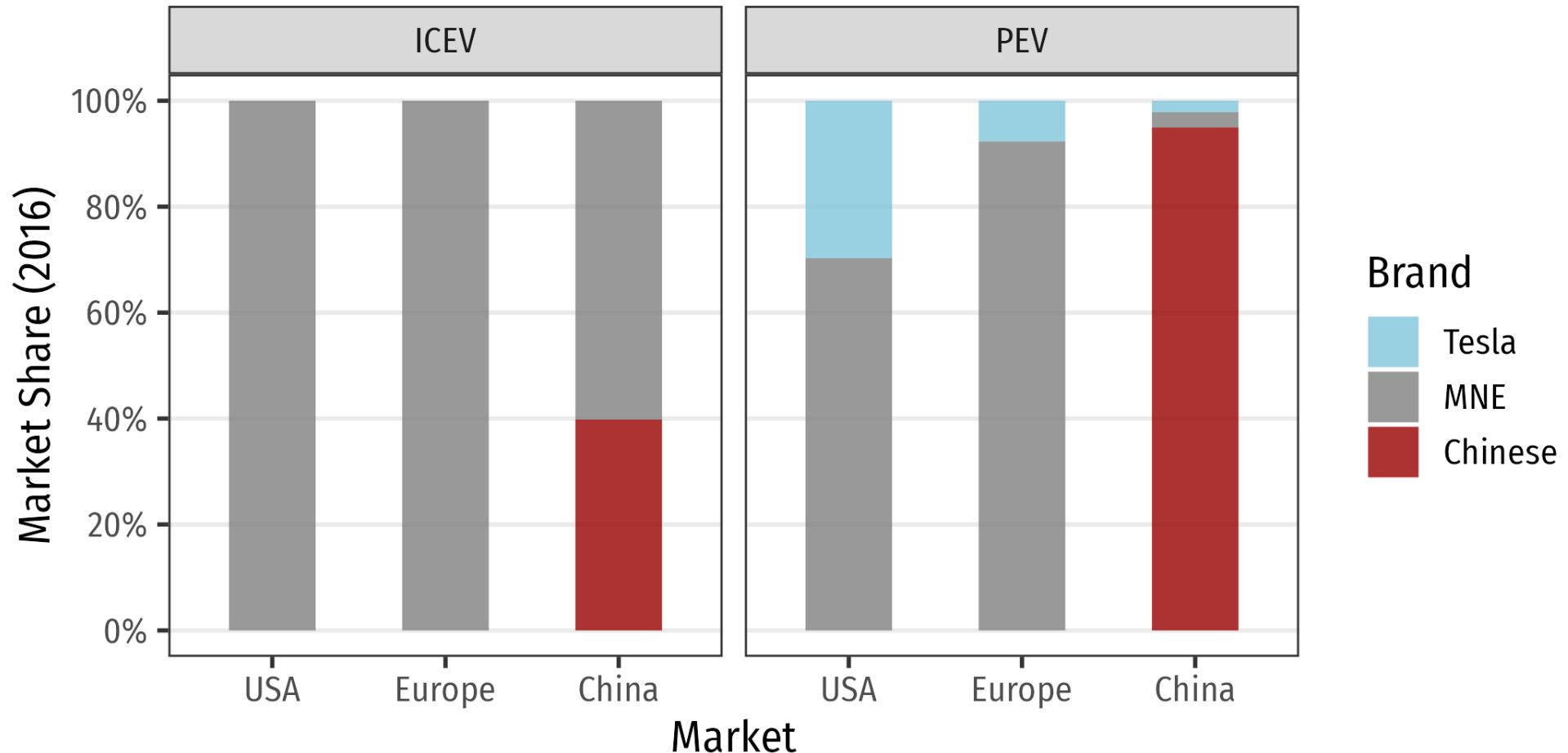
Chinese JV partners lack incentives to independently innovate

While MNEs dominate global vehicle markets, Chinese firms sell most PEVs in China



