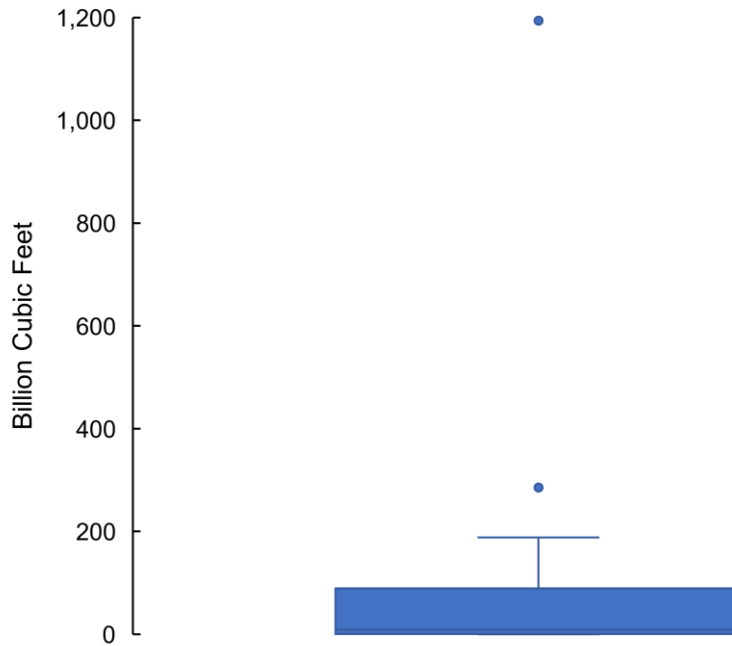


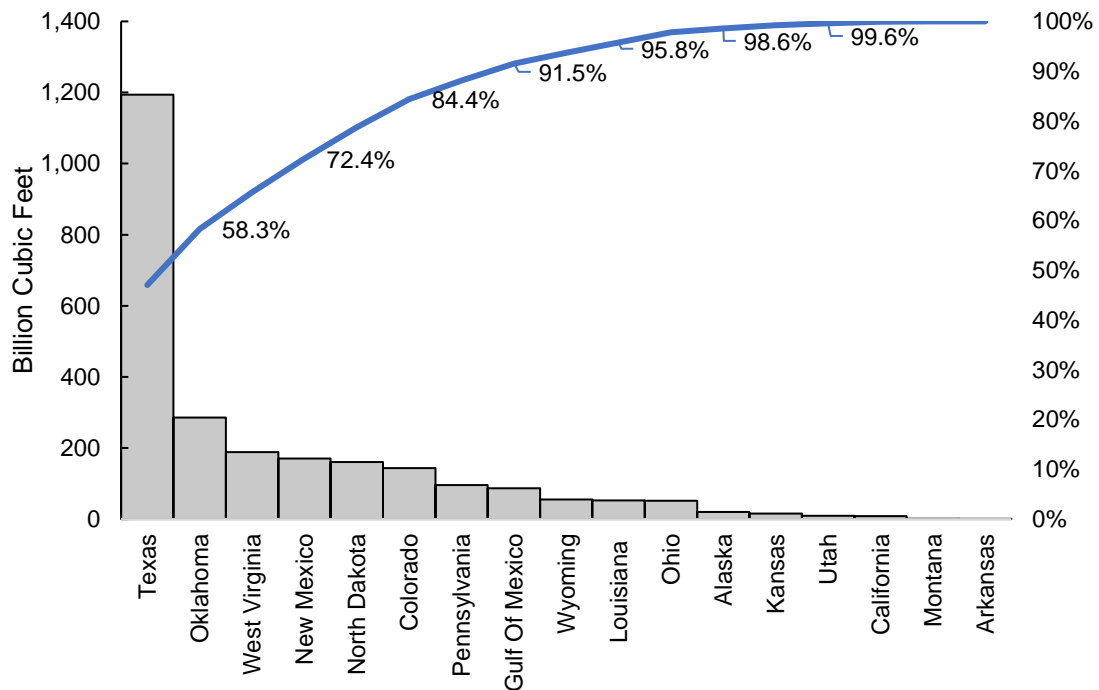
Visualizing Distribution

Figure 1. Distribution of Natural Gas Production by State, 2019



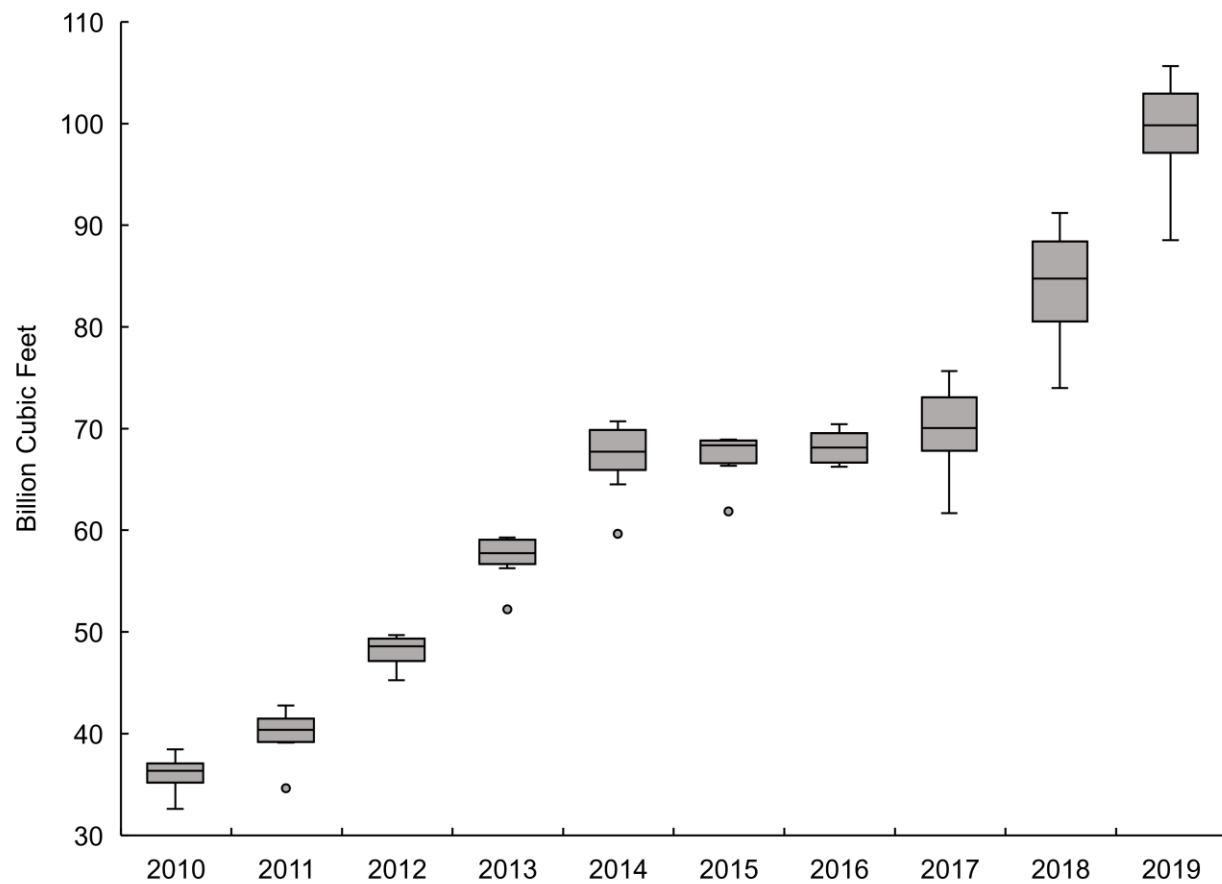
Source: Author's elaboration with data from the Energy Information Administration

Figure 2. Pareto Distribution of Natural Gas Production by State, 2019



Source: Author's elaboration with data from the Energy Information Administration

Figure 3. Distribution of Natural Gas Monthly Production in Texas, 2010-2019



Source: Author's elaboration with data from the Energy Information Administration

The relevant points of this data visualization are:

- The main purpose of these figures is to visualize distribution of natural gas production.
 - Figure 1 shows the distribution of plant liquid natural gas production by State in 2019 using a box-plot.
 - Figure 2 shows the distribution of natural gas of plant liquid natural gas production by State in 2019 using a Pareto distribution chart.
 - Figure 3 shows the monthly distribution of plant liquid natural gas production in Texas from 2010 to 2019 using side-by-side box-plots.
- As observed in Figure 1, the natural gas production in 2019 was highly positively skewed and two unusual points, probably outlier states, seem to be present.
- The median natural gas production in 2019 is 9 billion cubic feet.
- As observed in Figure 2, 58% of total natural gas production in 2019 was concentrated in Texas and Oklahoma which represents the unusual points in Figure 1.
- Texas is the largest natural gas producer as it accounts for 47% of the total U.S. natural gas production in 2019.
- 79% of the total natural gas production is concentrated in 5 states. These states are Texas, Oklahoma, West Virginia, New Mexico, and North Dakota.
- Market power is the capacity of a state to affect the natural gas price nationally due to its largescale production of natural gas.
- Texas has market power in the national natural gas price because of its production share.
- When a hurricane hits Texas, the natural gas production decreases as it becomes more costly to be produced. Natural gas price in Texas could be affected when a hurricane hits the state and given its market power it could affect the nationwide natural gas price.
- As observed in Figure 3, the monthly natural gas production from 2010 to 2019 in Texas is generally symmetric except for a few years.
