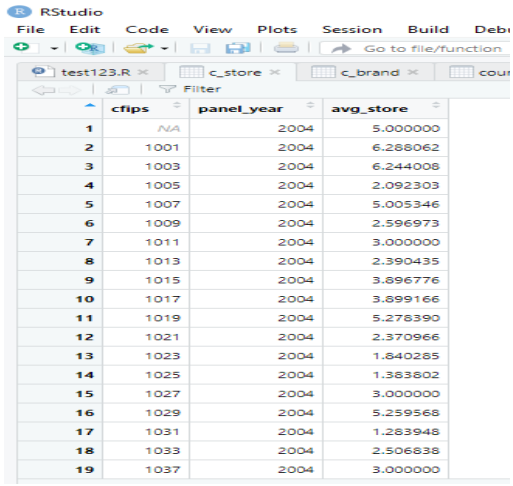
**Content**

**Design Description:** We first developed big picture questions of what our web application is supposed to answer based on the full story described in the Consumer Behavior and Rise of Broadband article. Then, we developed visualizations for each variable broadband, trips, chains, and brands that could answer these questions. After we designed our visualizations, we planned the layout of our app to visualize how broadband affected consumer behaviors.

**Broadband Visualizations: You can search up how to plot each of them on ChatGBT. Feel free to include more visualizations of your choice**

- How do broadband percentages change over the years from 2006 to 2016? We should plot a scatterplot that shows correlation between broadband percentages and year
- How do broadband percentage trends over time differ for counties in different broadband percentage percentiles? We should use a scatter plot to plot broadband trends over time for each 10th, 25th, 50th, 75th, 90th broadband percent percentiles. This figure should replicate Figures 8, 9, 10 in the reading we had to do for Week 1
- How does the distribution of broadband percentages change over the years from 2006 to 2016? Scatterplots do not show the specific properties of distributions that are useful for analysis, such as skewness, symmetry, etc. Thus, we need to make a histogram showing distribution of broadband percentages for each year and analyze the growth over the years.
- How does the distribution of counties in different broadband percentiles change over time? Previous visualizations do not show the specific numbers of counties that fit into each percentile. Over time, I expect more counties to be in the higher percentiles. Thus, we need to make a boxplot for each year showing distribution of counties in the 10th percentile, 25th percentile, 50th percentile, 75th percentile, 100th percentile of broadband percentages. Distribution of broadband growth rates for each year.
- How do broadband growth rates from 2006 to 2016 differ across US counties? We can make a map similar to the broadband map we already have that shows broadband growth rates instead of broadband percentages across US counties. Growth rate is calculated as (broadband 2016 - broadband 2006)/(broadband 2006) and repeat growth rate calculations for each county.
- Describe the distribution of counties' broadband growth rates and its implications. We need to make a histogram that shows the distribution of counties' growth rates from 2006 to 2016.
- Describe the distribution of counties in each growth rate percentile? We need to make a boxplot showing distribution of counties in the 10th, 25th percentile, 50th percentile, 75th percentile, 100th percentile of broadband growth rates from 2006 to 2016
- How do broadband growth rates correlate with changes in other variables, such as chain, trips, internet, and brand growth rates? The scatter plot should be similar to Figure 11, 12, 13, 14 in the Week 1 Reading. Basically, this answers the question of how broadband activity affects other metrics of consumer behavior listed below.

**Chains (2006 - 2016)**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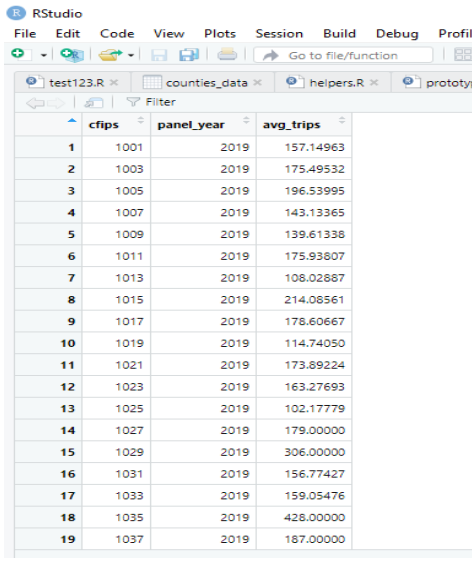
Filter

| | cfips | panel_year | avg_store |
|---|---|---|---|
| 1 | NA | 2004 | 5.000000 |
| 2 | 1001 | 2004 | 6.288062 |
| 3 | 1003 | 2004 | 6.244008 |
| 4 | 1005 | 2004 | 2.092303 |
| 5 | 1007 | 2004 | 5.005346 |
| 6 | 1009 | 2004 | 2.596973 |
| 7 | 1011 | 2004 | 3.000000 |
| 8 | 1013 | 2004 | 2.390435 |
| 9 | 1015 | 2004 | 3.896776 |
| 10 | 1017 | 2004 | 3.899166 |
| 11 | 1019 | 2004 | 5.278390 |
| 12 | 1021 | 2004 | 2.370966 |
| 13 | 1023 | 2004 | 1.840285 |
| 14 | 1025 | 2004 | 1.383802 |
| 15 | 1027 | 2004 | 3.000000 |
| 16 | 1029 | 2004 | 5.259568 |
| 17 | 1031 | 2004 | 1.283948 |
| 18 | 1033 | 2004 | 2.506838 |
| 19 | 1037 | 2004 | 3.000000 |

Repeat the same visualizations as broadband for chains. The only difference is a change of variable from broadband percentages to avg_store. Similarly, we would calculate growth rates of avg_store based on this dataset above. Each chip number is similar to a county.