Data sources: gasgoo.com, goodcarbadcar.com, hybridcars.com

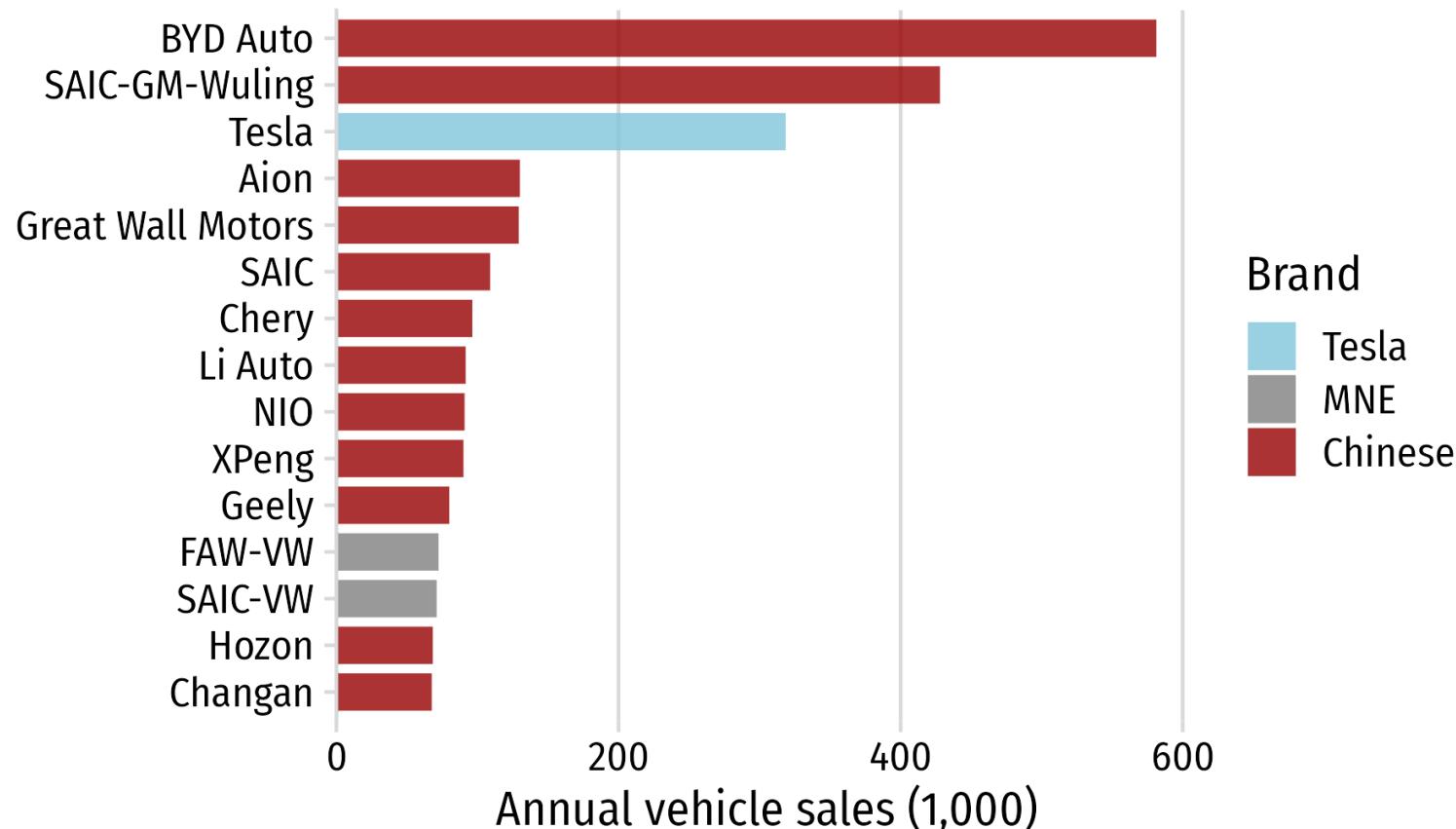
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Data sources: gasgoo.com, goodcarbadcar.com, hybridcars.com

