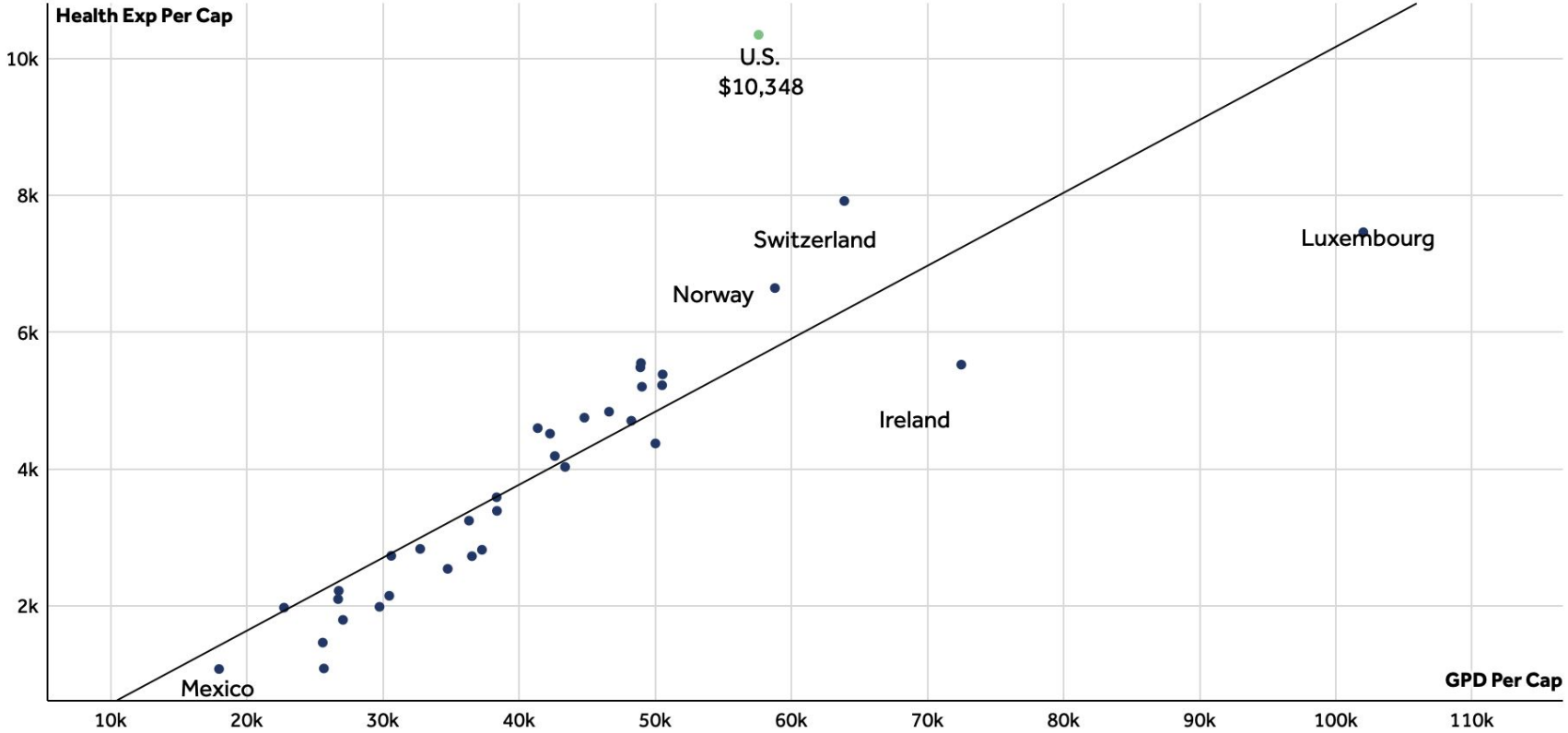
Inpatient Prospective Payment System

(IPPS)

Total health expenditures per capita/GDP per capita, U.S. dollars, PPP adjusted, 2016



The US value was obtained from the 2016 National Health Expenditure data.

Source: Kaiser Family Foundation analysis of data from OECD (2017), "OECD Health Data: Health expenditure and financing: Health expenditure indicators", OECD Health Statistics (database). DOI: 10.1787/health-data-en (Accessed on March 19, 2017). • Get the data • PNG