**Trips (2006 - 2016)**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| | cfips | panel_year | avg_trips |
|---|---|---|---|
| 1 | 1001 | 2019 | 157.14963 |
| 2 | 1003 | 2019 | 175.49532 |
| 3 | 1005 | 2019 | 196.53995 |
| 4 | 1007 | 2019 | 143.13365 |
| 5 | 1009 | 2019 | 139.61338 |
| 6 | 1011 | 2019 | 175.93807 |
| 7 | 1013 | 2019 | 108.02887 |
| 8 | 1015 | 2019 | 214.08561 |
| 9 | 1017 | 2019 | 178.60667 |
| 10 | 1019 | 2019 | 114.74050 |
| 11 | 1021 | 2019 | 173.89224 |
| 12 | 1023 | 2019 | 163.27693 |
| 13 | 1025 | 2019 | 102.17779 |
| 14 | 1027 | 2019 | 179.00000 |
| 15 | 1029 | 2019 | 306.00000 |
| 16 | 1031 | 2019 | 156.77427 |
| 17 | 1033 | 2019 | 159.05476 |
| 18 | 1035 | 2019 | 428.00000 |
| 19 | 1037 | 2019 | 187.00000 |

Repeat similar visualizations as chains, just different variables avg_trips instead of avg_stores.

**Brand (2006 - 2016)**

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test123.R* | c_brand | counties_data | proto

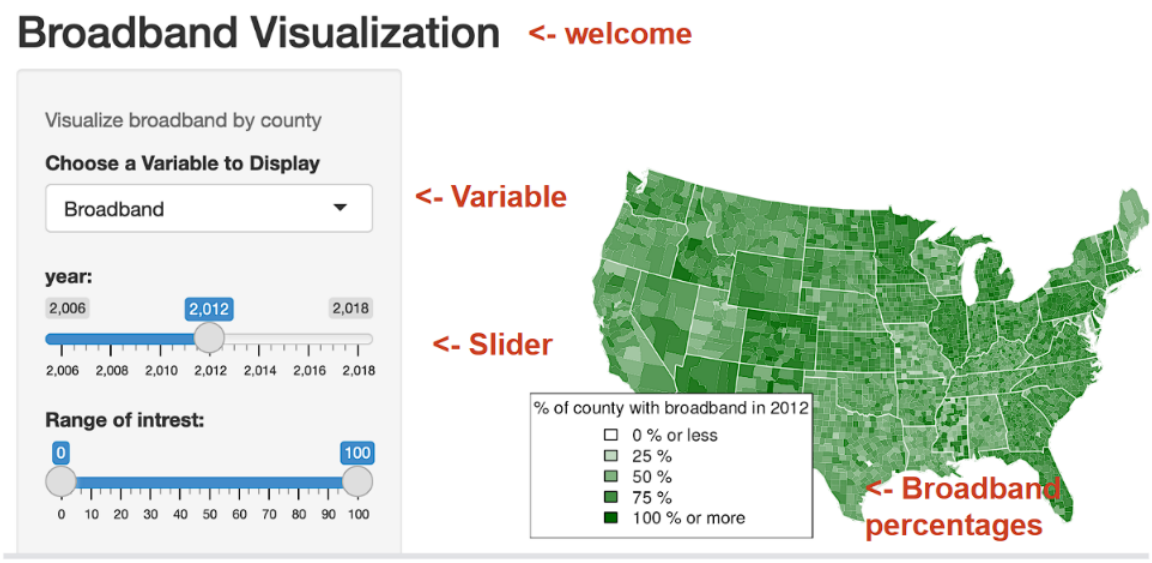
Filter

| | cfips | panel_year | avg_brand |
|---|---|---|---|
| 1 | NA | 2004 | 379.3891 |
| 2 | 1001 | 2004 | 513.8583 |
| 3 | 1003 | 2004 | 445.7154 |
| 4 | 1005 | 2004 | 377.5126 |
| 5 | 1007 | 2004 | 615.1910 |
| 6 | 1009 | 2004 | 514.2820 |
| 7 | 1011 | 2004 | 471.0000 |
| 8 | 1013 | 2004 | 402.6587 |
| 9 | 1015 | 2004 | 361.9548 |
| 10 | 1017 | 2004 | 360.2016 |
| 11 | 1019 | 2004 | 464.7671 |
| 12 | 1021 | 2004 | 480.2127 |
| 13 | 1023 | 2004 | 533.4898 |
| 14 | 1025 | 2004 | 280.0910 |
| 15 | 1027 | 2004 | 439.1044 |
| 16 | 1029 | 2004 | 515.1070 |
| 17 | 1031 | 2004 | 423.6310 |
| 18 | 1033 | 2004 | 350.8106 |
| 19 | 1037 | 2004 | 446.0000 |

Showing 1 to 19 of 2,374 entries, 3 total columns

Repeat similar visualizations as trips, just different variables avg_brand

**Layout**



Textboxe Notes: This is the order the text boxes will appear. Hit next to proceed. Title of textbox and text is shown below.

1. Welcome: This app was created as part of a Discovery Project based on a dissertation for: “Consumer Behavior and the Rise of Broadband: A Retail Apocalypse?”. The app provides an interactive experience for users to visualize how the proliferation of broadband affected key metrics in consumer behavior.
2. Variable: Choose which variable to display from this dropdown menu. These are the key metrics mentioned before and include:

   Brand
   Broadband
   Chain
   Spend
   Trips

3. Slider : Adjust the slider to see progression in variables
4. Broadband Percentages: This variable shows a choropleth map of the US. When you adjust the slider you can see how the percentage of counties with broadband changes overtime.

The goal is to look something like this (link):