

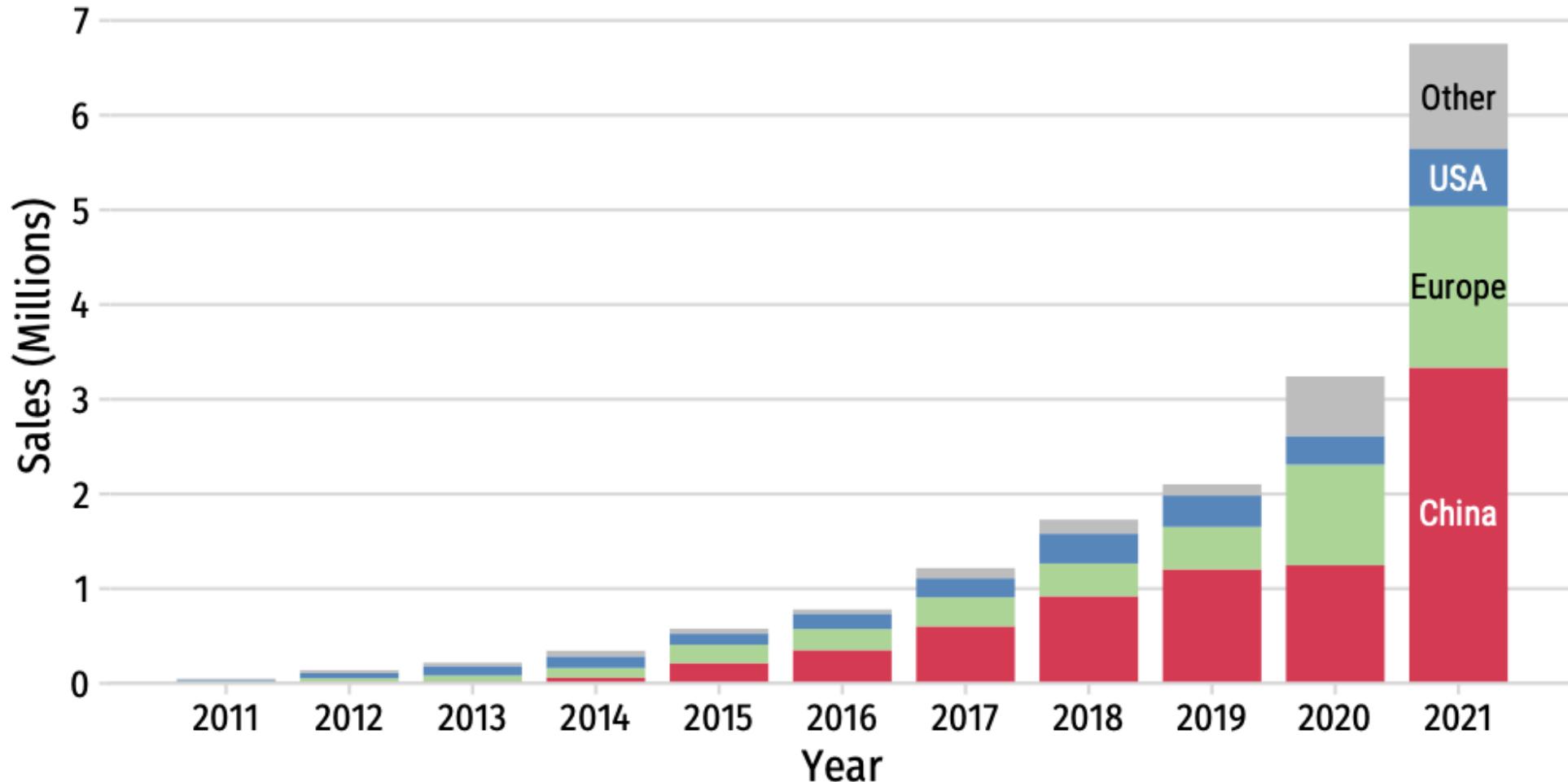
# The Rise of Chinese Leadership in the Plug-in Electric Vehicle Industry