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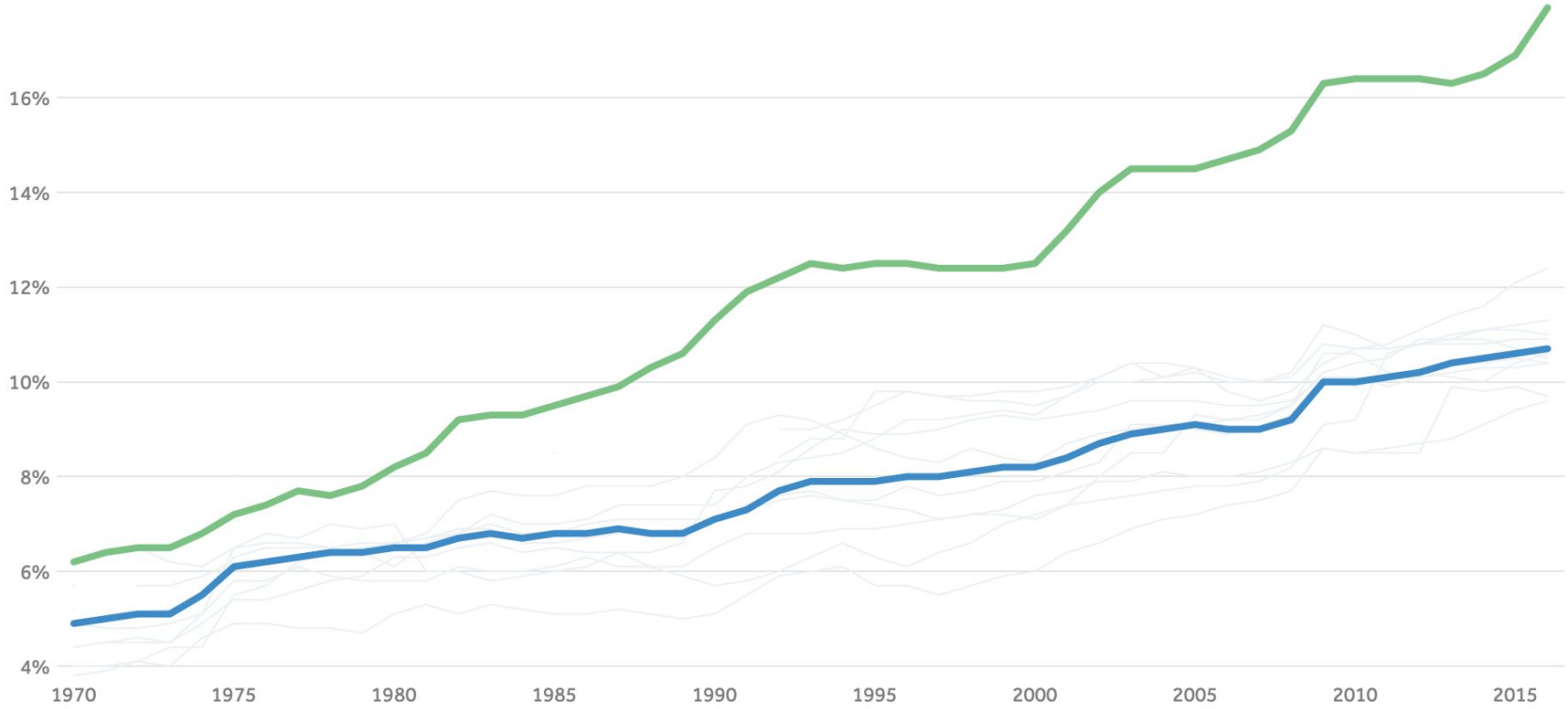
Total health expenditures as percent of GDP, 1970 - 2016



Excludes spending on structures, equipment, and noncommercial medical research. Data unavailable for: the Netherlands in 1970 and 1971; Australia in 1970; Germany in 1991; and France from 1971 through 1974, 1976 through 1979; 1981 through 1984, and 1986 through 1989. These countries are not included in calculated averages for those years. Break in series in 2003 for Belgium and France and in 2005 for the Netherlands. Data for 2016 are estimated values. The 2016 US value was obtained from National Health Expenditure data.

Source: Kaiser Family Foundation analysis of data from OECD (2017), "OECD Health Data: Health expenditure and financing: Health expenditure indicators", OECD Health Statistics (database) (Accessed on March 19, 2017). • Get the data • PNG

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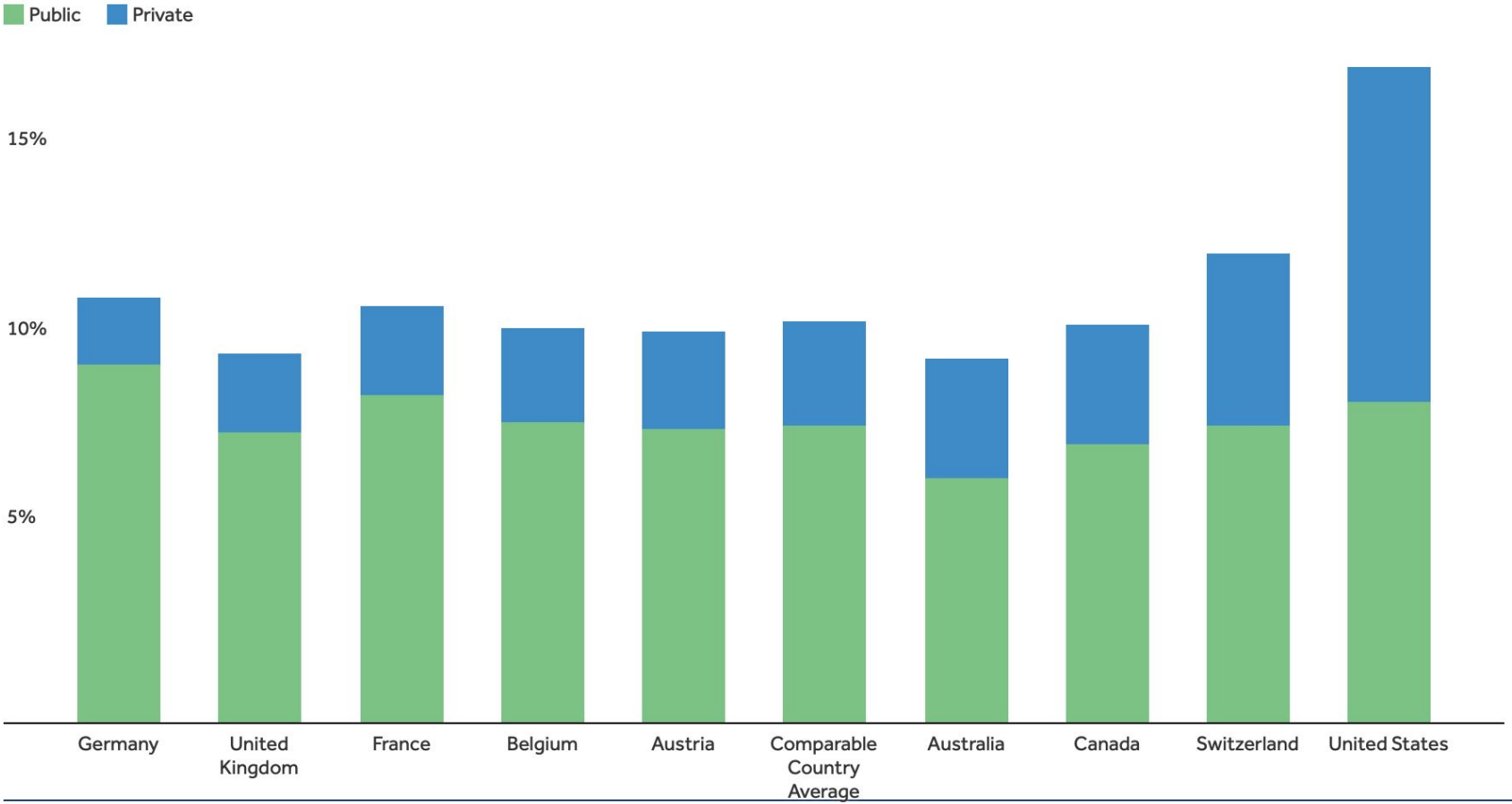
Total health expenditures as percent of GDP by public vs. private spending, 2016



