

Forecasting Export Volume

Using Ocean Freight Data to Drive Decision Making

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Who Uses Container Forecast Models?

Forecasting is central to many activities within any organization

❖ **Ports**

- Equipment and personnel planning
- Spatial and expansion needs

❖ **Shipping Carriers**

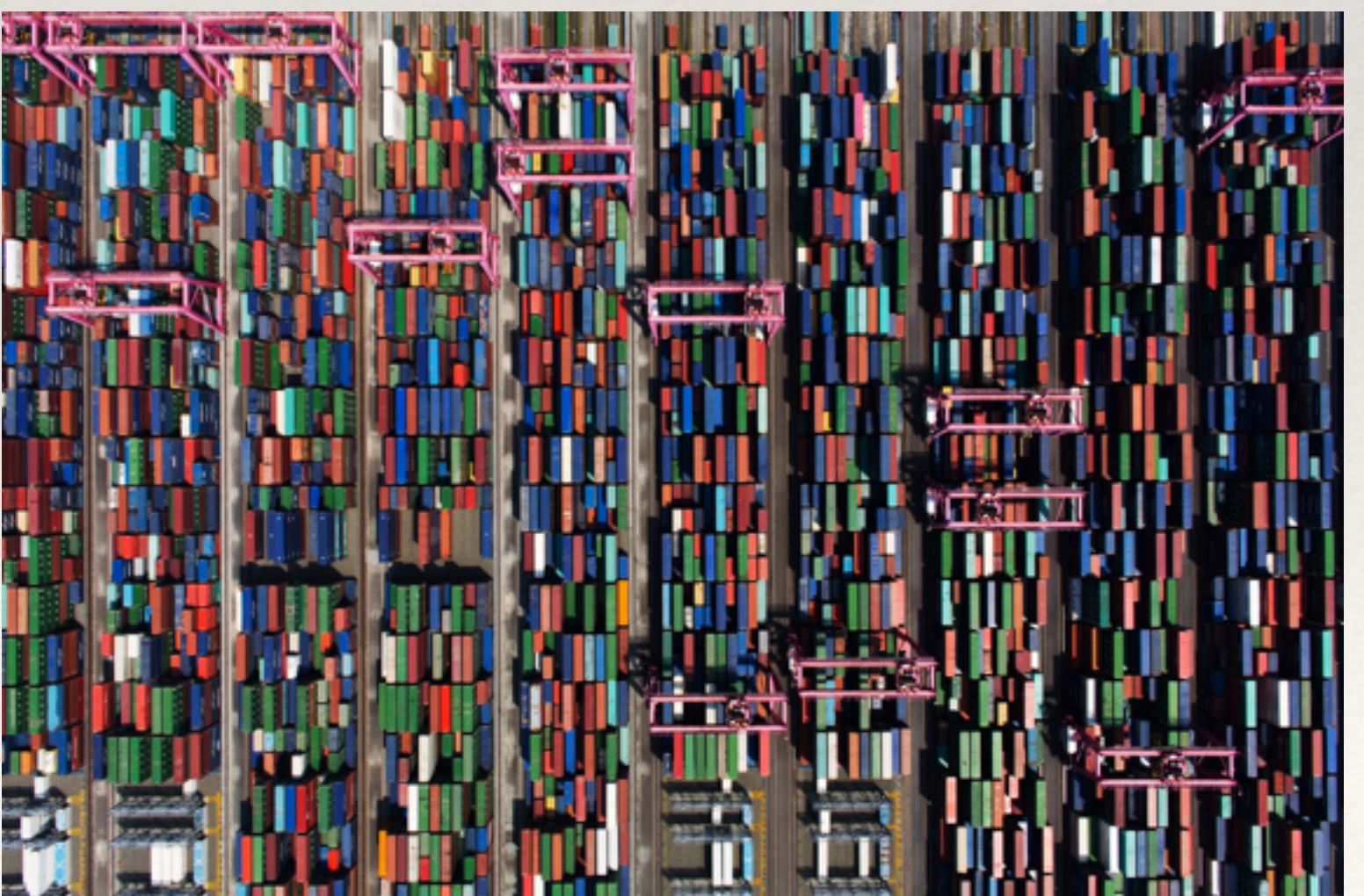
- Route, demand, capacity planning
- “Roll” percentage calculation

❖ **Importers and Exporters**

- Supply Chain and Inventory planning
- Spoilage

❖ **Economists**

- Economic metrics like GDP per capita influenced by net exports



Bill of Lading Data

- ❖ Over 100 million import observations
5 years 2014-2018
- ❖ Enigma Public - Bill of Lading Imports
- ❖ BOL data includes
port of origin, vessel name, destination, arrival date, harmonized tax code, description of contents
- ❖ Port of LA & Long Beach —>

enigma Ⓜ public



PostgreSQL

Tools used:

- PostgreSQL
- Facebook Prophet

PROPHET



Port of Origin Map

Where do ocean imports come from?