John Paul Helveston

The George Washington University

September 30, 2022

# Half of global PEV sales are in China

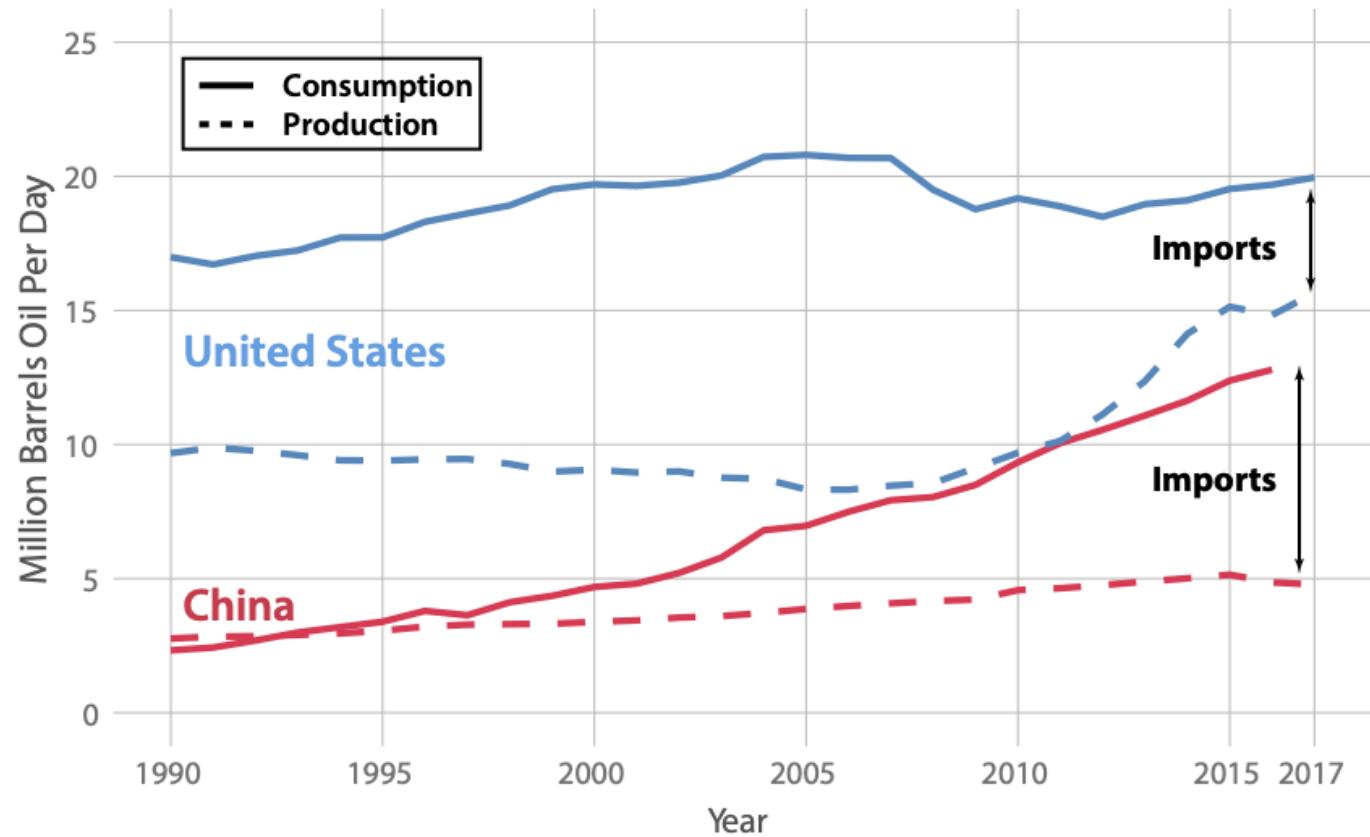


# China's PEV Ambition

- Energy Security
- Pollution Reduction
- Technology Leadership

# China's PEV Ambition

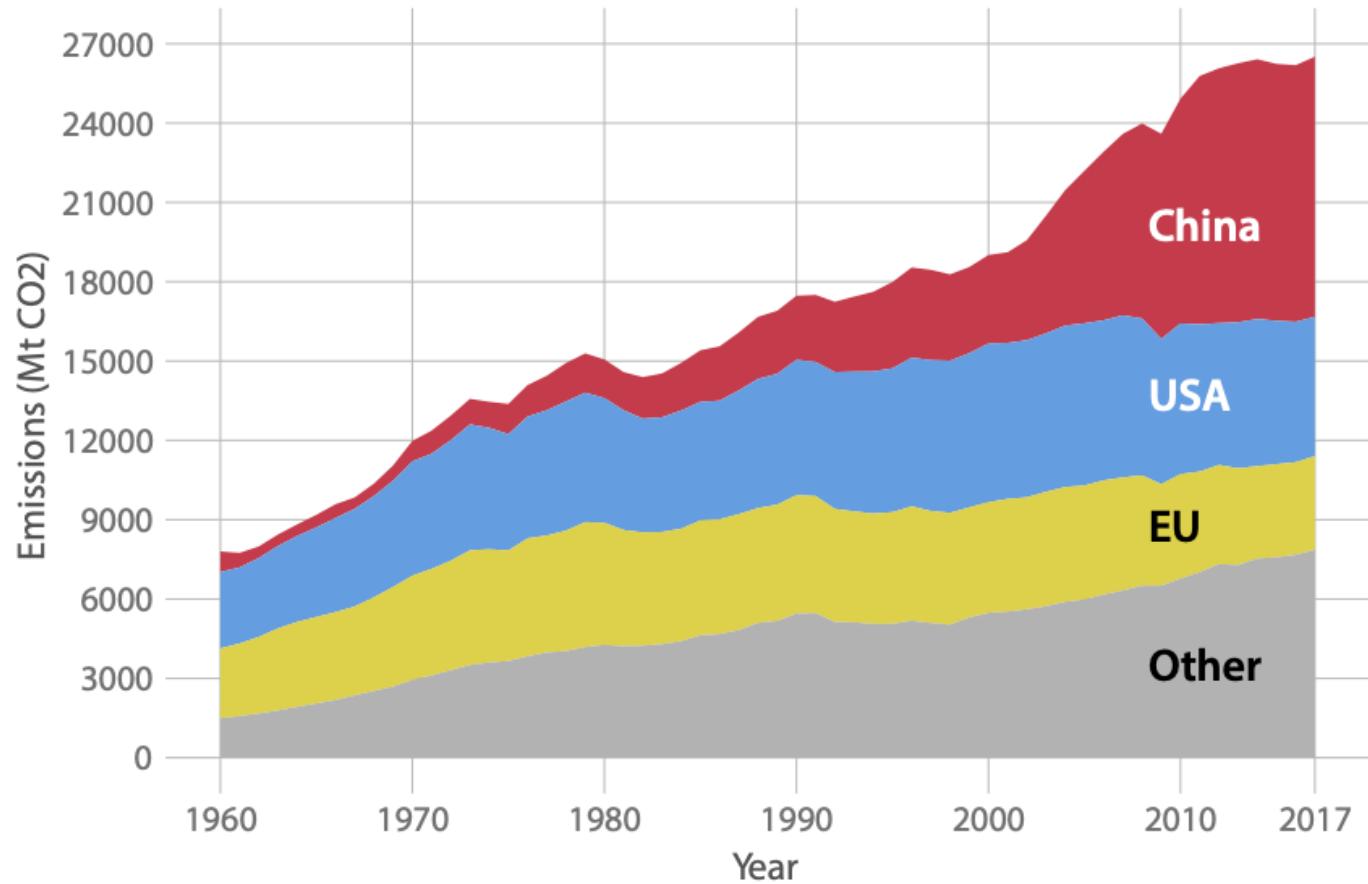
- Energy Security
- Pollution Reduction
- Technology Leadership



