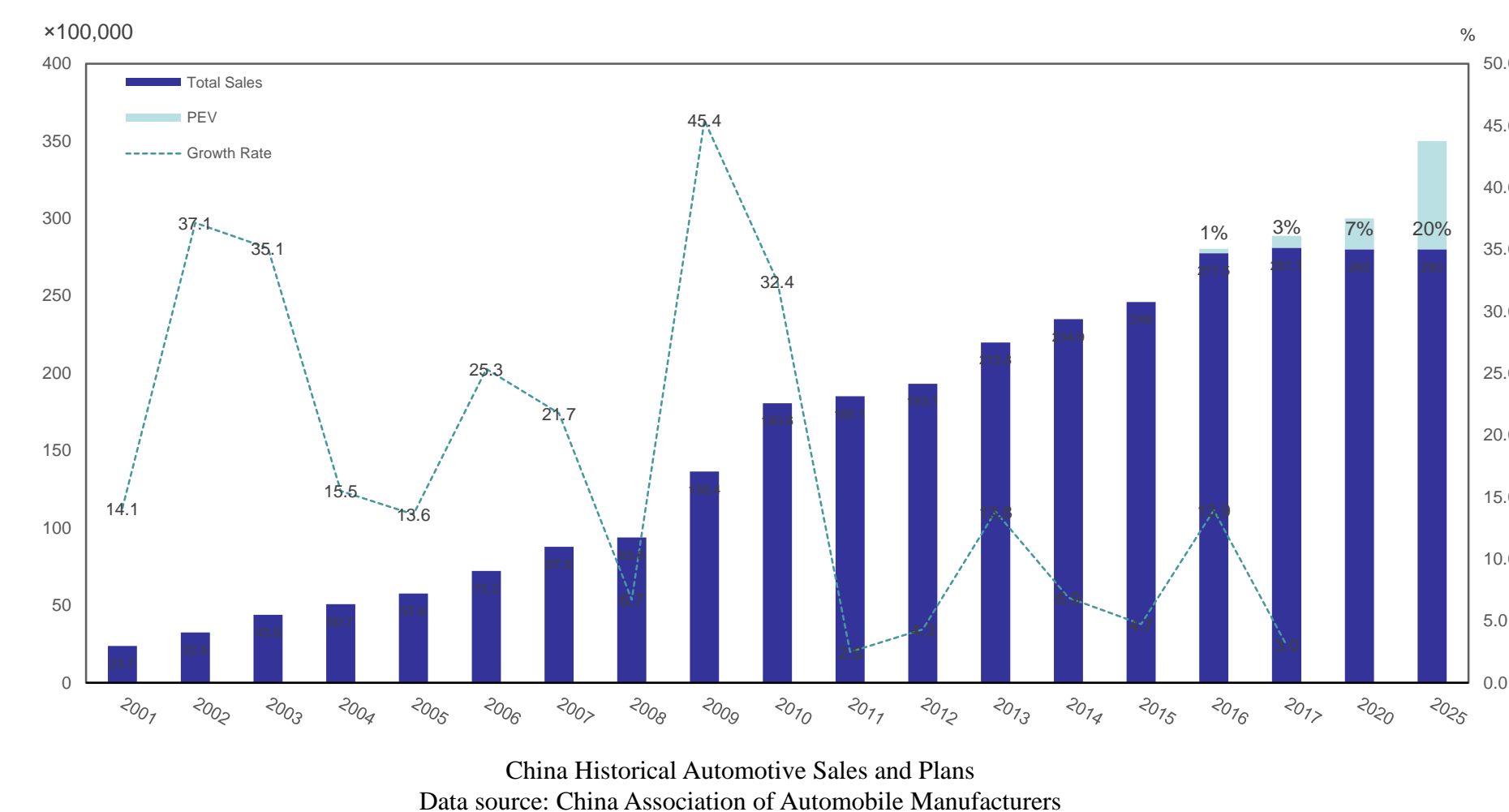
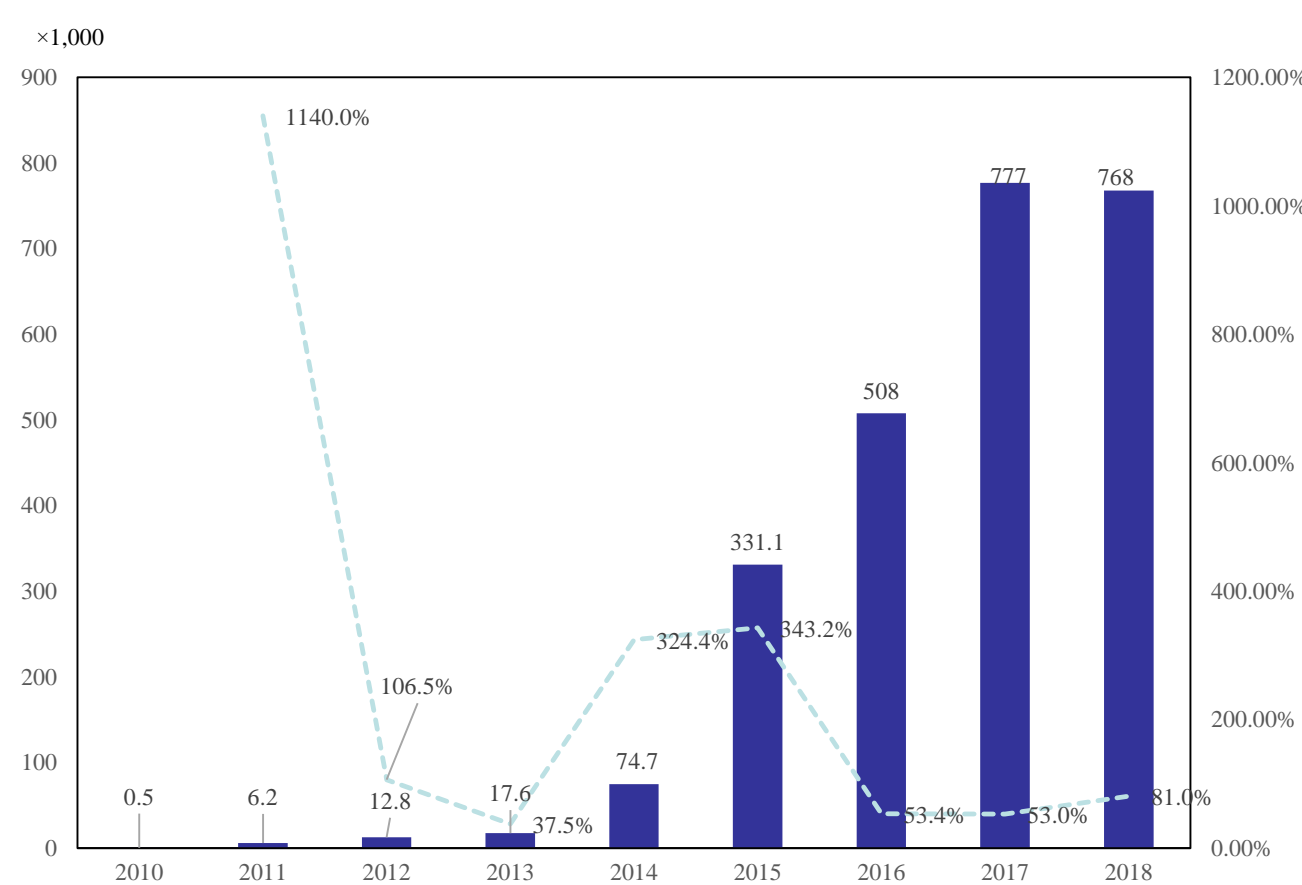