- The distribution of natural gas production of Texas in the years 2010, 2012, and 2015 was negatively skewed.
- The natural gas production of Texas presented outliers in the years 2011, 2013, and 2015 indicating that Texas experienced a dropped in production in a particular month.
- This graph presented below along with the explanation of market power could be helpful to highlight the relevance of having a natural disaster relief fund for Texas in those months where a hurricane is anticipated in order to avoid high natural gas prices spread nationwide.

I presented in Table 1 the six Tufte's principles recommended for a data visualization along with a description of each principle. Additionally, I indicated which of these principles I used when creating Figure 1 and explained their applications.

Table1. Tufte's Principles applied in Figures 1-3

Tufte's Principles	Figure1-3	Detailed description	Application
Show comparisons	✓	Making comparisons is helpful in identifying magnitude visually	Figure 3 compares side-by-side box plots of natural gas production in Texas from 2010 to 2019.
Show causality	NA	The data visualization could have as major goal to show causality. How a variable cause another visually could provide a first insight in identifying causation	NA
Use multivariate data	✓	Use multiple variables to accomplish the goal of the data visualization	Figure 3 uses time (year) and natural gas production in billion cubic feet.
Completely integrate text, images, and numbers	✓	Integrate relevant notes, remarks, and images to better inform your audience about the information you want to communicate	These figures include title of the information displayed; and they are also labeled to indicate their unit scale.
Establish credibility	✓	One form to establish credibility is to include the data source and also start from the origin or allow the reader to identify the scale you are using	The source is included at the end of each figure. I also provided additional information about market power and the potential application of these data visualizations.
Focus content	✓	Use space efficiently and avoid <i>chartjunk</i> by including relevant data to communicate your idea and stress on your main goal of your data visualization.	I included labels when relevant such as in every two points in the cumulative distribution of natural gas production in Figure 2 to avoid overcrowding.