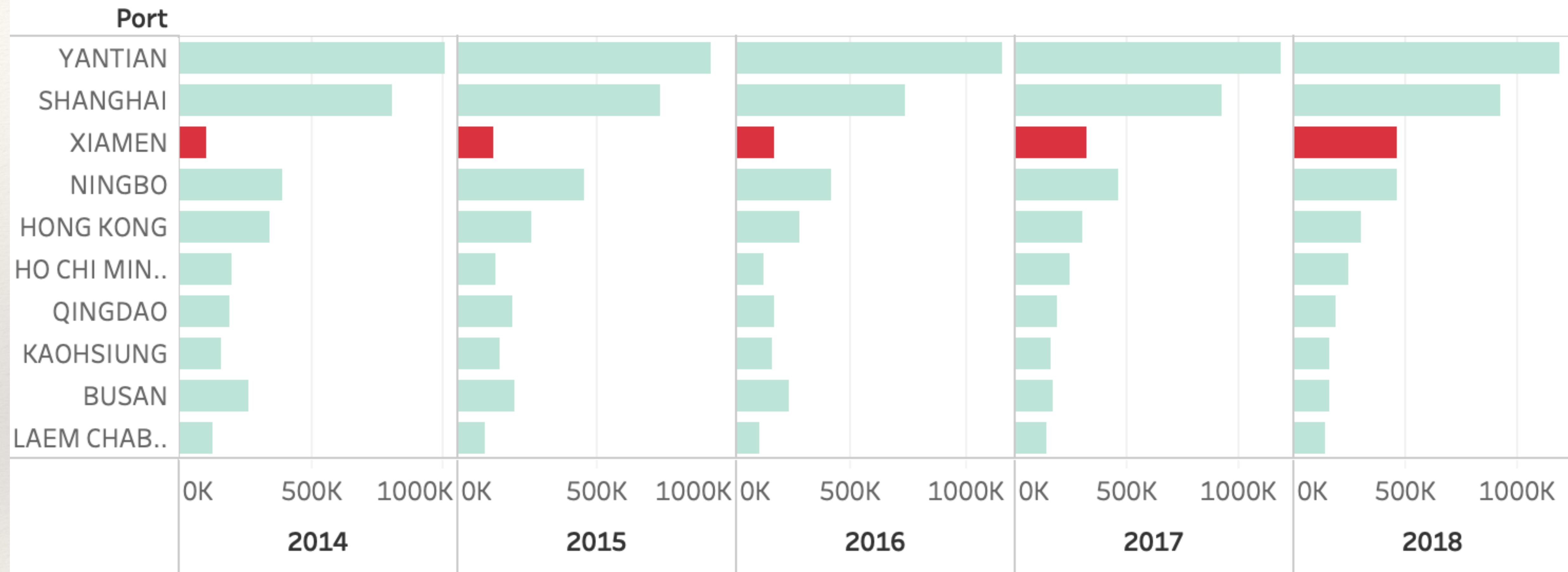
China surpassed Canada as USA's #1 trade partner in 2007

Top Imports

1. Furniture
2. Auto Parts
3. Apparel
4. Electronics
5. Footwear



Annual Export Volume by Port



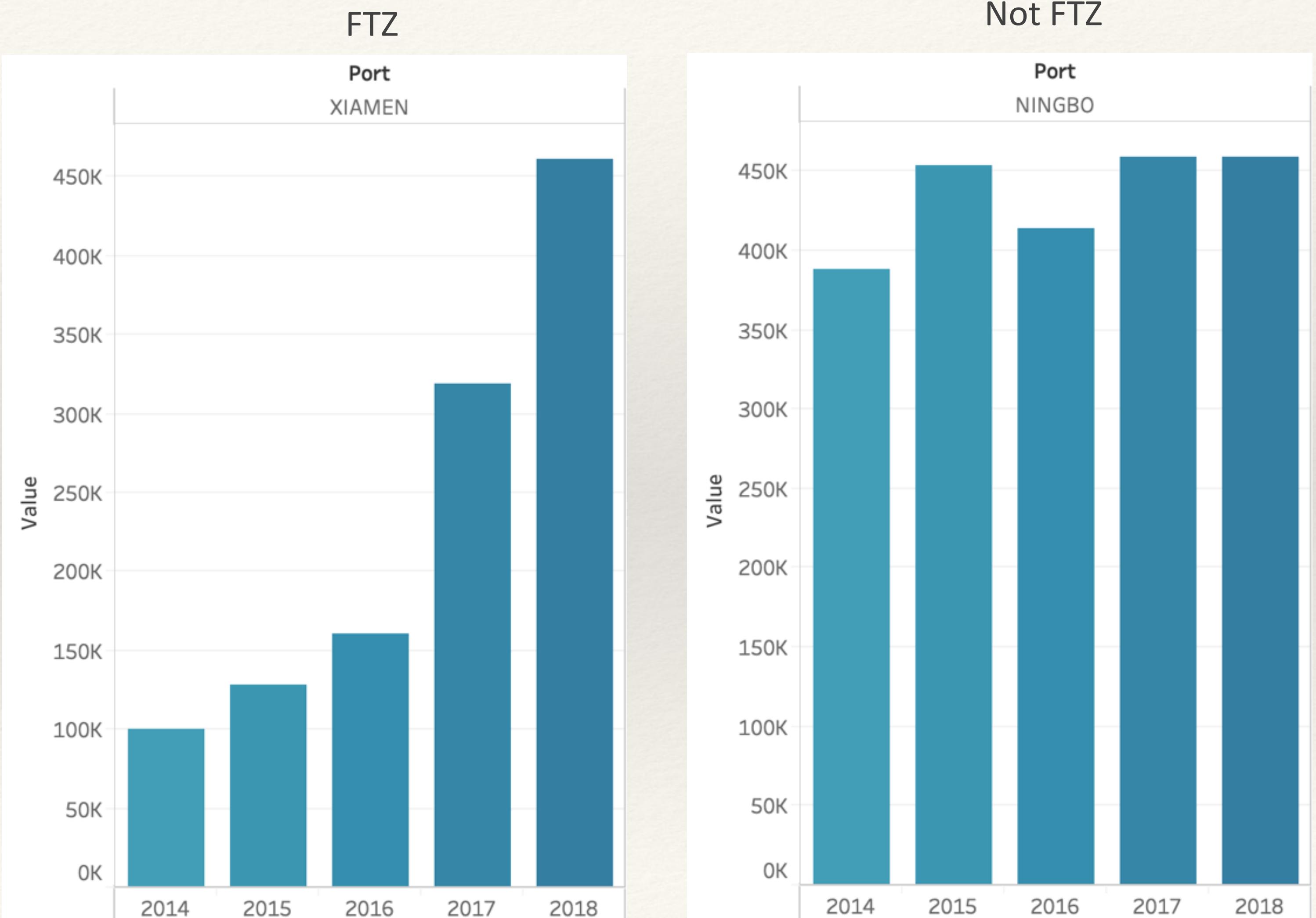
Free Trade Zone effect on Export Volume

FTZ definition

- A geographic area where goods may be landed, stored, manufactured and re-exported, generally not subject to customs duty. - wikipedia