Data source: U.S. EIA:  
<https://www.eia.gov/petroleum/data.php?i>

# China's PEV Ambition

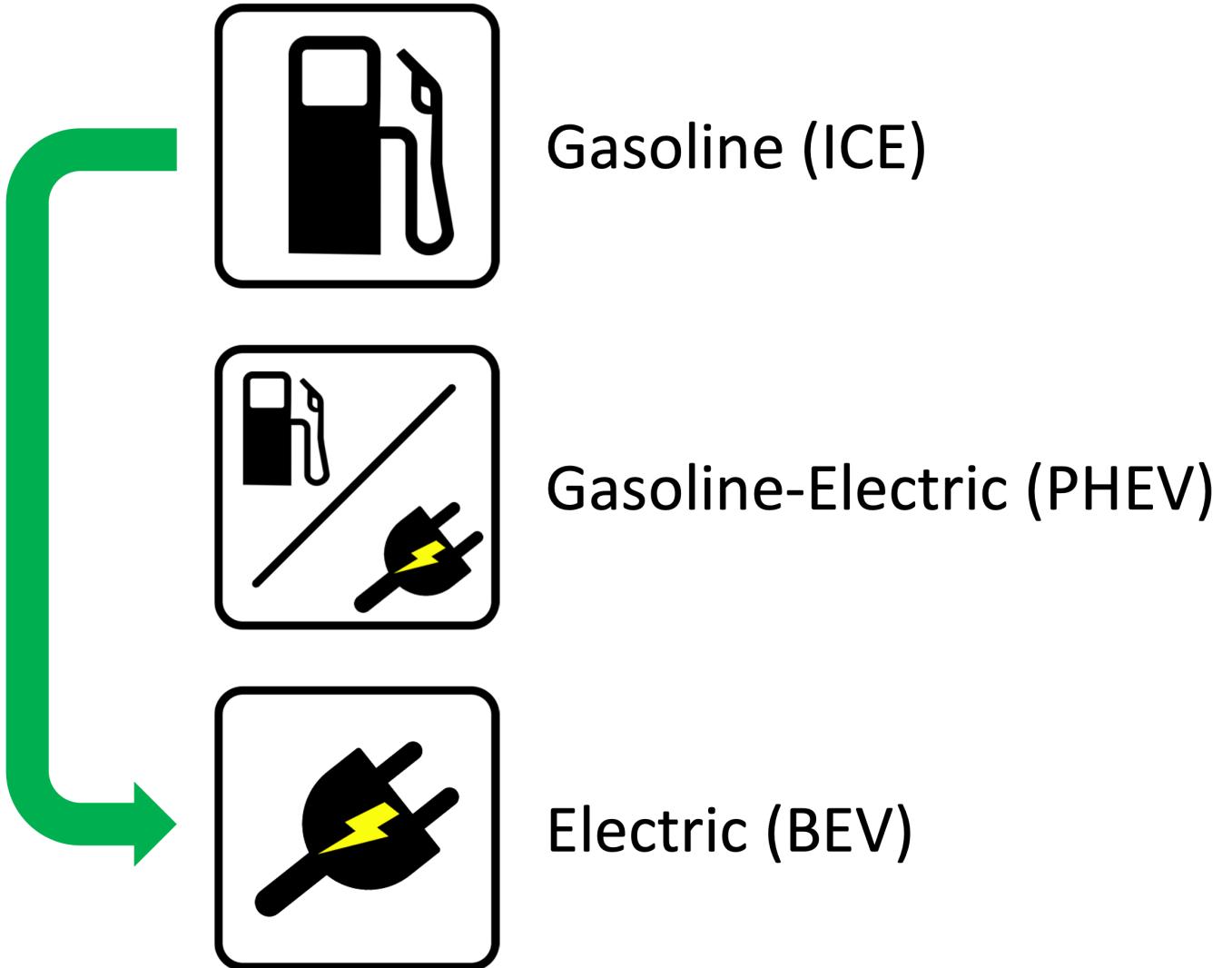
- Energy Security
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Data source: <https://www.globalcarbonatlas.org>