Source: Kaiser Family Foundation analysis of data from OECD (2017), "OECD Health Data: Health expenditure and financing: Health expenditure indicators", OECD Health Statistics (database) (Accessed on March 20, 2017). • Get the data • PNG

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But you get what you pay for... right?

- The US has fewer physicians per capita than in most other OECD countries. In 2013, the U.S. had 2.6 practicing physicians per 1,000 people; below the world average of 3.3
- There are only about 1.2 primary care physicians per 1,000 people in the US. Projections indicate that the U.S. will need 52,000 more primary care physicians by 2025 to meet demand
- There is a significant spatial mismatch within the United States for physicians as well. While the U.S. averaged 225.6 doctors active in patient care per 100,000 people in 2014, there is a wide variance across states
- In 2013, the U.S. infant mortality rate was 5.96 per 1,000 live births (median is 3.8)
- The obesity rate among adults in the U.S. was 35.3 percent in 2013, down slightly from 36.5 in 2011. This is the highest rate among developed countries (average is 19%)

Source: *AFL-CIO (DPE)*

Our Dataset

Data.CMS.gov

The data include hospital-specific charges for the more than 3,000 U.S. hospitals that receive Medicare Inpatient Prospective Payment System (IPPS) payments for the top 100 most frequently billed discharges (n=163,065), paid under Medicare based on a rate per discharge using the Medicare Severity Diagnosis Related Group (MS-DRG) in 2017.

https://data.cms.gov/Medicare-Inpatient/Inpatient-Prospective-Payment-System-IPPS-Provider/97k6-zzx3

Our code is available on **github.com/hasanregius/team_ipps**

Data Source


```
# The API link
link = "https://data.cms.gov/resource/ehrv-m9r6.json"

# The app token and client
key = "oBbcgRhXZS4dqtTJVyz6zQujv"
client = Socrata("data.cms.gov", key)

# Retrieving all rows of data available returned as JSON from API
# and converted to Python list of dictionaries by sodapy and then data frame
results_df = pd.DataFrame.from_records(client.get("ehrv-m9r6", limit=163065))

# Saving the data frame as .csv
results_df.to_csv("raw_ipps.csv")

# Checking the head of the data frame
results_df.head()
```

Data Exploration and Cleanup Process

Notable Variables

Average Covered Charges	The provider's average charge for services covered by Medicare for all discharges in the DRG. These will vary from hospital to hospital because of differences in hospital charge structures.
Average Total Payments	The average of Medicare payments to the provider for the DRG including the DRG amount, teaching, disproportionate share, capital, and outlier payments for all cases. Also included are co-payment and deductible amounts that the patient is responsible for

Research Questions:

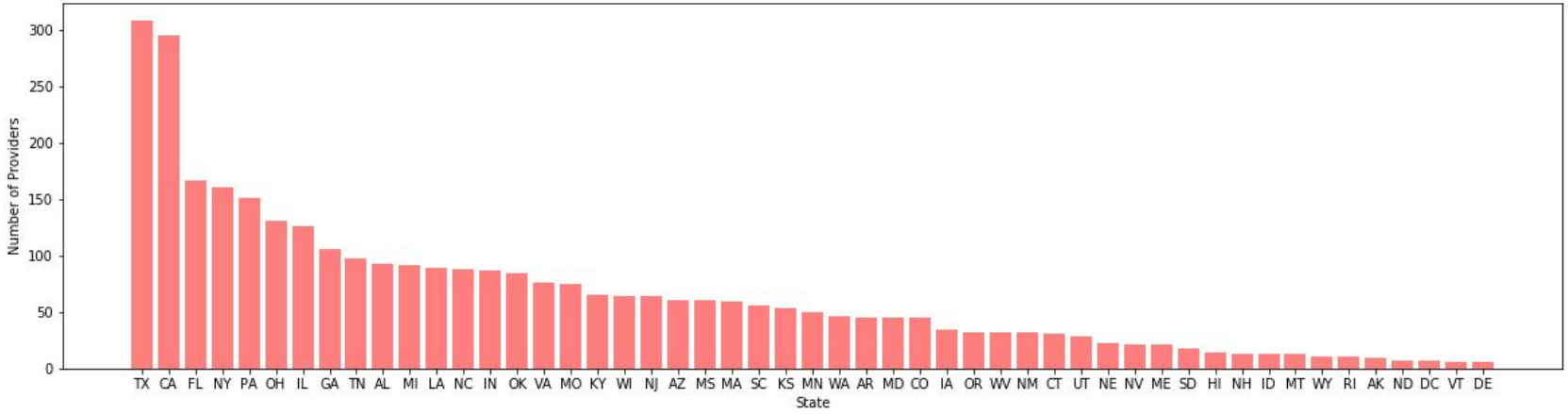
Question 1: Can we infer meaningful correlations between the number of providers and the volume of procedures done on average provider charge?