Research Question

- China is making great progress in promoting the penetration of ZEVs (Zero Emission Vehicles, including Plug-in and Battery Electric Vehicles, Fuel Cell Vehicles) and is now one of the largest ZEV markets in the world. The national government is proposing to ban ICE (Internal Combustion Engine) vehicles in 2030s or 2040s.
- Shenzhen has reached 100% electrification in bus fleet and is close to 100% in their taxi fleet; Beijing and several other cities announced they plan to reach 100% electrification in bus fleet no later than 2020.
- Under conservative and aggressive assumptions, how will the growth trajectory look like in the short and long term? To what percentage can ZEVs take in vehicle sales market?



Methods and Data

• Technology Diffusion Model

– With the consumers innovators and imitators to new technology products assumption, we took ZEV as a new technology in the market and projected the growth trajectory with saturation setting of total ownership in the future of 250m and 400m, fitting the model with historical ZEV sales data in China 2011-2017.

• Electric 2-Wheelers Adoption Analogy

– China witnessed a huge increase in the electric 2-wheelers during the past decade under policy intervention of motorcycles banned in the urban area. The generous subsidy from national and local governments, road usage right privilege for ZEVs and registration privilege for ZEVs would provide a similar motivation for the adoption of ZEVs. Under the analogy to the growth rate of 2-wheelers in the past decade in China, the ZEV annual sales in the coming decade were projected with a Loess smoothed 2-wheelers growth rate.