# China's PEV Ambition

- Energy Security
- Pollution Reduction
- Technology Leadership



Institutions

Market Conditions

Policies

# Institutions

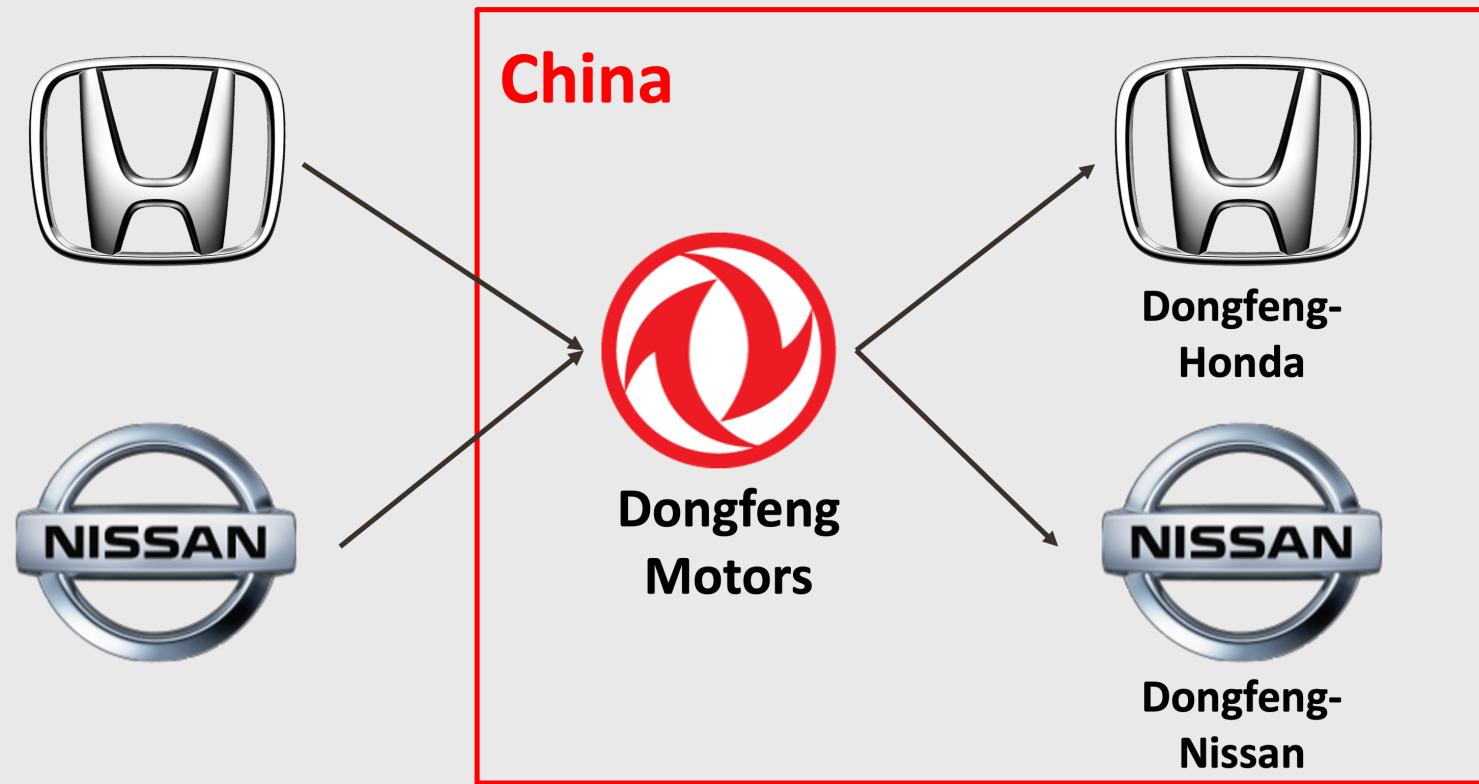
## Market Conditions

## 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.”

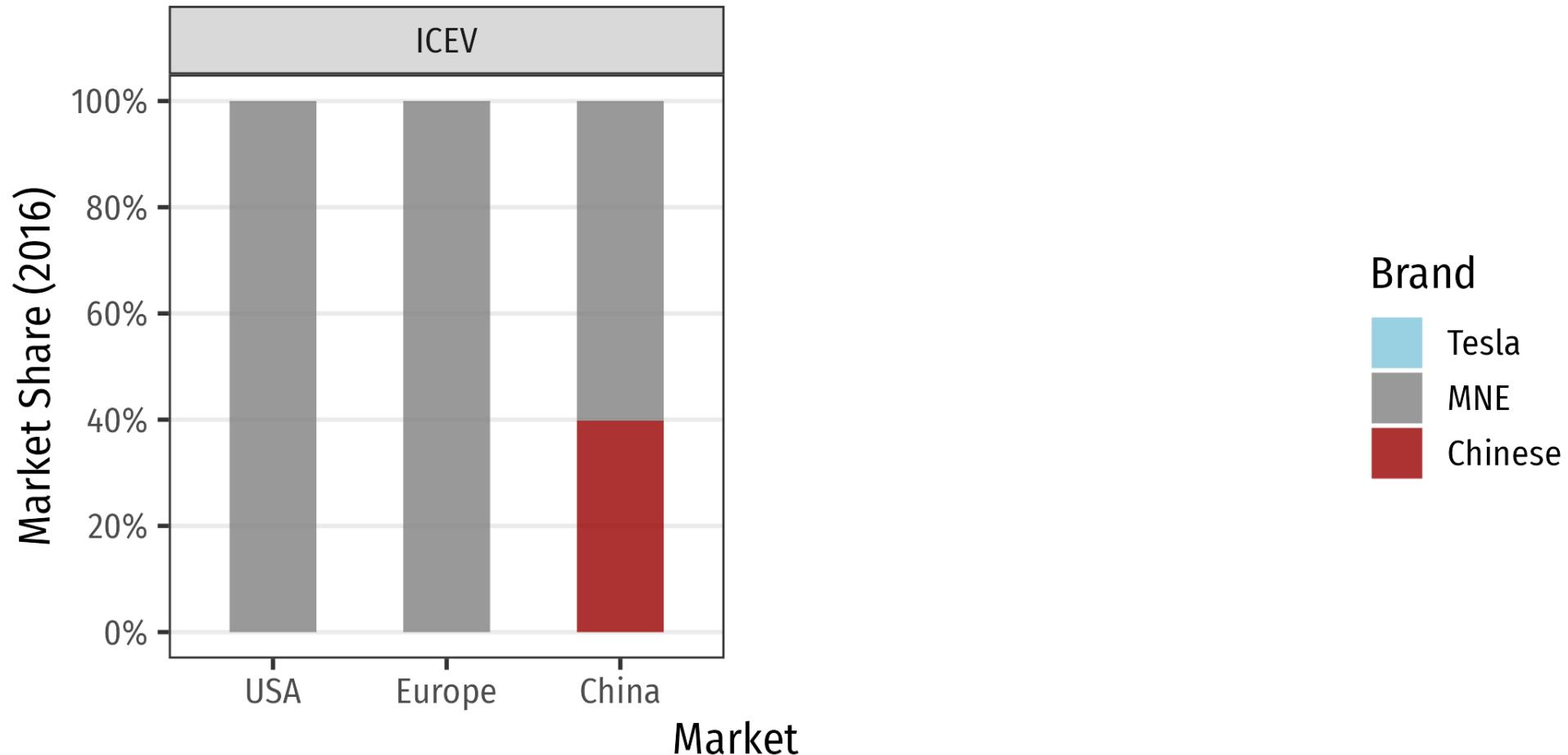
Guangyuan He, Former Minister of Machinery and Industry (Reuters, 2012)