For a patient-centric system, we could expect lower prices for procedures as the volume of procedures done increases since facilities and equipments are used more frequently and no relationship with provider counts. Assuming a for-profit model system, if there are more providers in a state, we can expect lower prices due to competition and higher prices if there is more demand for the procedure.

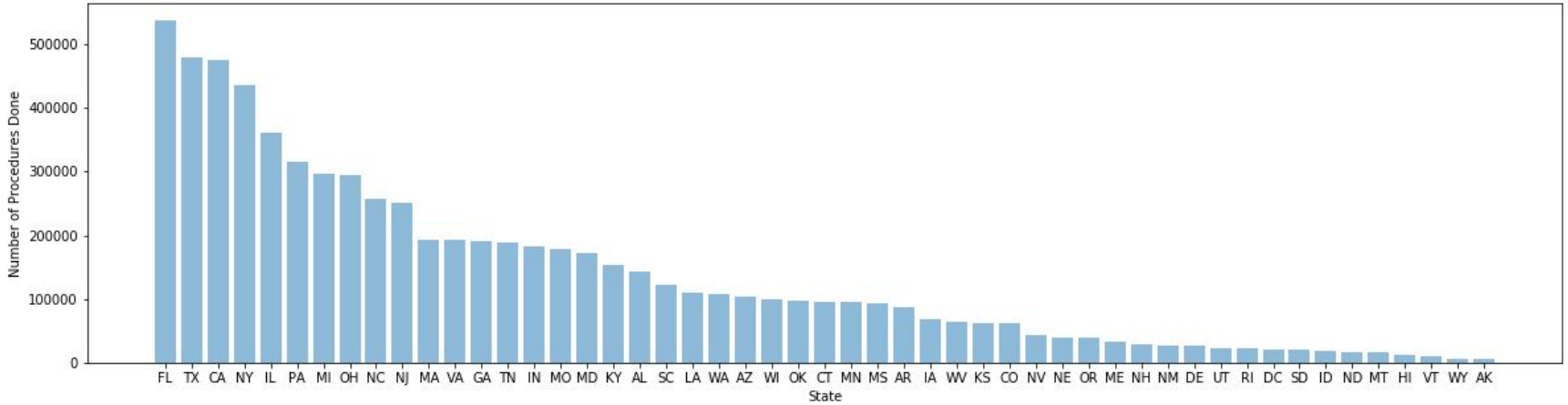
Question 2: Medicare and patients don't pay the full amount charged by the provider. Does this differ by state?

Though the Affordable Care Act is on the federal level, states still have their own laws regarding healthcare costs