Notable dates

- Xiamen begins as FTZ April 2015
- New US presidency begins late 2016
- Can we accurately forecast ports with explosive growth?

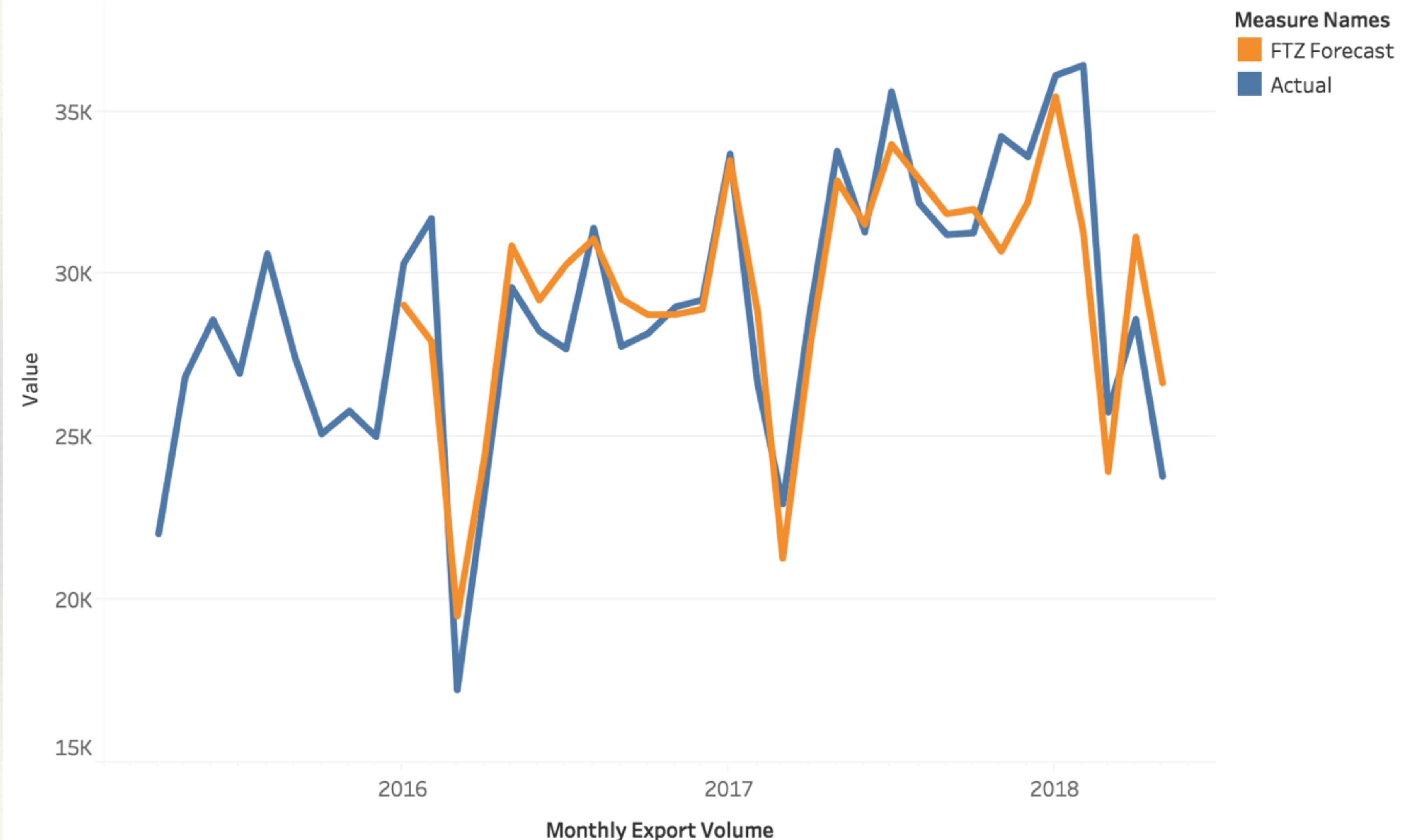


Forecast Model Results

Facebook Prophet Model

- Linear Growth Trend
- Yearly/Weekly Seasonal
- Holiday handling
CNY effect
- Performance
RMSE 837

Xiamen Forecasts vs Actual



Future Work

- ❖ Build a combined Port Optimization model that can learn to manage port resources on its own from experience in a reinforcement learning environment

Thank You

Michael Weber



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References

GDP per capita numbers - <https://www.ceicdata.com/en/china/gross-domestic-product-per-capita-prefecture-level-city/cn-gdp-per-capita-fujian-xiamen>

Xiamen 2014 Free Trade test site - <https://www.globalsources.com/TRADESHOW/XIAMEN-EXPORT-BASE/OVERVIEW.HTM>

Long Beach Port Optimizer - https://www.joc.com/port-news/us-ports/port-long-beach/long-beach-port-optimizer-decision-raises-data-questions_20190313.html