April 2018: JV requirement dropped for PEVs

Chinese automakers dominate China's PEV market



Data source: <https://www.protocol.com/china/china-record-ev-sales-tesla>

Local protectionism incubated early experimentation

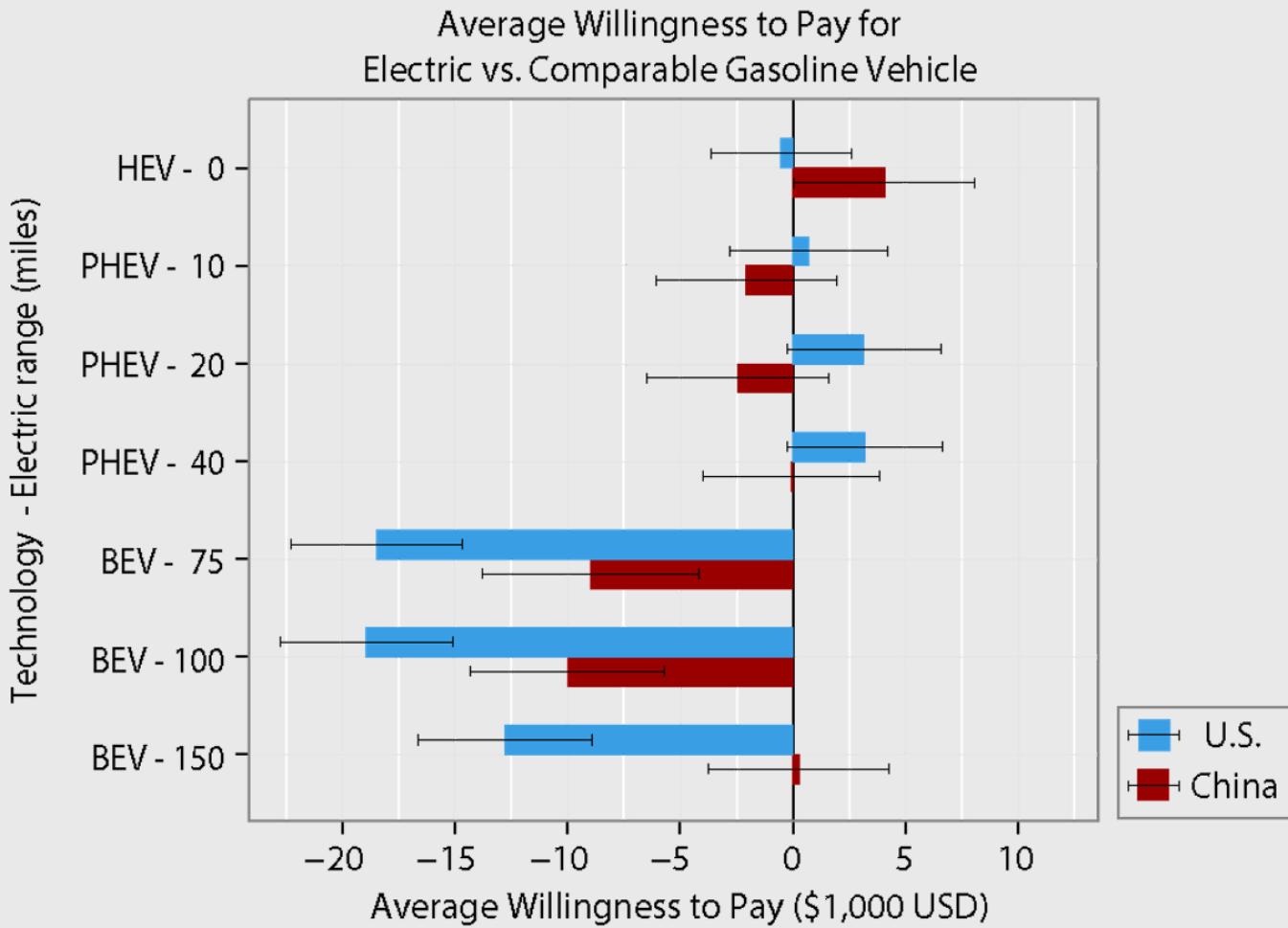
Institutions

Market Conditions

Policies

- 1) Lower bar for selling PEVs
- 2) Infrastructure

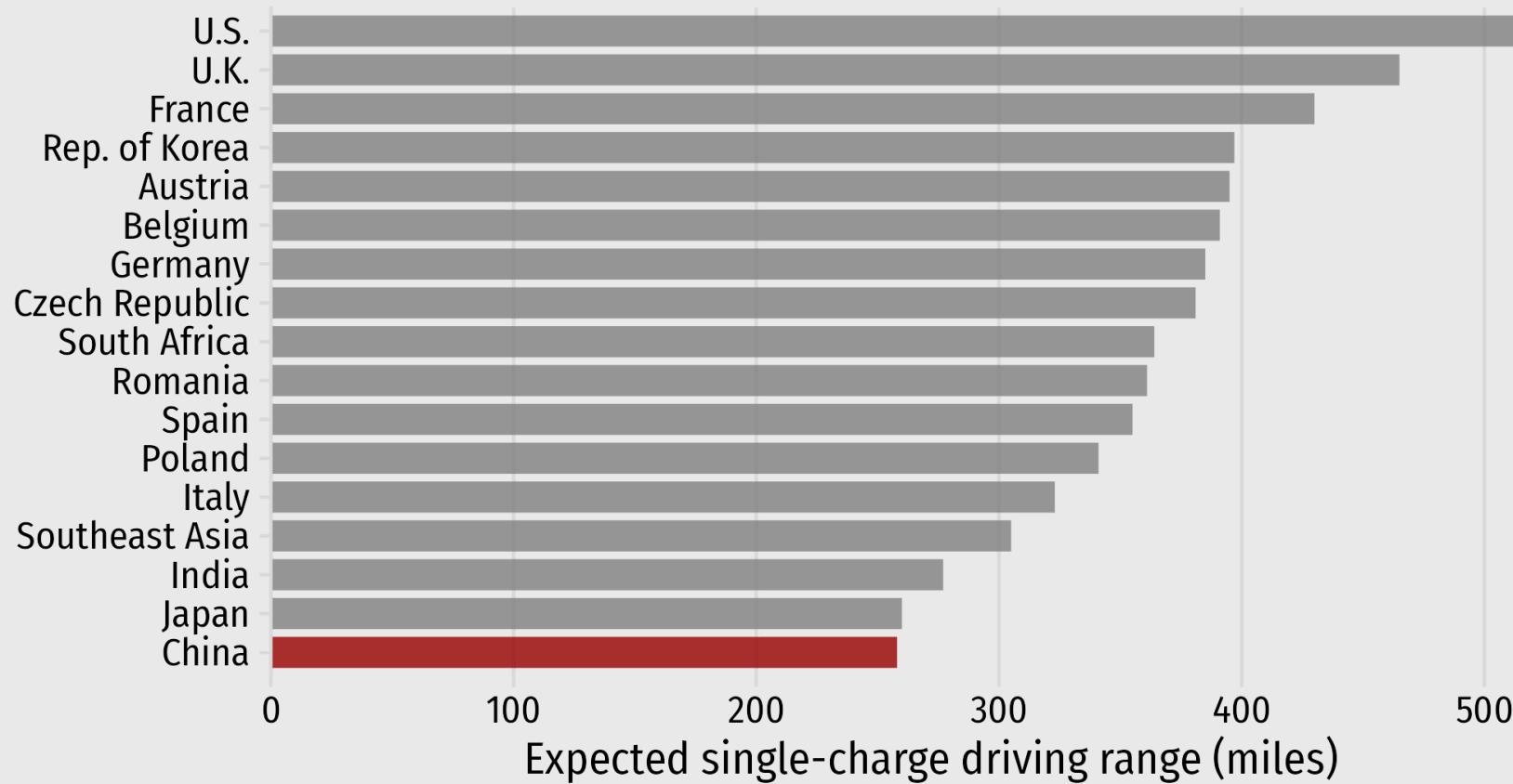
Chinese buyers are more willing to adopt BEVs