# JV system creates disincentives for industry incumbents to innovate

Multinational OEMs lack incentives to bring cutting-edge technologies

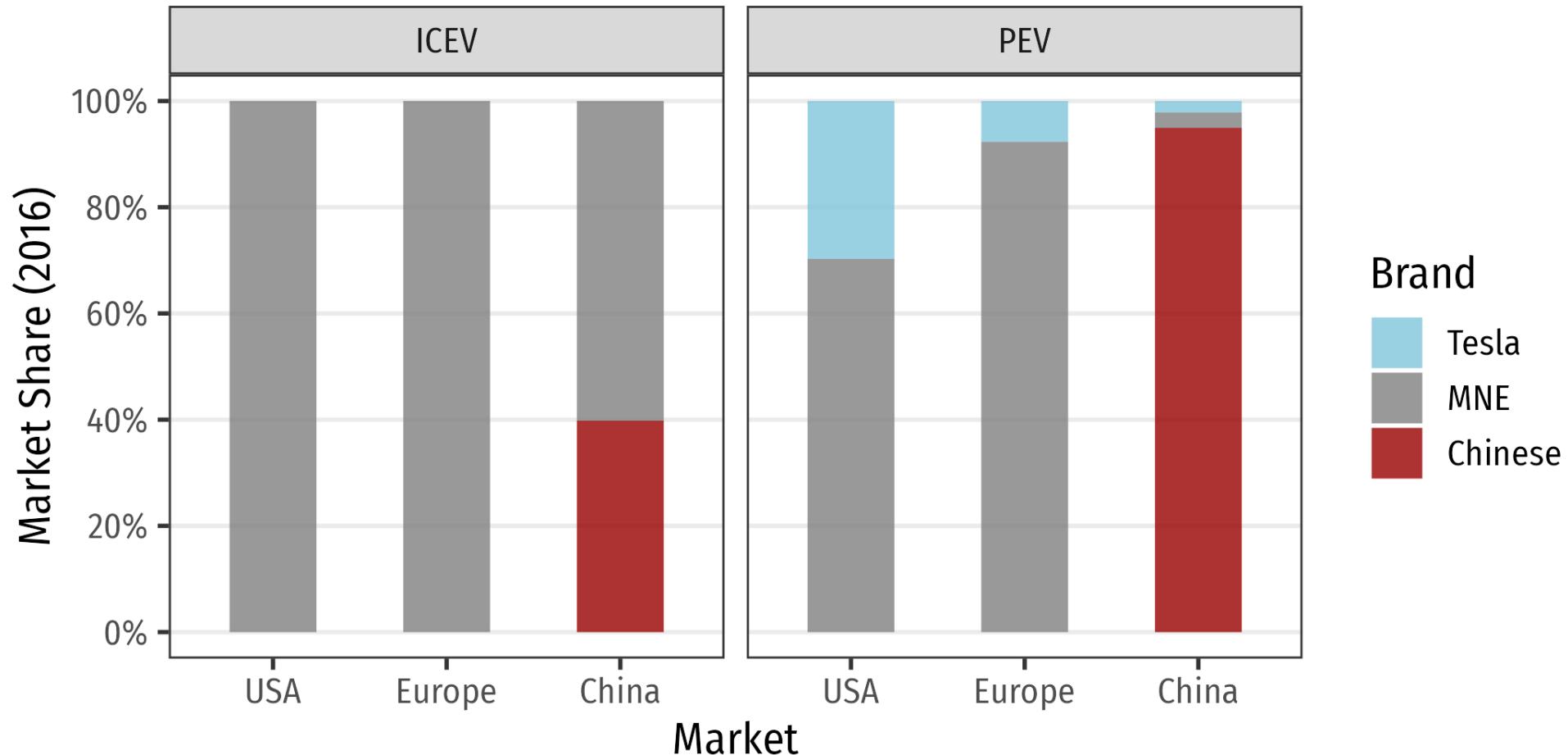
Chinese JV partners lack incentives to independently innovate

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



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

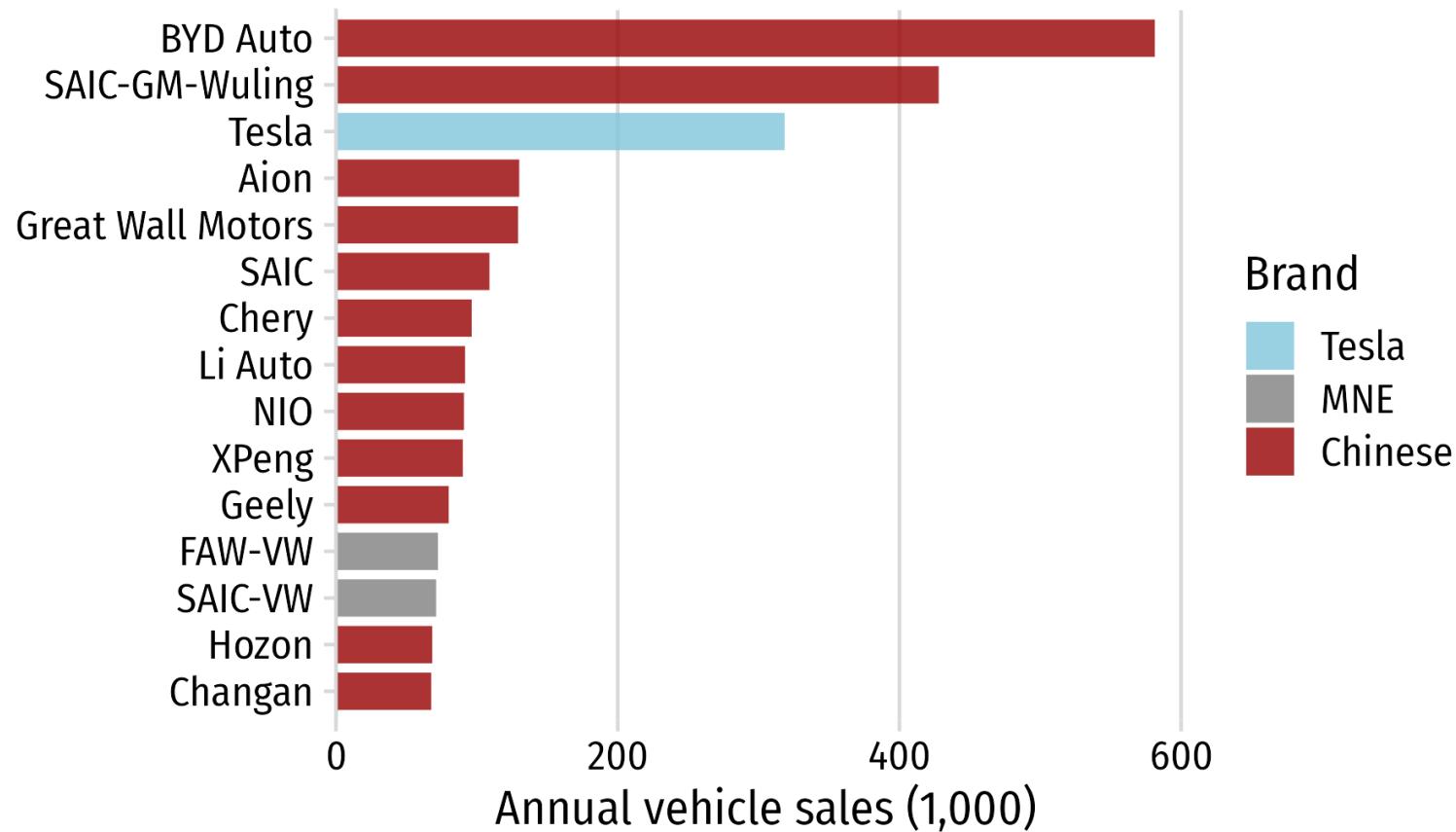
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Data sources: [gasgoo.com](http://gasgoo.com), [goodcarbadcar.com](http://goodcarbadcar.com), [hybridcars.com](http://hybridcars.com)