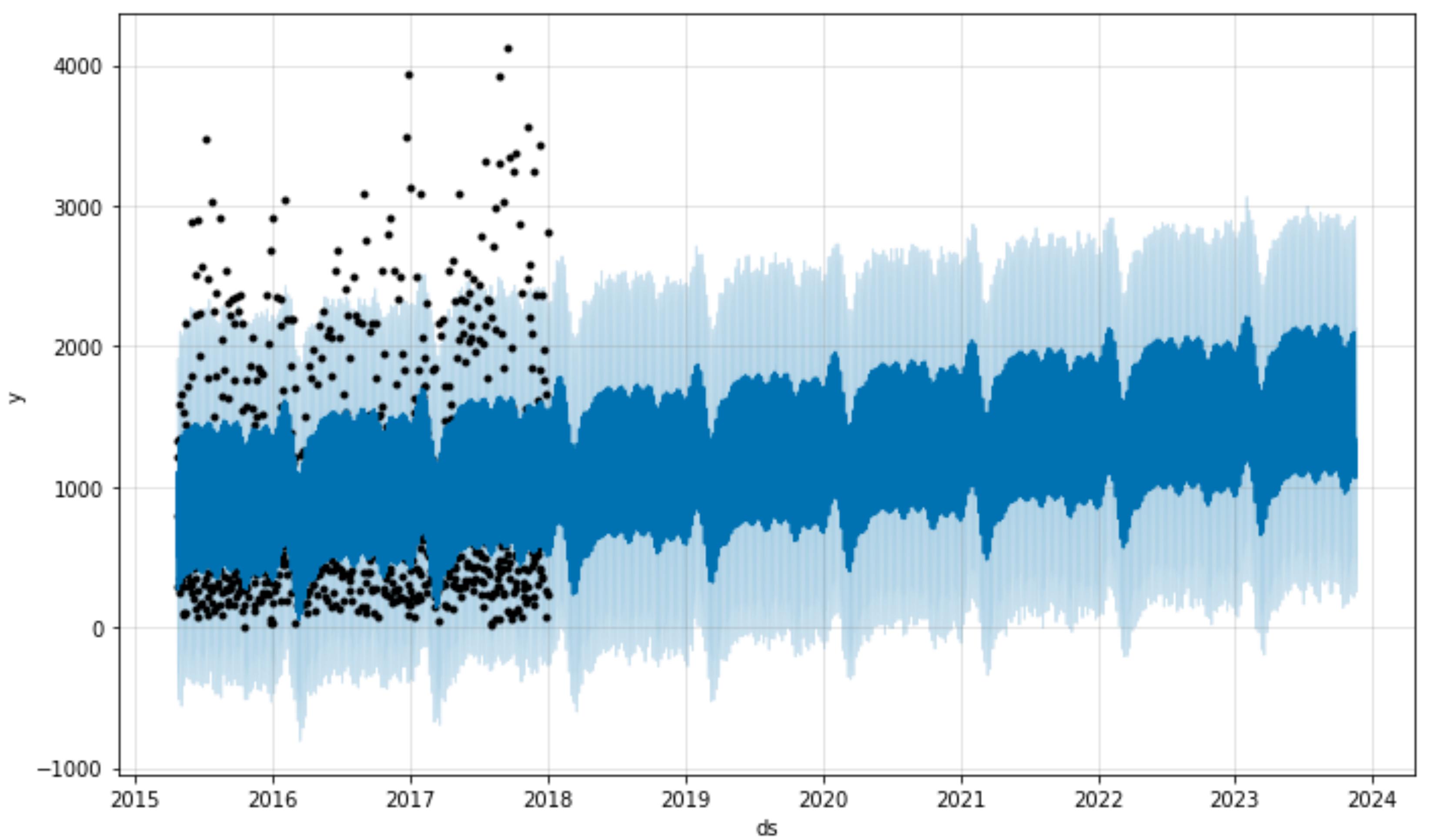
Tianjin Pilot Free Trade Zone - https://en.wikipedia.org/wiki/Tianjin_Free-Trade_Zone

TEU stands for Twenty-Foot Equivalent Unit which can be used to measure a ship's cargo carrying capacity. The dimensions of one TEU are equal to that of a standard 20' shipping container. 20 feet long, 8 feet tall

Xiamen biz report - https://build.export.gov/china/doingbizinchina/regionalinfo/secondtiercities/eg_cn_025698