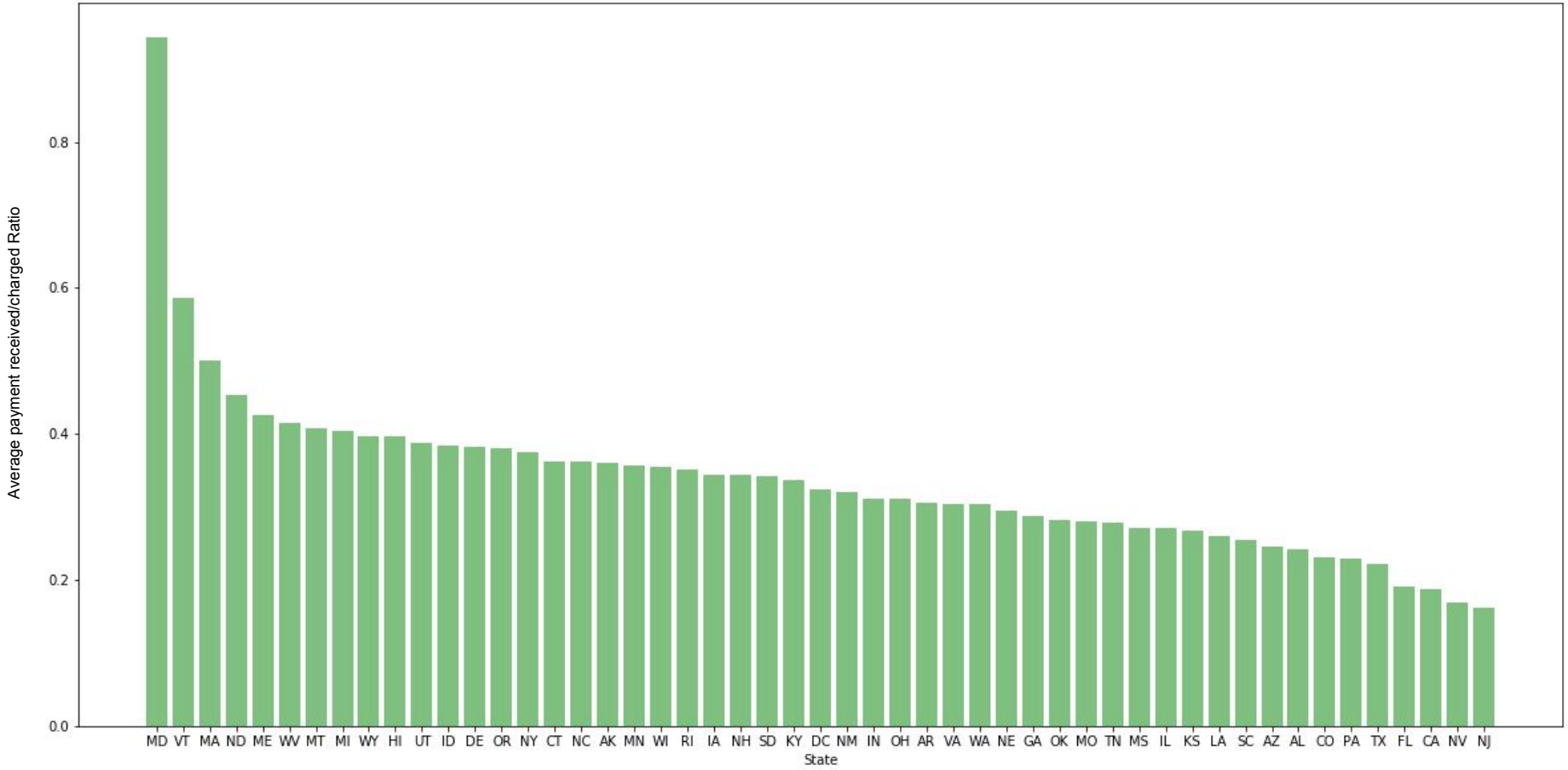
How do states differ in **number of providers**?



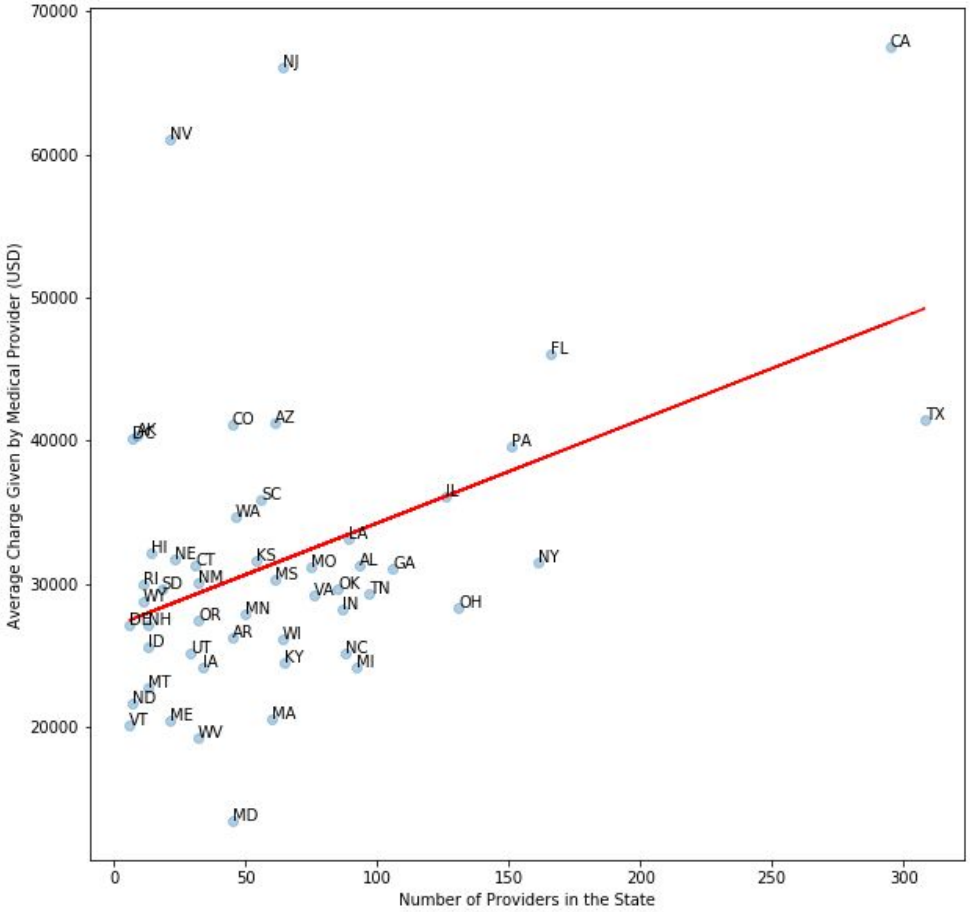
How do states differ in **volume of procedures done**?