# 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

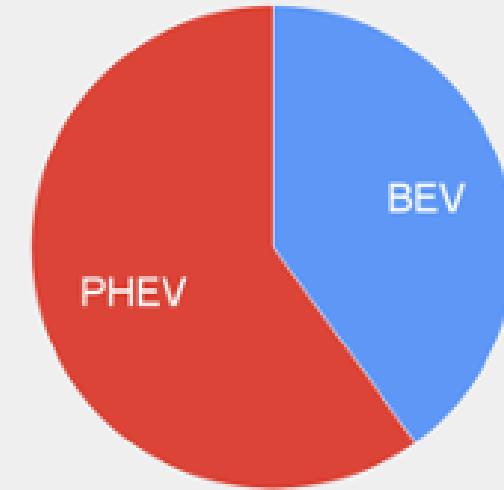
## Beijing

Only BEVs exempt from license plate restrictions



## Shanghai

BEVs & PHEVs exempt from license plate restrictions



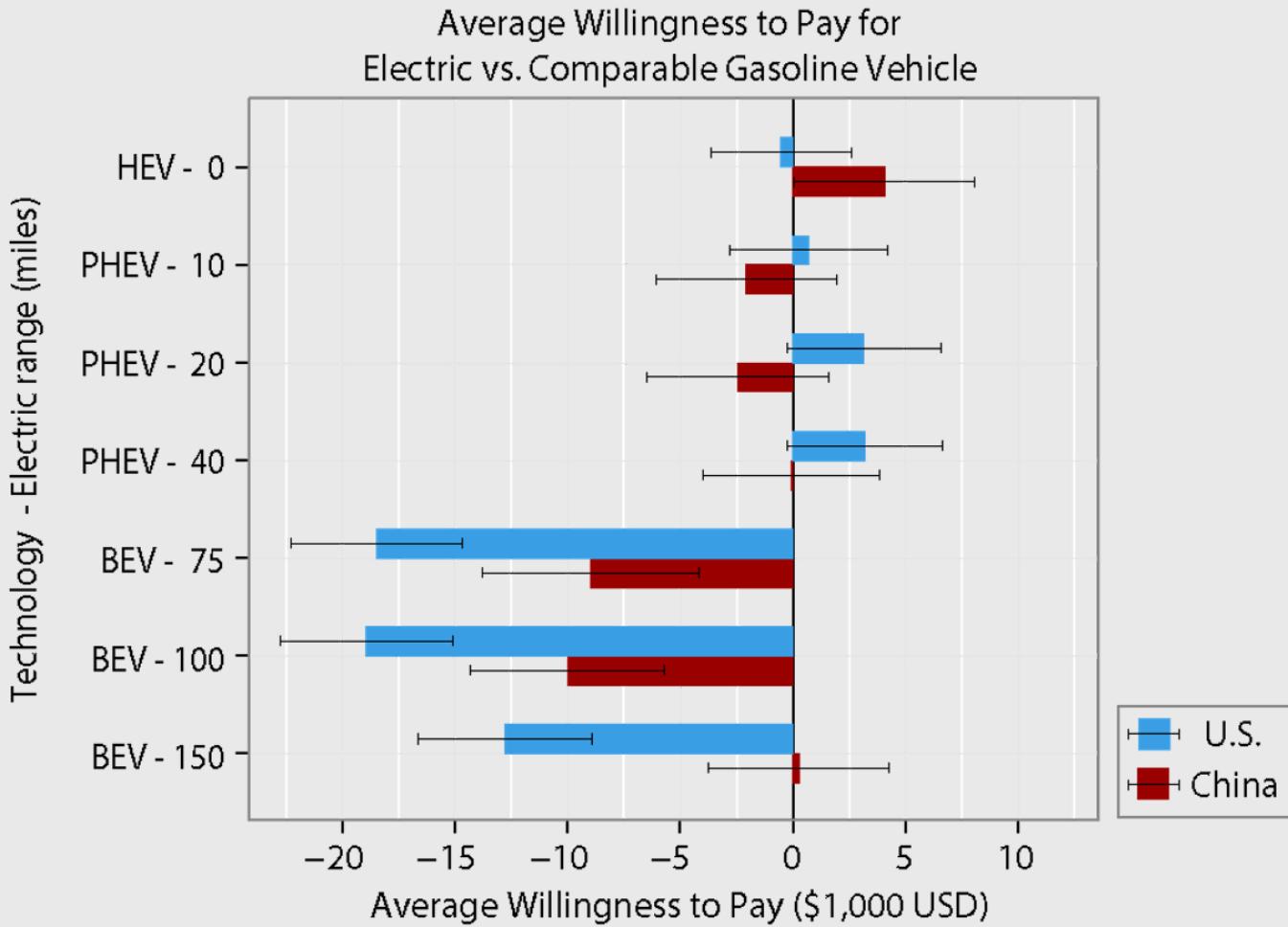
# Institutions

# Market Conditions

# Policies

- 1) Lower bar for selling PEVs
- 2) Better alternatives to cars