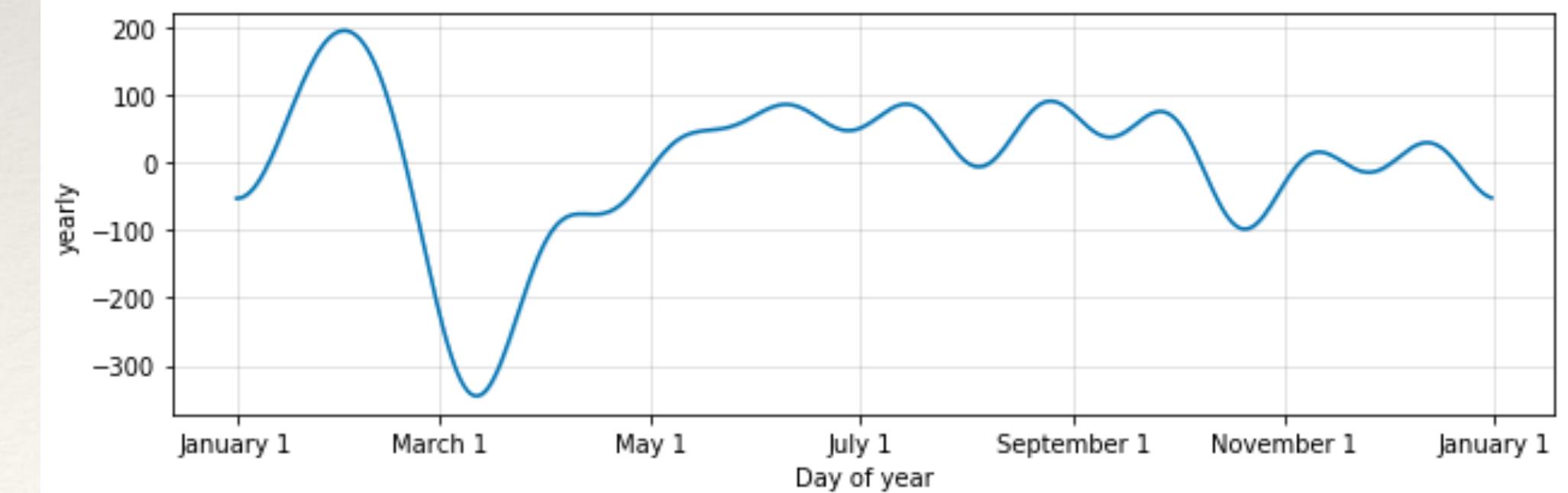
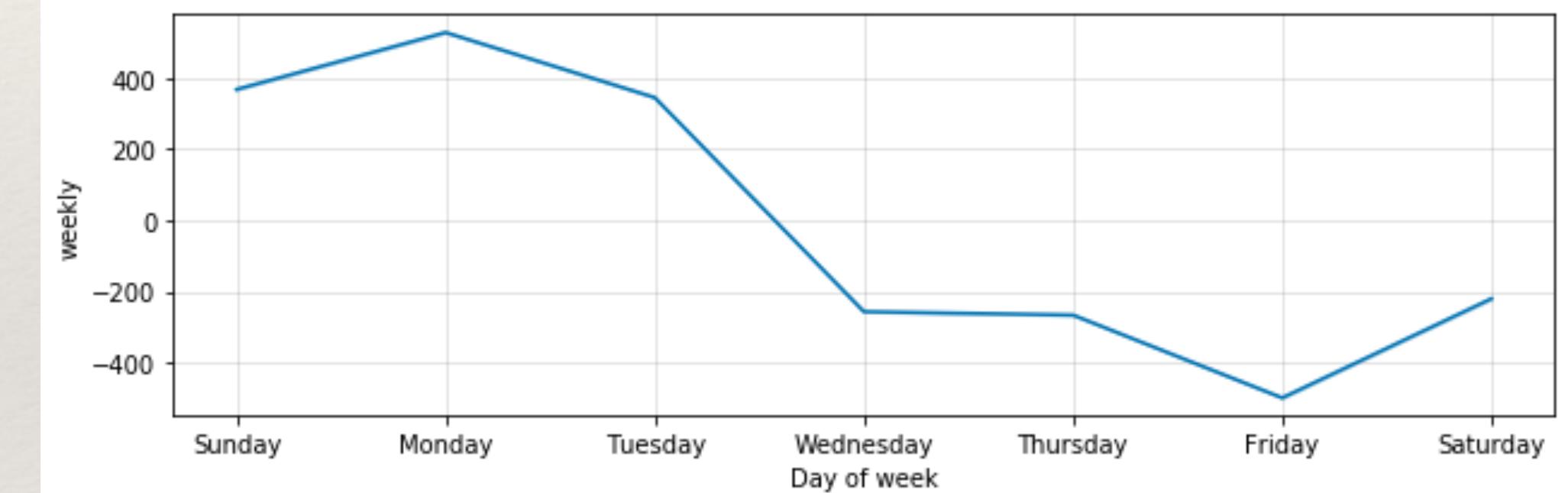
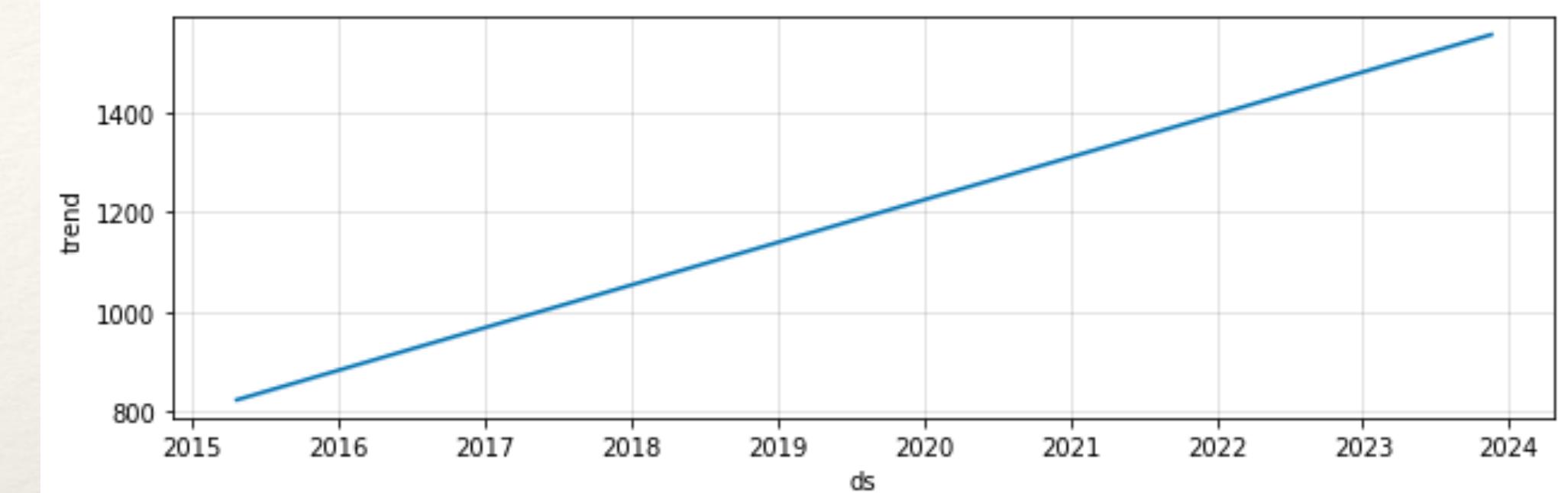
GDP a good measure of well being - <https://voxeu.org/article/defence-gdp-measure-wellbeing>