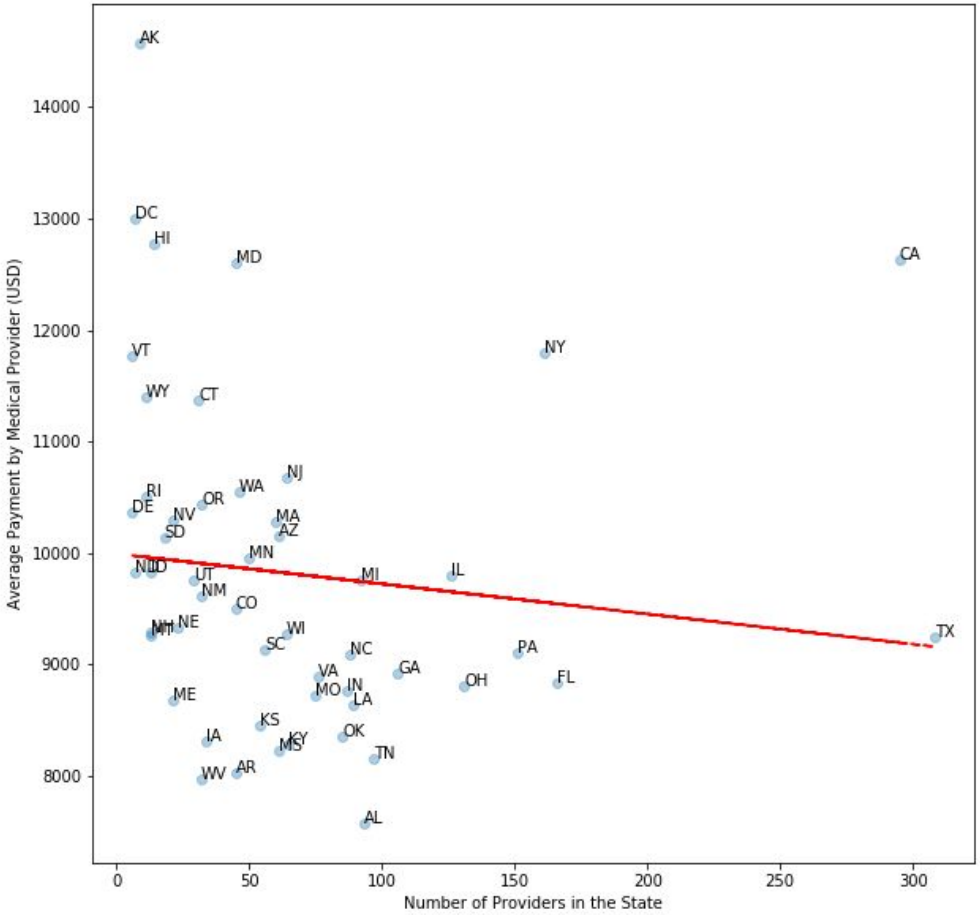
How do states differ in **paid/charged** ratio?