# Chinese buyers are more willing to adopt BEVs

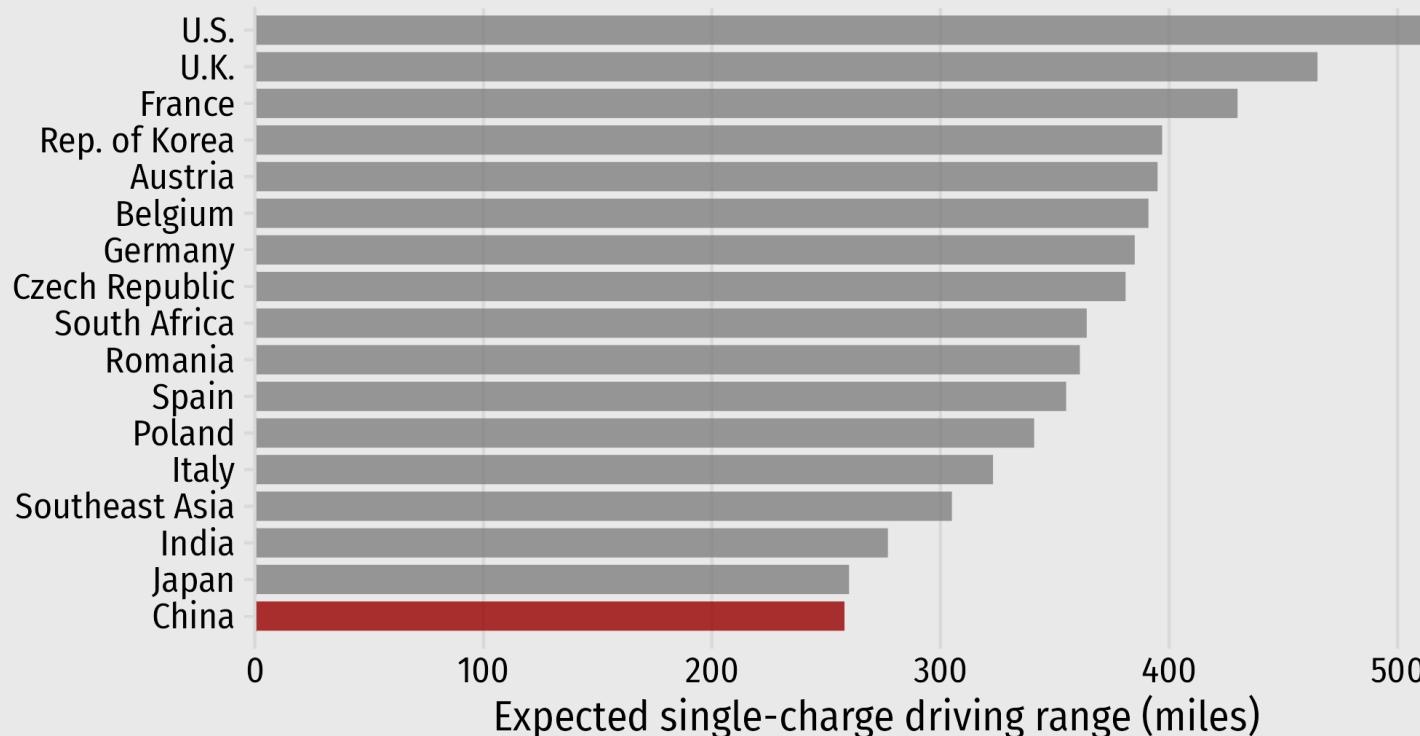


Helveston et al. (2015) "Will subsidies drive electric vehicle adoption? Measuring consumer preferences in the U.S. and China"  
*Transportation Research Part A: Policy and Practice*. 73, 96–112. DOI: [10.1016/j.tra.2015.01.002](https://doi.org/10.1016/j.tra.2015.01.002)