Forecasting to 2024

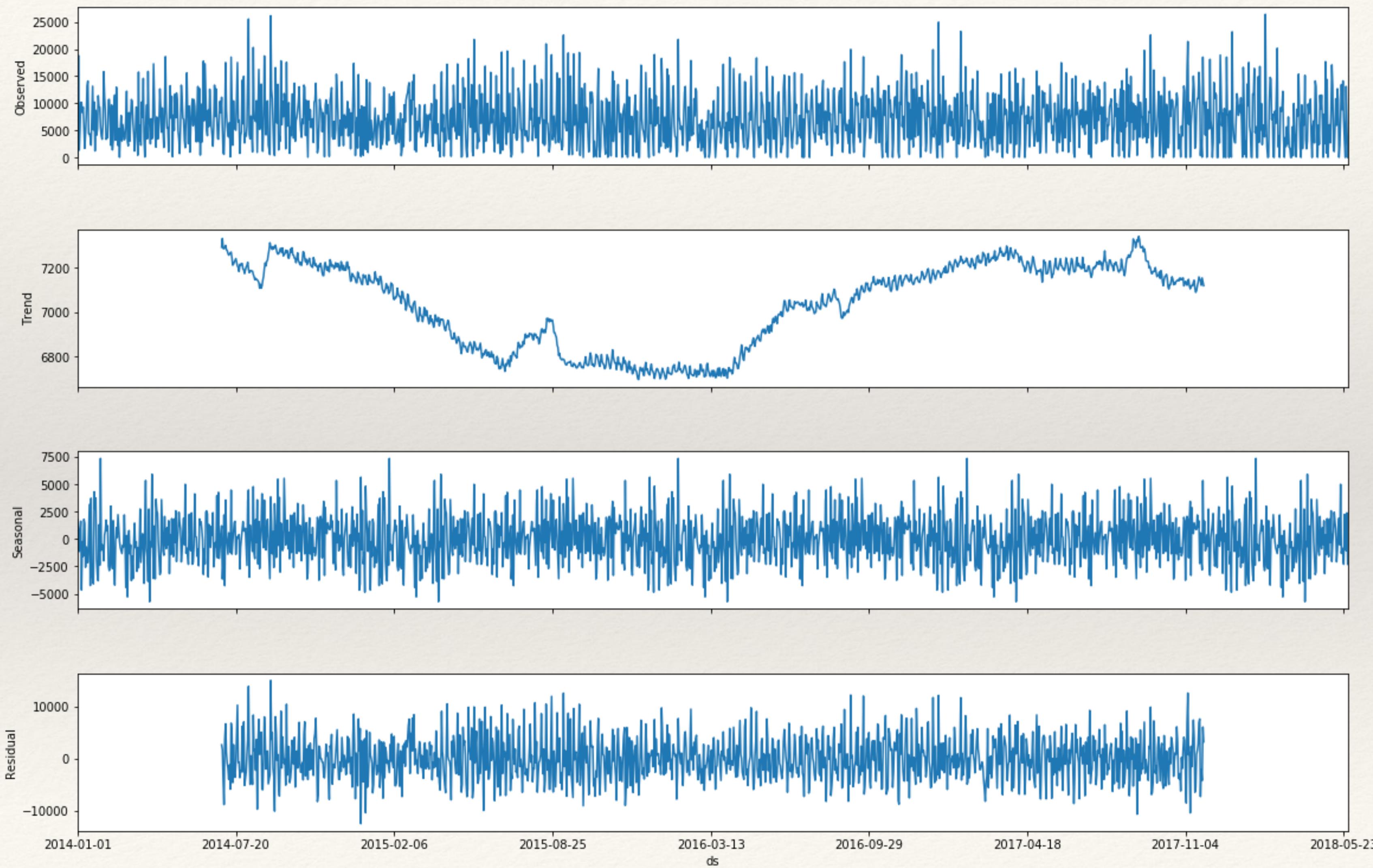


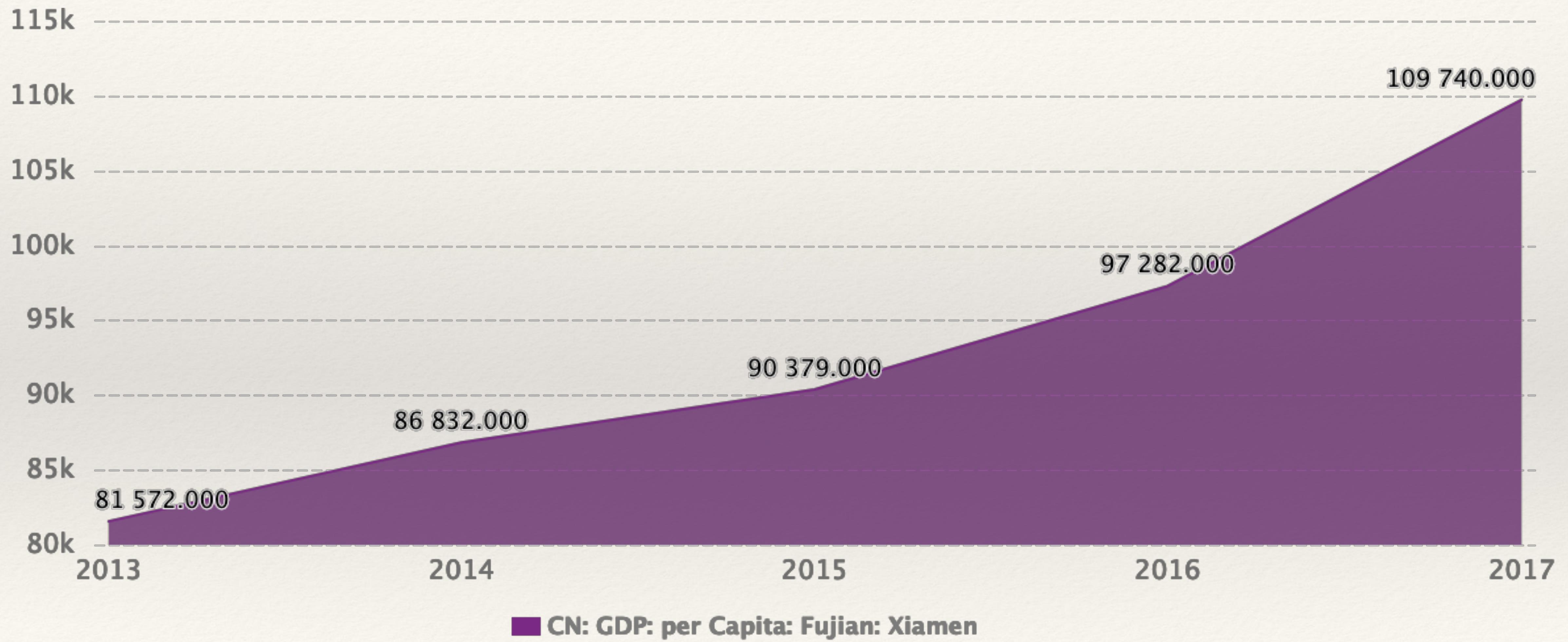
Components graph

- Seasonality & Holiday - CNY effect