Helveston et al. (2015) "Will subsidies drive electric vehicle adoption? Measuring consumer preferences in the U.S. and China"
Transportation Research Part A: Policy and Practice. 73, 96–112. DOI: [10.1016/j.tra.2015.01.002](https://doi.org/10.1016/j.tra.2015.01.002)

Chinese buyers are willing to accept relatively lower BEV driving ranges

Average response to question: "How much driving range would a fully charged all-battery electric vehicle need to have in order for you to consider acquiring one?"



Data source: Deloitte 2022 Global Automotive Consumer Study

Infrastructure

World's largest charging network

- End of 2020, China had 800,000 chargers installed.
- 112,000 chargers installed in December 2020 alone.

World's largest HSR network

- China's high-speed rail network recently surpassed the length of the equator at just over 40,000 km long

Institutions
Market Conditions

Bigger Sticks & Carrots

Policies

Consumers

- **Purchase Subsidies:**
 - RMB 50,000 (USD \$8,200) for PHEVs
 - RMB 60,000 (USD \$9,800) for BEVs
- **PEV exemptions from restrictions**
 - Shanghai license plates auction for ~\$15,000 (free for PEVs)
 - Unlimited driving during "Rush Hour" (7am – 8pm)

OEMs

- **Dual Credit System:** require annual credits for meeting fuel economy standards & selling PEVs.
- Tesla earned \$1.58 billion from credit sales in 2020 (\$721 million profit would have been -\$859 million loss).

Policies that make ICEVs more expensive than PEVs increase PEV adoption

The Future of China's PEV Industry

- 1) What if the JVs break up?
- 2) Will local protectionism hinder growth?
- 3) An Emerging PEV Category: The Mini EV

What if the JVs break up?

They probably won't

- Sunk costs
- Knowledge / IP sharing not a real threat
- Chinese partners can help meet dual credit requirements