# Chinese buyers are more willing to adopt BEVs

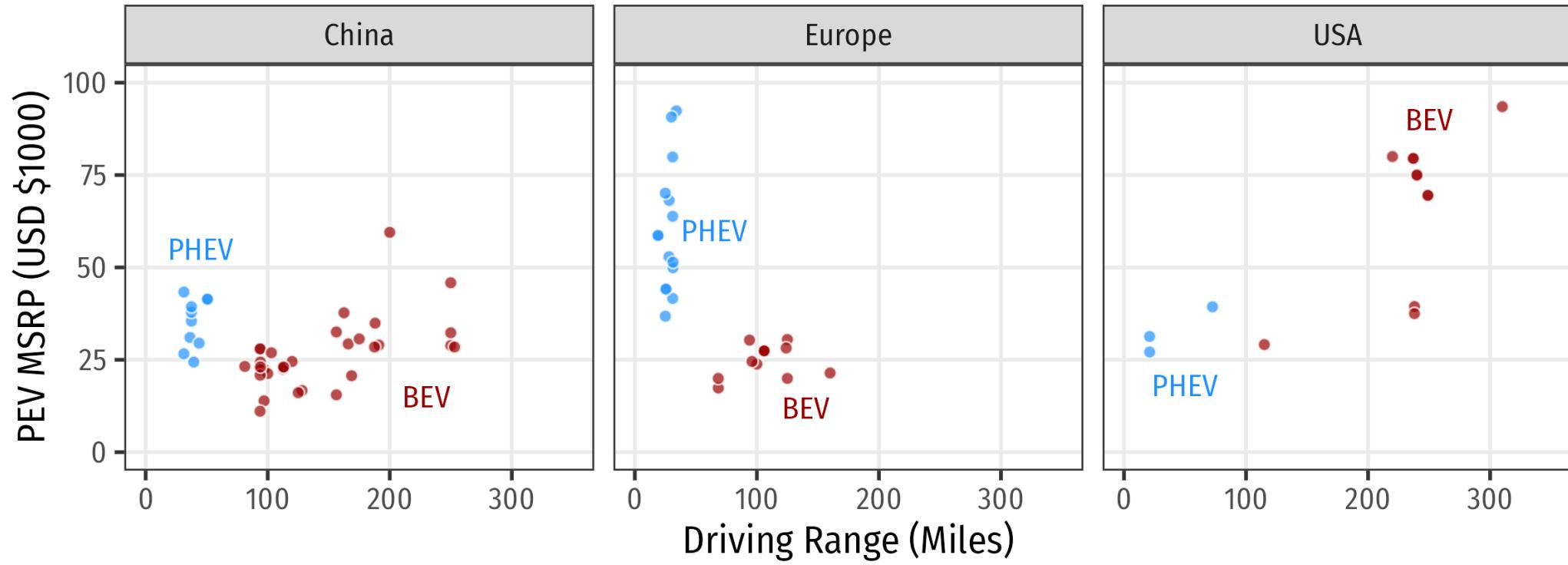
## Chinese car buyers are willing to accept relatively lower BEV driving ranges

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

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



Data source: [wattev2buy.com](http://wattev2buy.com)

# Better alternatives to cars

## 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

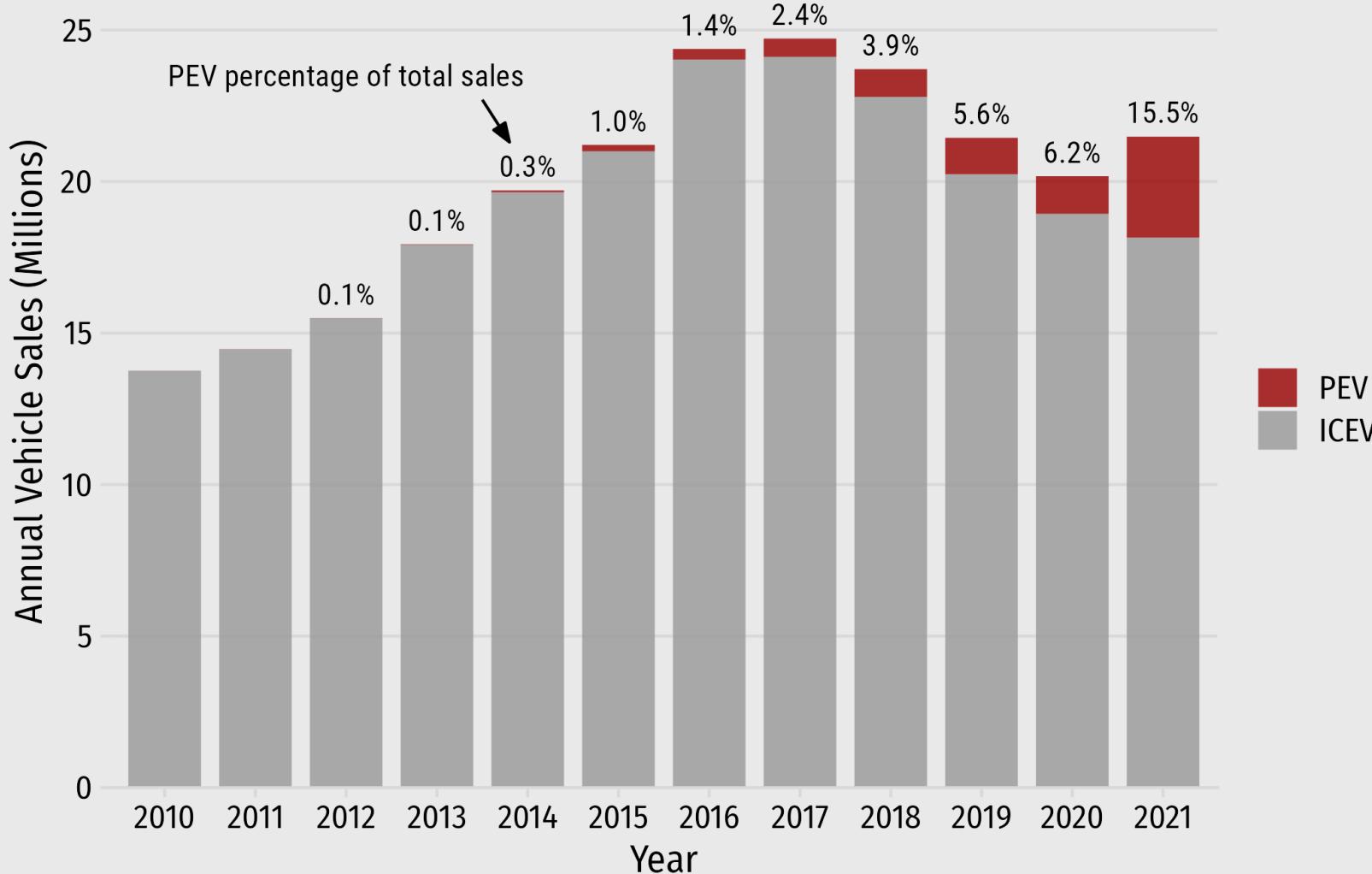
- Leading Chinese firms don't have JVs (e.g. BYD, Geely, XPeng, NIO)

# 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**

<b>Feature</b>	<b>Low-speed EV</b>	<b>Mini EV</b>	<b>BEV</b>
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

Institutions

Market Conditions

Policies

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

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# Extra slides

## 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

