How Different Lockdown Measures within the United States Have Affected the Economy since COVID-19

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Research Question

Was there a difference between how quickly a major city in a lockdown state vs a major city in a non-lockdown state "bounced-back" economically after the COVID-19 pandemic?

Introduction

The COVID-19 pandemic caused a rapid deceleration and decline of the American economy compared to pre-pandemic measures, resulting in rising unemployment rates as many families faced economic hardships and businesses struggled to stay afloat. The sharp contraction of economic activity created a need for economic policies addressing the current challenges and looking forward to rebuilding a post-COVID economy. As such, some states reacted by lifting lockdown restrictions (or never imposing them at all), while others waited to prioritize the health of their citizens and minimize transmission.

To break down and adequately answer our question, we chose to compare total spending, arts, entertainment, and recreation spending, and grocery and food store spending in New York City, New York vs Omaha, Nebraska. While choosing which cities to focus on through the lens of our research question, we looked at lockdown policies enacted at state-level. We chose New York City as an example of a city which thoroughly enforced lockdown procedure early into the pandemic, as Governor Cuomo issued a stay-at-home order (more specifically the "New York State on PAUSE" executive order [1]) to be implemented on March 22nd, with an earlier "State of Emergency" declaration being made on March 7th — only six days after the first case found in NYC. Conversely, Omaha, Nebraska did not declare an official stay-at-home order for the entire duration of the pandemic. The state implemented a cap on indoor crowds on March 16th (ten days after the first case), but some businesses (including bars) were allowed to reopen as early as June 1st, 2020 [2].

Looking at initial economic reports for both states, New York seems to have been hit harder by the pandemic and is taking longer to recover to pre-pandemic levels, with an unemployment rate of 21% in May 2020 and a slowly recovering tourism industry that was hit hard by sudden closures [3]. On the other hand, Omaha was impacted less severely, and its recovery seems much quicker, with growth in tourism and an influx of entertainment/nightlife activities [4]. When considering this question, we must also keep in mind the differences in population and primary industry between these two cities. Still, we aim to address the gap in knowledge focused on how consumer spending in major cities is impacted by lockdown policies, especially when considering the epicenter of the outbreak against a less intense epidemic. In doing so, we hope to gain insight on how economic policies impact consumer behaviors in times of crisis, thus informing future policy decisions.

Data Description

There are 48706 observations in this data set, and 24 variables. In this project, we chose to use four variables:

1. **cityid**: The city identifier that the county is assigned to. We further isolated cities with IDs 2 (New York City) and 40 (Omaha).
2. **spend_all**: The spending done in all spending categories by people residing in the city (based on zip code of residence not based on zip code of purchase). This is measured in the percent change in spending in comparison to the index period of January 6, 2020 - February 2, 2020.
3. **spend_aer**: Spending done in arts, entertainment, and recreation. This is measured in the percent change in spending in comparison to the index period of January 6, 2020 - February 2, 2020.
4. **spend_grf**: Spending done in grocery and food stores. This is measured in the percent change in spending in comparison to the index period of January 6, 2020 - February 2, 2020.

Methods

Data Source:

- Dataset from Opportunity Insights [5], a Harvard University research team focused on improving economic mobility and opportunity in the U.S.
- Consumer spending data sourced from Affinity Solutions [6], which tracks daily credit and debit spending paired with geographic and demographic information.

Cities Selected: **New York City** (high pop.; strict lockdown) vs **Omaha** (no stay-at-home order)

Dataset Details:

- Change in spending relative to an index period (Jan 6 – Feb 2, 2020).
- Data from Jan 2020 to June 2024; daily observations until June 5, 2022, then a 7-day moving average.
- Spending categorized by merchant activity and based on consumers' residential zip codes

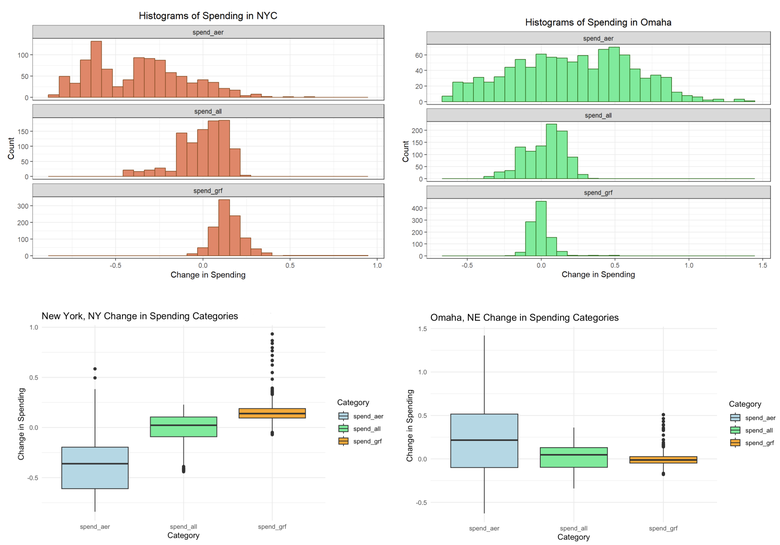
Spending Categories Investigated:

- All Categories: General spending behavior.
- Arts, Recreation, and Entertainment: Reflects spending on non-essential social and leisure activities.
- Grocery and Food Stores: Captures spending on essential goods, with potential early-pandemic spending surges.

Statistical Method:

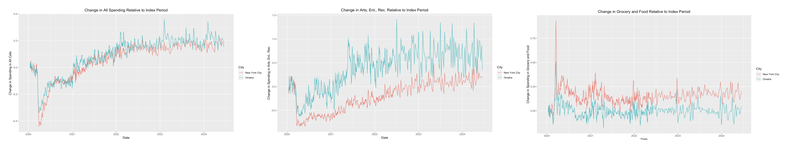
- Paired T-test
  - Compares the change in spending across the two cities for each spending category.
  - Tests if the mean difference in spending relative to the index period is zero or nonzero.
  - Observations from each city are independent, making the paired t-test appropriate.
  - Limitations: Use of mean diff. between obs. obscures potential periods where diff. in spending is drastically different or relatively similar in the two cities

Exploratory Data Analysis



Results

Spending in All Categories:	Spending in Art, Ent, & Rec:	Spending in Groc. & Food:
T-Statistic: -20.561	T-Statistic: -65.707	T-Statistic: 73.92
Degrees of Freedom: 980	Degrees of Freedom: 980	Degrees of Freedom: 980
P-value: <2.2e-16	P-value: < 2.2e-16	P-value: < 2.2e-16
95% Conf.: (-0.030, -0.025)	95% Conf.: (-0.598, -0.563)	95% Conf.: (0.150, 0.159)
Mean Difference: -0.02755	Mean Difference: -0.5804	Mean Difference: 0.1544



Conclusion

Summary

Based on the results of our t-tests and time series graphs, there is a significant difference in change in spending relative to the index period between Omaha and New York City. While we can not conclusively assert which city "bounced-back" faster, there is evidence that the rate at which the cities returned to "normalcy" in spending was different (otherwise we would see no gaps between the time series and no difference in the average change in spending). In short, our results indicate that there was a difference between how quickly a major city in a lockdown state vs in a non-lockdown state "bounced-back" economically after the COVID-19 pandemic.

Limitations

Aside from the limitations referenced in our methods sections, our key limitation occurs in substantial differences between the cities we chose. A clearer understanding of the issue at hand can be achieved using data from more similar cities. While the two cities chosen here fit the criteria set (lockdown vs non-lockdown), there are other socio-cultural factors at play that influence spending in both cities. Furthermore, one must consider the impact of New York City being the epicenter of the pandemic in the United States, and therefore being hit harder than Omaha, which was not an extreme hotspot in the same manner.

Recommendations

In further investigation, we would suggest the comparison of two cities more alike in population or industry in order to have a more balanced analysis with fewer confounding factors. Furthermore, we would consider exploring a more robust method of analysis, possibly using linear models to determine whether COVID-19 lockdowns were a significant factor in spending increases or decreases.

References

[1] *Governor Cuomo Signs the "New York State" on PAUSE Executive Order*. (2020, March 20). Governor Andrew M. Cuomo. `https://www.governor.ny.gov/news/governor-cuomo-signs-new-york-state-pause-executive-order`

[2] *Timeline: COVID-19 in Nebraska*. (2021, March 3). JournalStar.com. `https://journalstar.com/timeline-covid-19-in-nebraska/html_61be814b-1361-5c1d-b9e3-7a7dbe049b78.html`

[3] Bhat, S., & Welch, W. (n.d.). *How's New York City Doing?* The City. `https://projects.thecity.nyc/hows-new-york-city-doing/index.html`

[4] Delkamiller, N. (2024, November 12). *Downtown Omaha's Economy Is Recovering Quicker Than Other Cities*. Governing. `https://www.governing.com/management-and-administration/downtown-omahas-economy-is-recovering-quicker-than-other-cities`

[5] *Data |Opportunity Insights*. (2014). Opportunityinsights.org. `https://opportunityinsights.org/data/`

[6] *Consumer Card Transaction Data: Unlock Insights - Affinity*. (2024, August 5). Affinity Solutions. `https://www.affinity.solutions/`