- Trend - High growth post FTZ status
- Error - RMSE



52 months 4+ years of import data





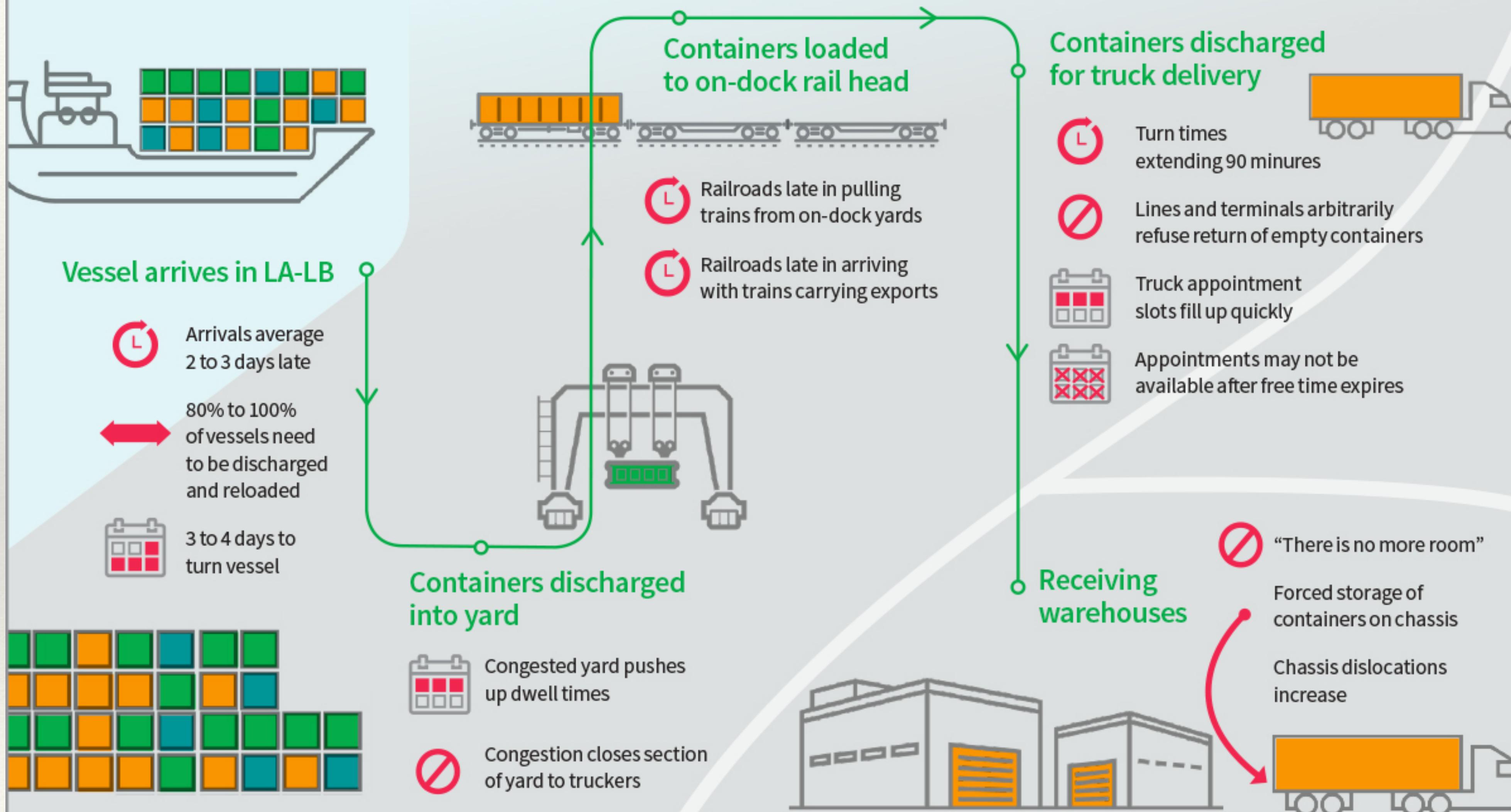
SOURCE: WWW.CEICDATA.COM | National Bureau of Statistics