Even if they did,
not much would change

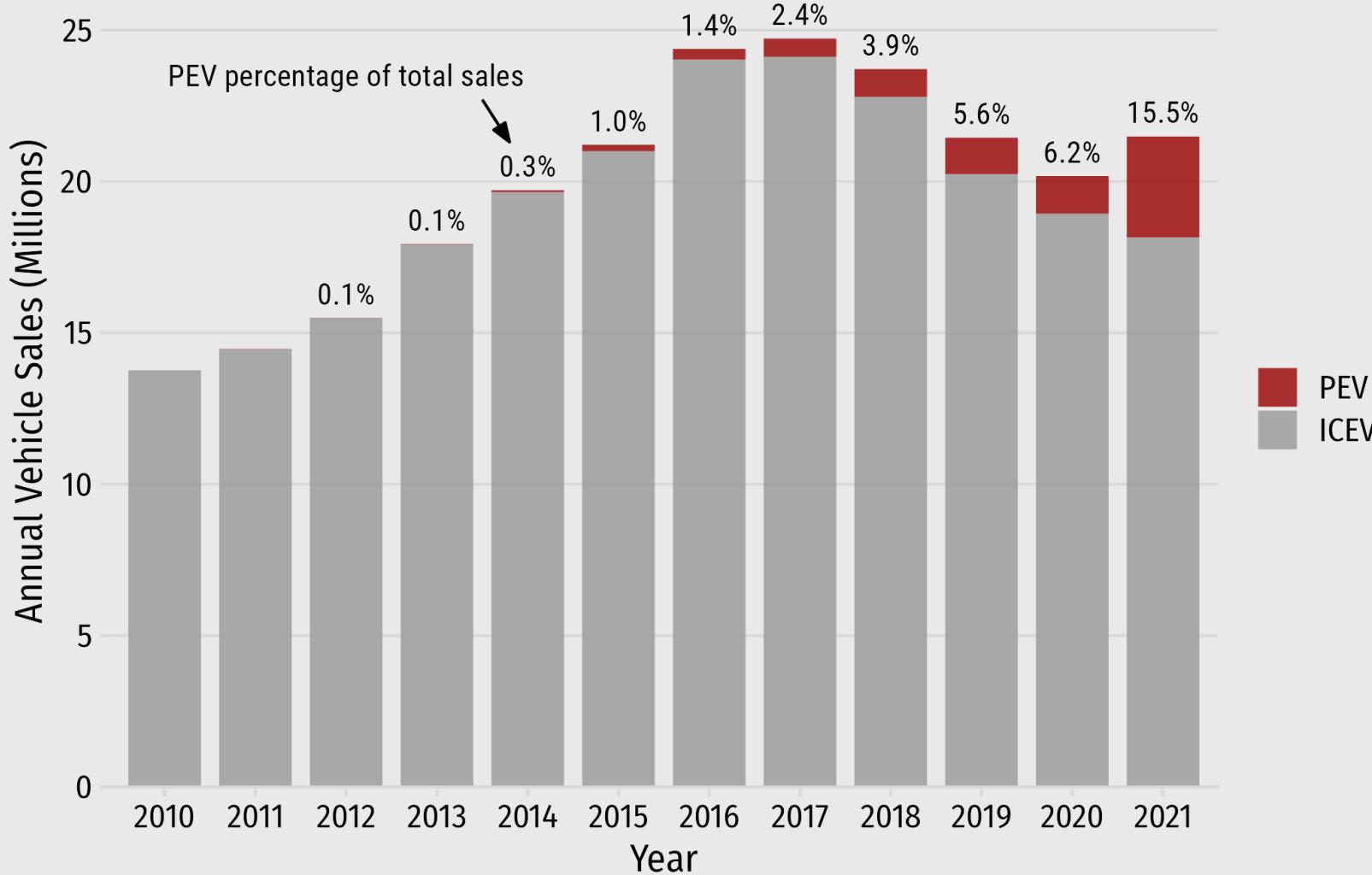
- Leading Chinese firms don't have JVs (e.g. BYD, Geely, XPeng, NIO)

Will local protectionism hinder growth?

- Central government cracking down on protectionism strategies
- China's PEV market already more competitive than many others.

PEVs growing, ICEVs slowing

For the past five years, PEV sales in China have increased while ICEV sales have decreased



Data source: EV-Volumes.com

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An Emerging PEV Category: **The Mini EV**

Typical Low-speed EV (LSEV)



The Wuling Hongguang Mini EV



An Emerging PEV Category: **The Mini EV**

Feature	Low-speed EV	Mini EV	BEV
Battery Chemistry	Lead-acid	Lithium-ion	Lithium-ion
Driving Range (km)	< 120	120 - 200	> 200
Top Speed (kph)	< 60	60 - 80	80 - 120
Price (1,000 RMB, after subsidies)	< 30	40 - 80	> 80