Results

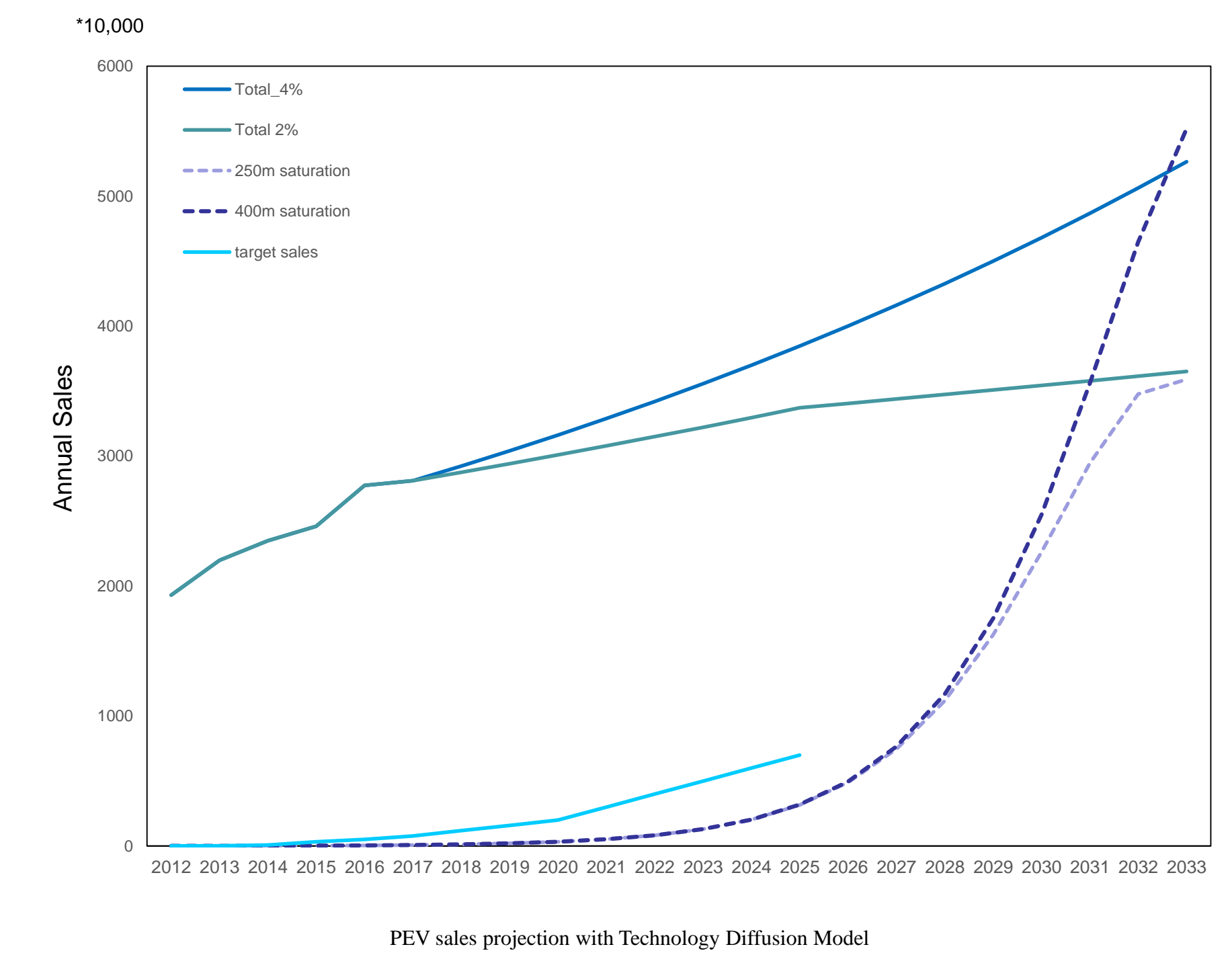
Technology Diffusion Model

• Assumptions:

- Tech Diffusion model with saturation setting of 250 m ZEV and 400 m ZEV
- Total vehicle linear growth with rate of 4% and 2%

• About 100% PEV in mid-2030s

- With incentives and other supporting policies, ZEV sales in the past decade and governments targets are higher than the Tech Diffusion modelling results



Electric 2-Wheelers Adoption Analogy

• Background:

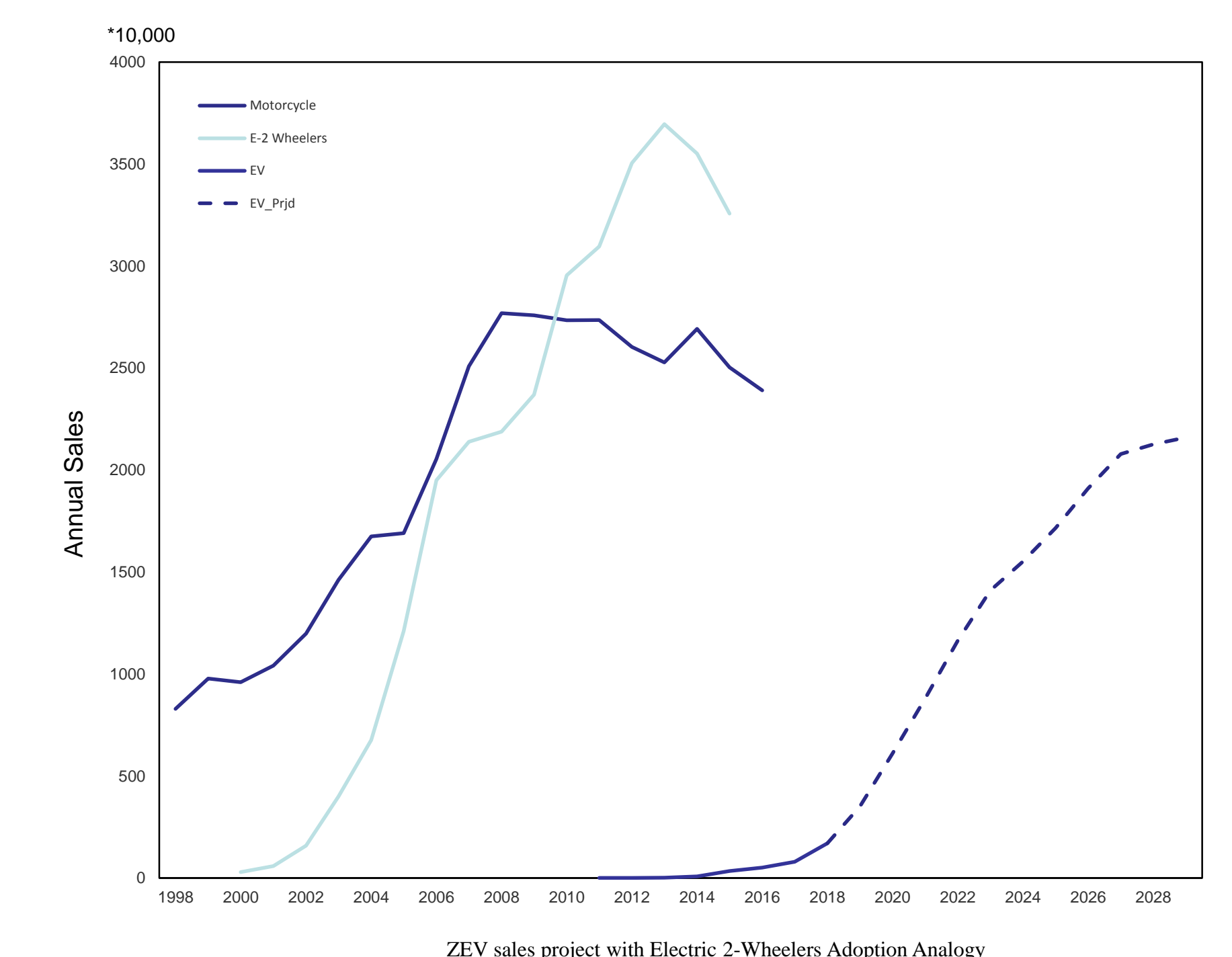
– With cities successively banned motorcycles driving in urban areas started in around year of 2000, the electric 2-wheelers soared in the past decade and replaced motorcycles ownership

• Assumptions:

- ZEV penetration with national and local strong promotion policies may follow the trend of 2-wheelers soaring after the motorcycle ban in urban area, with a smoother and adjusted rate

• Result

- About 20 million annual ZEV sales in 2030s



About this study

- Relevance: With the technology diffusion model and e-2 wheelers analogy model, we projected the possible growth trajectory of ZEVs in China.
- Limitations: the assumption of ZEV penetration follow technology diffusion model and analogy of e-2 wheelers vehicles providing reference scenarios, however, more sophisticated model should be developed to test the credibility of the model assumptions and results.
- Discrete Choice Model for projection of ZEVs is under development...
- A case study on Shenzhen's experience of high electric vehicles penetration in bus fleet, taxi fleet and ride hailing service fleet will be conducted during Dec 2018 – Jan 2019.