Xiamen Forecasts vs Actual



Navigating LA-Long Beach port pain points

With 12 container terminals handling more than 16 million TEU a year carried by three vessel-sharing alliances and generating more than 30,000 gate moves per day, Los Angeles-Long Beach is the nation's most complex port environment.



Port of Los Angeles

147,000 jobs in Los Angeles (1 in 13)

526,000 jobs in five-county region (1 in 17)

1.6 million jobs throughout the U.S.

41% of west coast's market share

18% of nation's market share

San Pedro Bay Port Complex

(Port of Los Angeles + Port of Long Beach)

190,000 jobs in Los Angeles/Long Beach (1 in 12)

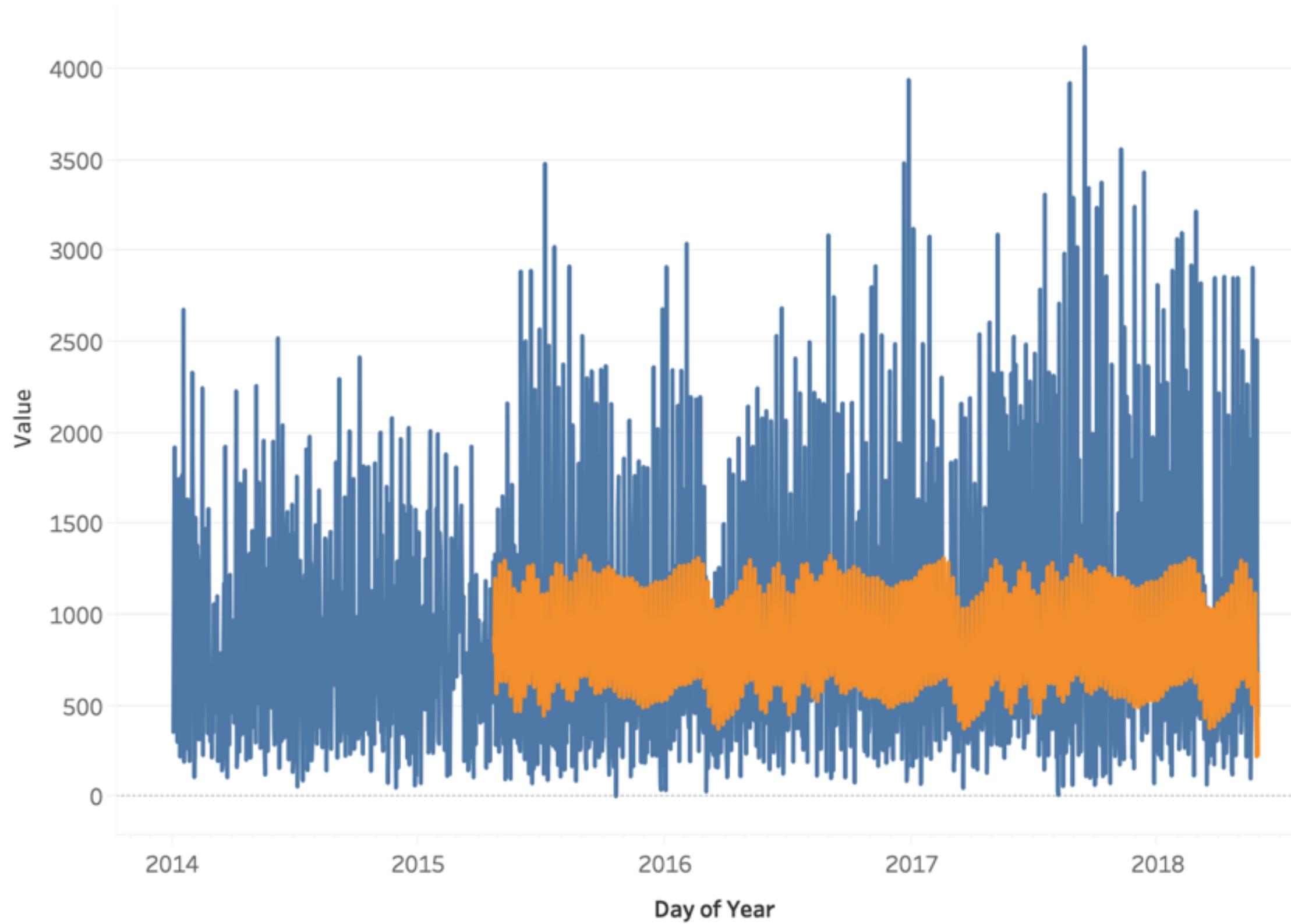
992,000 jobs in five-county region (1 in 9)

2.8 million jobs throughout the U.S.

73% of west coast's market share

32% of nation's market share

Xiamen Forecast Before FTZ vs Actual



Xiamen Forecast After FTZ vs Actual