Slides available at <https://slides.jhelvy.com/>

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Extra slides

Local protectionism incubated early experimentation

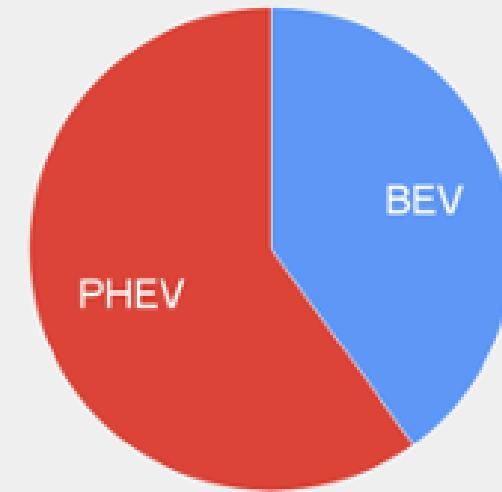
Beijing

Only BEVs exempt from
license plate restrictions

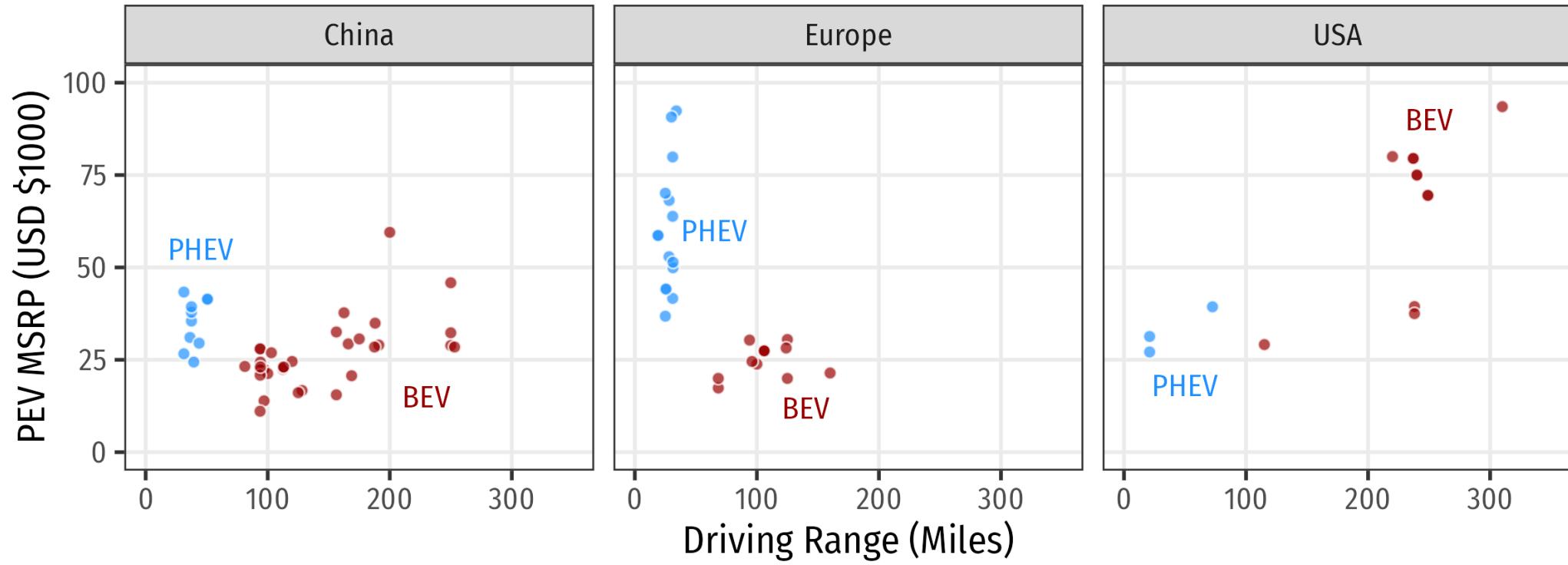


Shanghai

BEVs & PHEVs exempt from
license plate restrictions



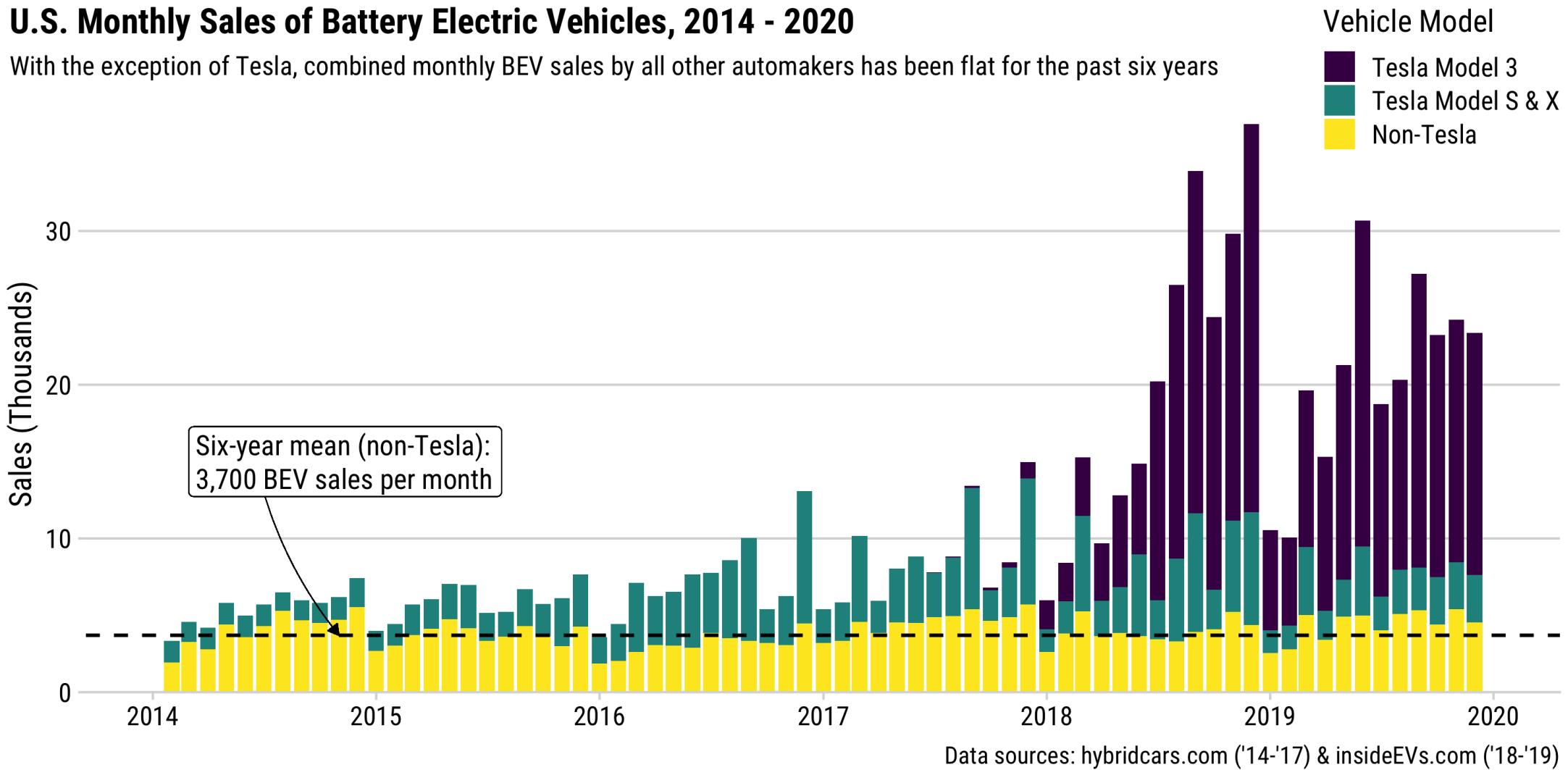
Chinese automakers offer a greater variety of PEVs at more affordable prices and driving ranges