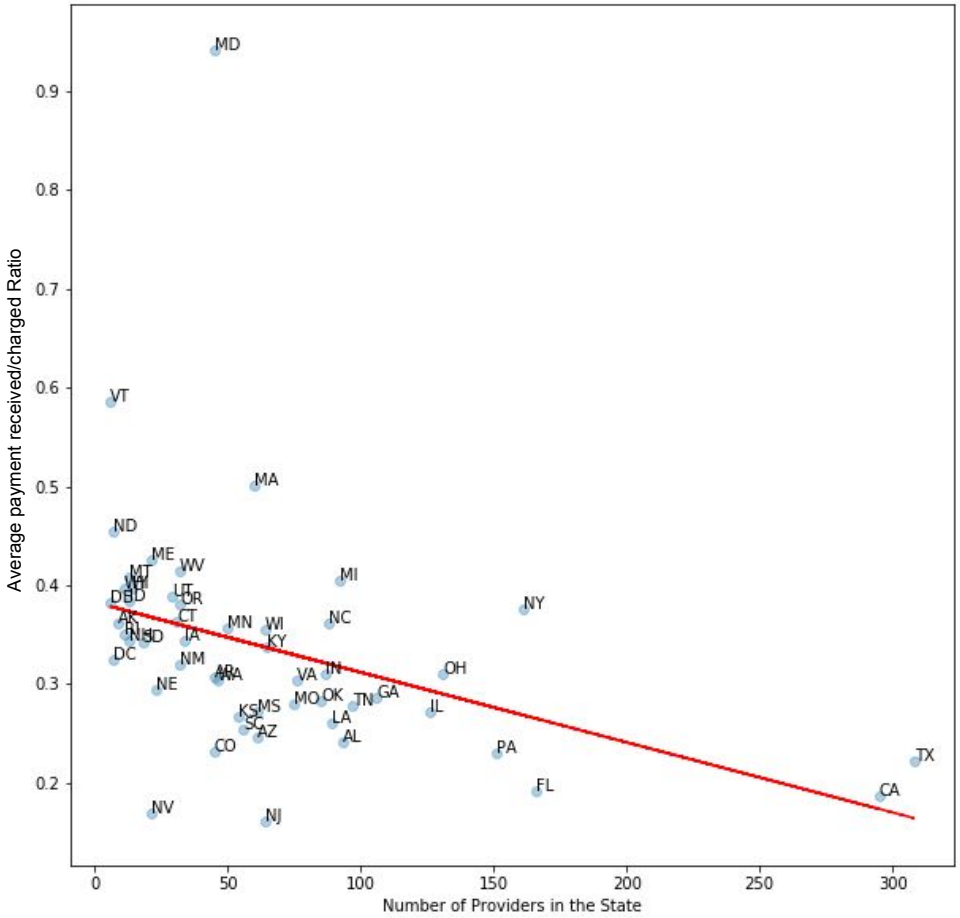
Provider Count and Provider Charge



Provider Count and Payment Received



Provider Count and Paid/Charged Ratio

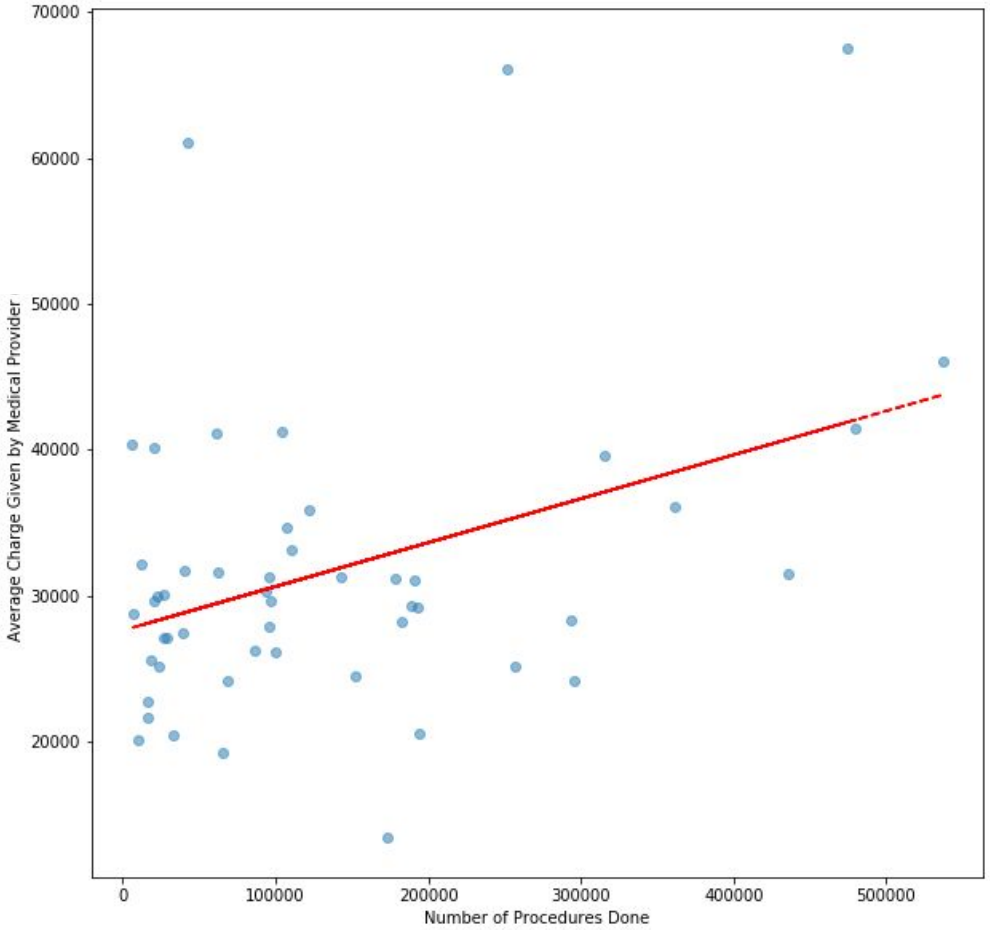


What can we infer about provider counts?