Data source: wattev2buy.com

U.S. Monthly Sales of Battery Electric Vehicles, 2014 - 2020

With the exception of Tesla, combined monthly BEV sales by all other automakers has been flat for the past six years

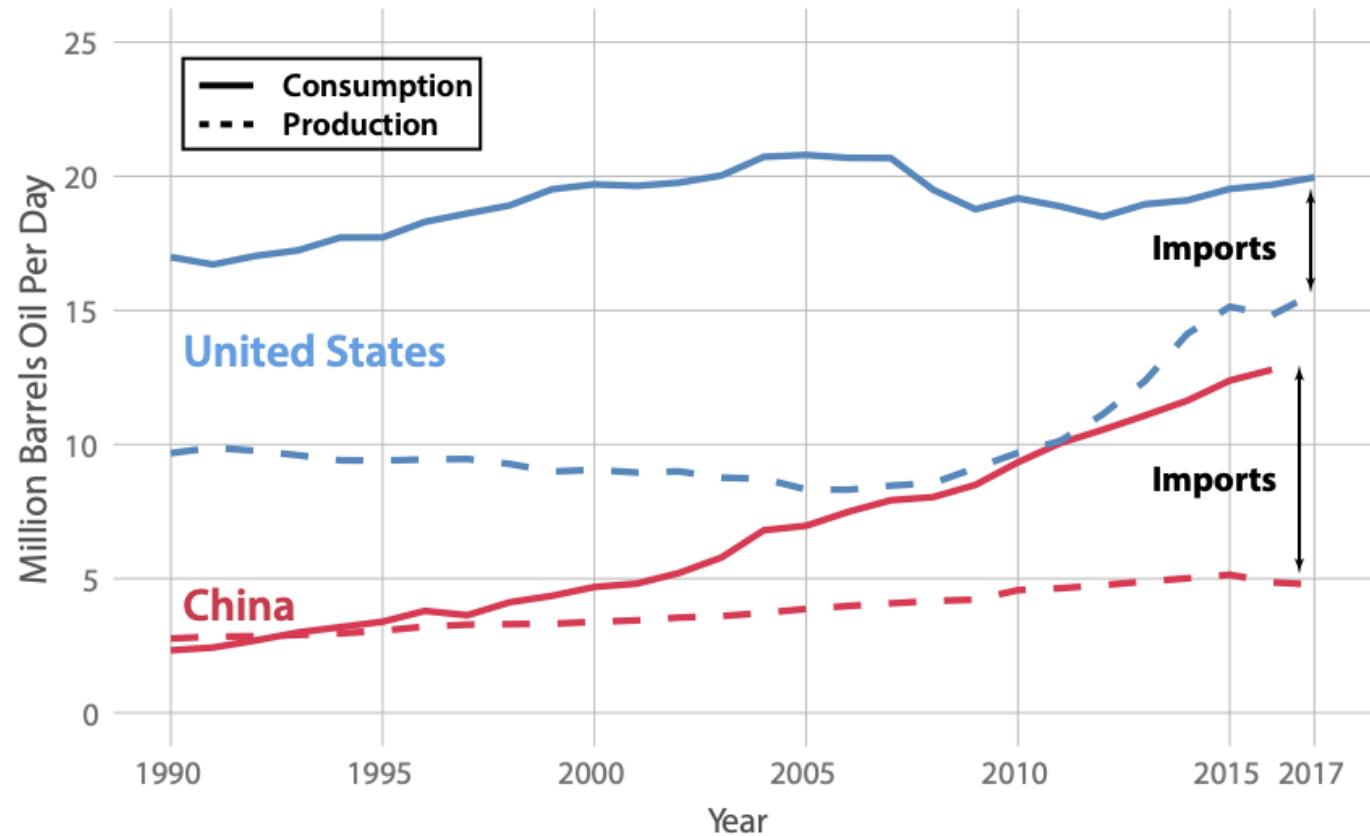


China's PEV Ambition

- Energy Security
- Pollution Reduction
- Technology Leadership

China's PEV Ambition

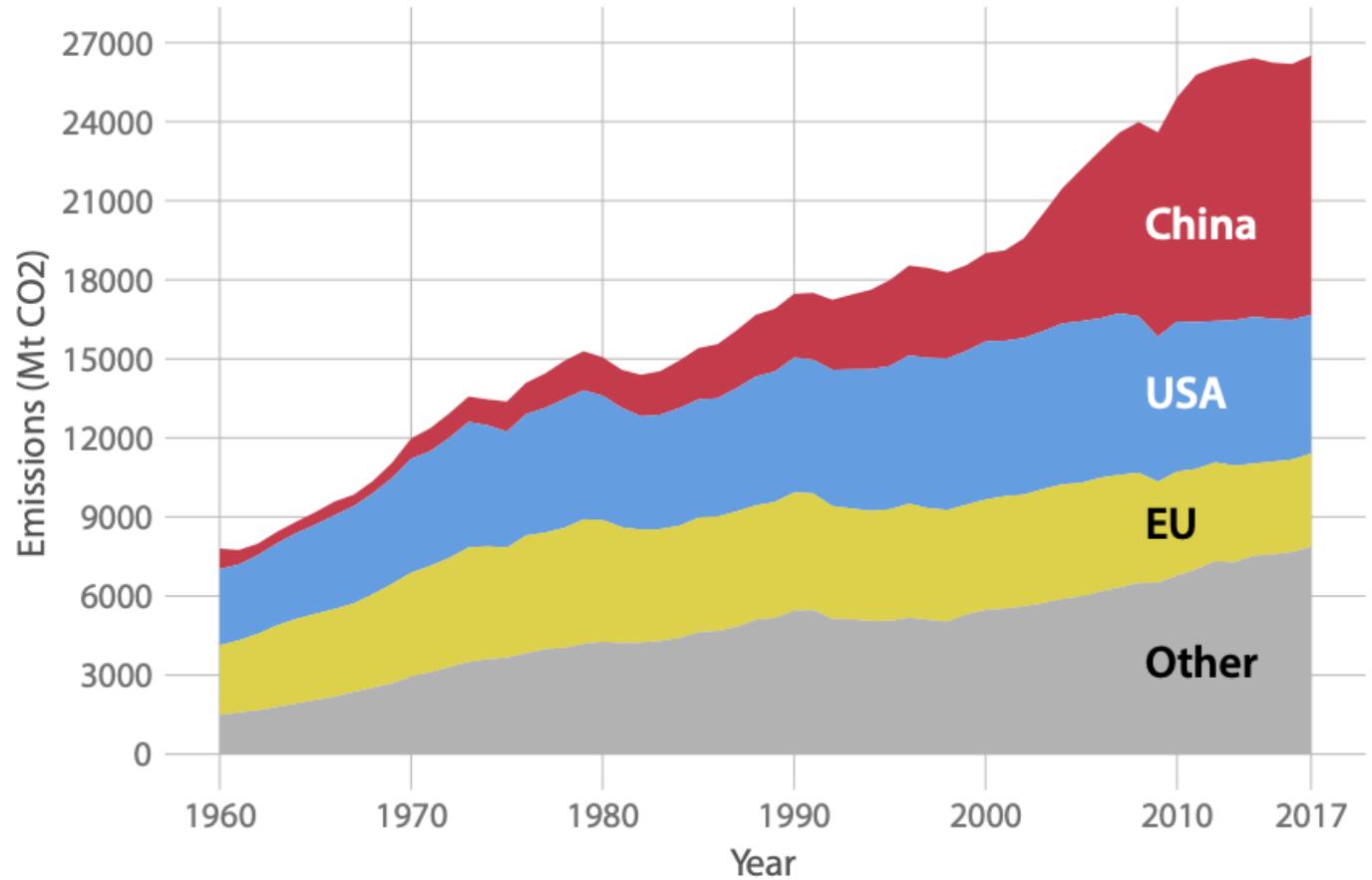
- Energy Security
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Data source: U.S. EIA:
<https://www.eia.gov/petroleum/data.php>

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Data source: <https://www.globalcarbonatlas.org>

China's PEV Ambition

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