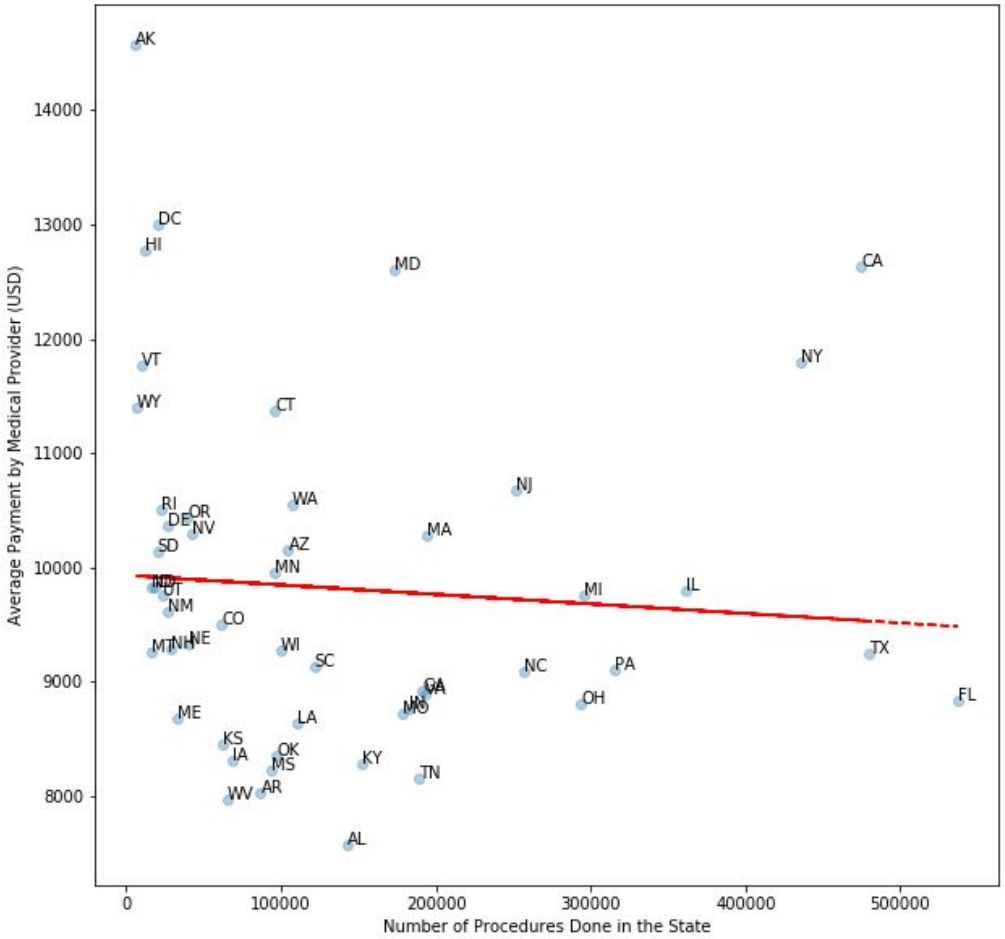
Provider count increase results in

- Rise in average provider charge
- Drop in average payment received
- Lower charged/payment ratio
- Change rate varies by state
- Providers tend to **charge more** as the number of providers increase but **receive less** from Medicare and patients

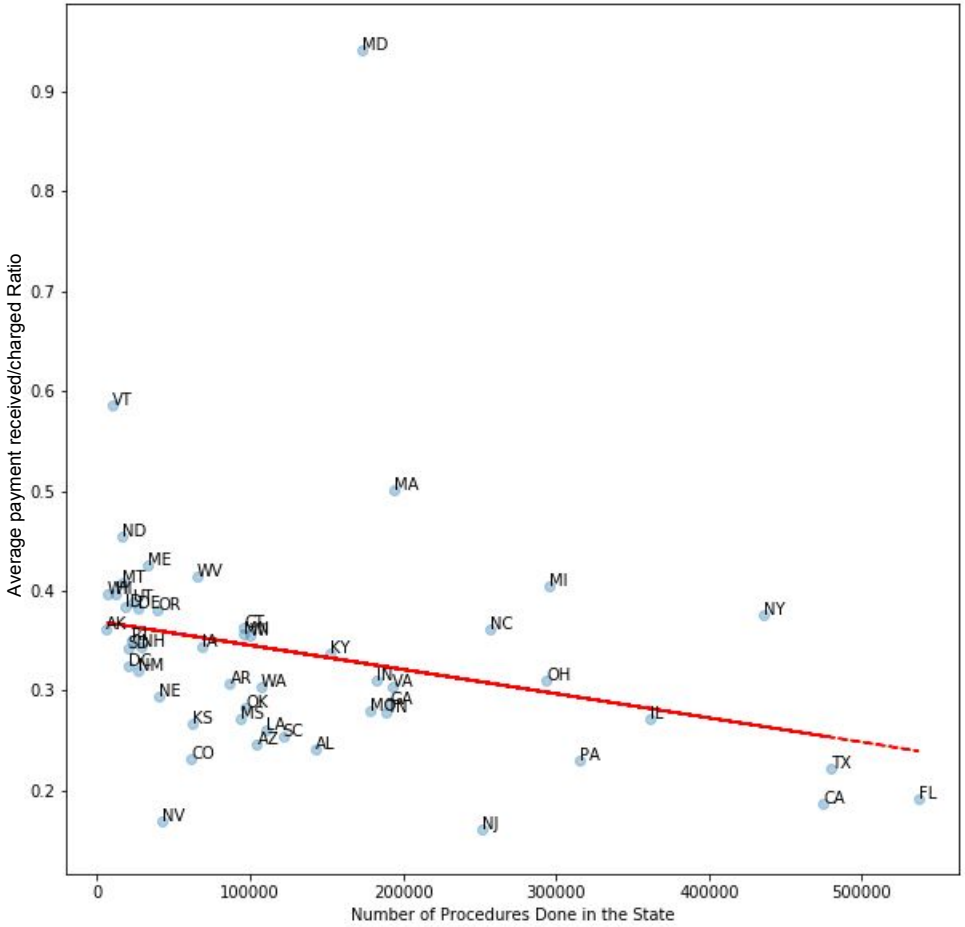
Volume of Procedures Done and Provider Charge



Volume of Procedure Done and Payment Received



Volume of Procedure Done and Paid/Charged Ratio



What can we infer about volume of procedures done?

Volume of procedure increase results in

- Rise in average provider charge
- Drop in average payment received
- Lower charged/payment ratio
- *Comparable effects as provider count*
- Average amount charged tends to **increase** as the volume of procedures increase but also **decrease** in payment received.

In Summary :

Question 1: Can we infer meaningful correlations between the number of providers and the volume of procedures done on average provider charge?

Though more data is needed, we found that patients generally pay less when there are more procedures done in the state as well as if there are more providers in the state - which follows what would be expected from a for-profit model.

Question 2: Medicare and patients don't pay the full amount charged by the provider. Does this differ by state?

Interestingly, we found that there is a difference in the ratio for payment made, amount charged, and the ratio thereof between states. Though what drives the differences are unknown.

Open Ended Discussion of Finding

1. It’s not entirely clear what drives the paid/charged ratio. Employers and insurers, the government, along with private citizens can negotiate the price. From a business standpoint, it makes little sense to post close to 5x the paid amount as the price for a service.

Future Improvements

1. We could've used a 'for' function to make multiple graphs at once
2. We could've also incorporated other datasets like voter data and even disaster/disease occurrence data to model price based on risk
3. Correlation != causation. No mechanistic descriptions can be made about the dataset without a substitution/elimination/addition experiment
4. We could do a spatial analysis instead of treating states as a factor
5. Not all hospitals were included, only close to 3,000
6. Only data for the most common 100 procedures are included