Do Governmental Regulators Regarding COVID-19 Affect People's Spending Habits and Outdoor Activities?

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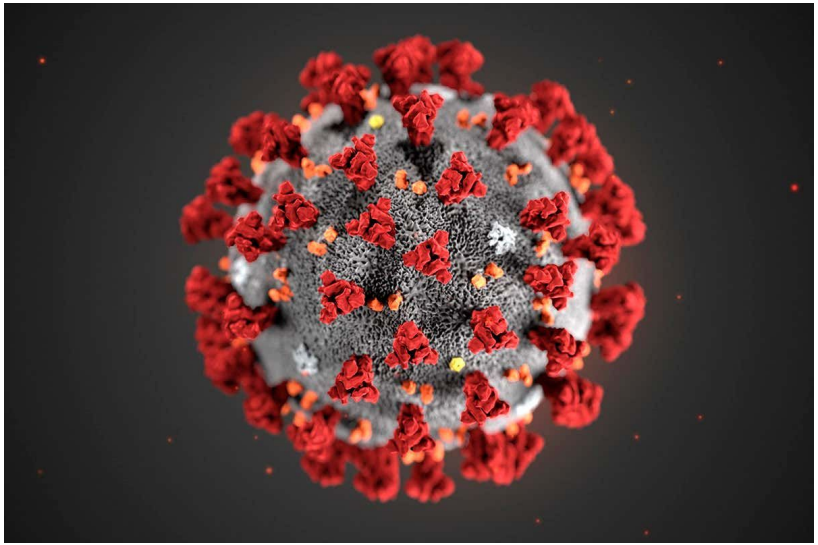


Abstract

To cope with the coronavirus pandemic, numerous governments are taking critical policy measurements and enforcing social distancing laws. How strict governments impose social distancing laws vary across countries and governments are seeking appropriate regulations day by day to slow down the spread of disease. We study the impact of governmental response on people's spending, outdoor activities. To determine whether varying governmental guidelines influence the public's expenditures and cultural life, we use spending, outdoor activity data of two countries that took radically different government policies: Sweden and Taiwan. Taiwan imposes strict governmental regulations and Sweden for some time period pursued a herd immunity strategy with far less stringent restrictions than Taiwan. We predict that governmental restrictions do influence people's expenditures and lifestyles. Using HPC, Hive on Hadoop cluster on Dumbo for analytics, we find some correlations between different tables and validate the impact of government responses on consumer spending and outdoor activities in regards to predictability, autonomous control of activities, and the duration of effect.

Motivation

COVID-19 pandemic
Loss of life
governmental regulations
Change in people's life styles

Who are the users?

Primarily Governments

Who will benefit?

Private Businesses
Economists
Industry Groups

Why important?

For better governmental regulations and adaptation to post corona era

Project Description

- **Primary Goal:** To determine whether contrasting governmental guidelines influence the public's expenditures on food, clothing, shelter, and cultural life
- **Hypothesis**: Governmental guidelines do influence people's expenditures
- **Testing Process:** In order to validate the hypothesis, we chose two countries that are using radically different government policies
- **Country 1:** Taiwan - strict governmental regulations were applied
- **Country 2:** Sweden - government pursued 'herd immunity strategy' with light governmental regulations

Goodness

- We compared our result on the following data to the published research paper that had studied correlation of Covid-19 pandemic and change in consumer behavior.
- Also, the other two published research papers define Taiwan and Sweden as countries with highly governmentally restricted and non restricted.
- Link to the paper:
  - https://jamanetwork.com/journals/jama/article-abstract/2762689
  - https://www.nber.org/papers/w27427

Data Sources

Data Source Title	Size	Link	Description
change-visitors-grocery-stores	1.1MB	https://ourworldindata.org/covid-mobility-trends	How the number of visitors to grocery and pharmacy stores has changed compared to baseline days
change-visitors-parks-covid	1.1MB	https://ourworldindata.org/covid-mobility-trends	How the number of visitors to parks and outdoor spaces has changed compared to baseline days
changes-residential-duration-covid	1.1MB	https://ourworldindata.org/covid-mobility-trends	How the number of visitors to residential areas has changed compared to baseline days

Data Sources Continued

Data Source Title	Size	Link	Description
historical_country_Sweden_indicator_Consumer_Confidence	30KB	https://tradingeconomics.com/sweden/consumer-confidence-current-conditions	Sweden Consumer Confidence
historical_country_Sweden_indicator_Consumer_Spending	15KB	https://tradingeconomics.com/sweden/consumer-spending#:~:text=Consumer%20Spending%20in%20Sweden%20averaged,the%20second%20quarter%20of%201983.	Sweden Consumer Spending
historical_country_Taiwan_indicator_Consumer_Confidence	24KB	https://tradingeconomics.com/taiwan/consumer-confidence#:~:text=Looking%20forward%2C%20we%20estimate%20Consumer,according%20to%20our%20econometric%20models.	Taiwan Consumer Confidence
historical_country_Taiwan_indicator_Consumer_Spending	15KB	https://tradingeconomics.com/taiwan/consumer-spending?embed	Taiwan Consumer Spending

Data Sample 1 (Change in Visits to Grocery Store and Pharmacy)

Entity	Code	Date	grocery_and_pharmacy
Sweden	SWE	2/17/20	-3.333
Sweden	SWE	2/18/20	-2.5
Sweden	SWE	2/19/20	-1.8
Sweden	SWE	2/20/20	-1.333
Sweden	SWE	2/21/20	-1.143
Sweden	SWE	2/22/20	-1.286

Data Sample 2 (Change in Visits to Parks and Outdoor Spaces)

Entity	Code	Date	parks
Sweden	SWE	2/17/20	-10
Sweden	SWE	2/18/20	-4.25
Sweden	SWE	2/19/20	1.8
Sweden	SWE	2/20/20	1.333
Sweden	SWE	2/21/20	-1.143
Sweden	SWE	2/22/20	4.286

Data Sample 3 (Change in Duration of Residential Areas)

Entity	Code	Date	residential
Sweden	SWE	2/17/20	1.333
Sweden	SWE	2/18/20	1.25
Sweden	SWE	2/19/20	1.2
Sweden	SWE	2/20/20	1.167
Sweden	SWE	2/21/20	1.143
Sweden	SWE	2/22/20	1.286

Data Sample 4 (Change in Visits to Grocery Store and Pharmacy)

Entity	Code	Date	grocery_and_pharmacy
Sweden	SWE	2/17/20	-3.333
Sweden	SWE	2/18/20	-2.5
Sweden	SWE	2/19/20	-1.8
Sweden	SWE	2/20/20	-1.333
Sweden	SWE	2/21/20	-1.143
Sweden	SWE	2/22/20	-1.286

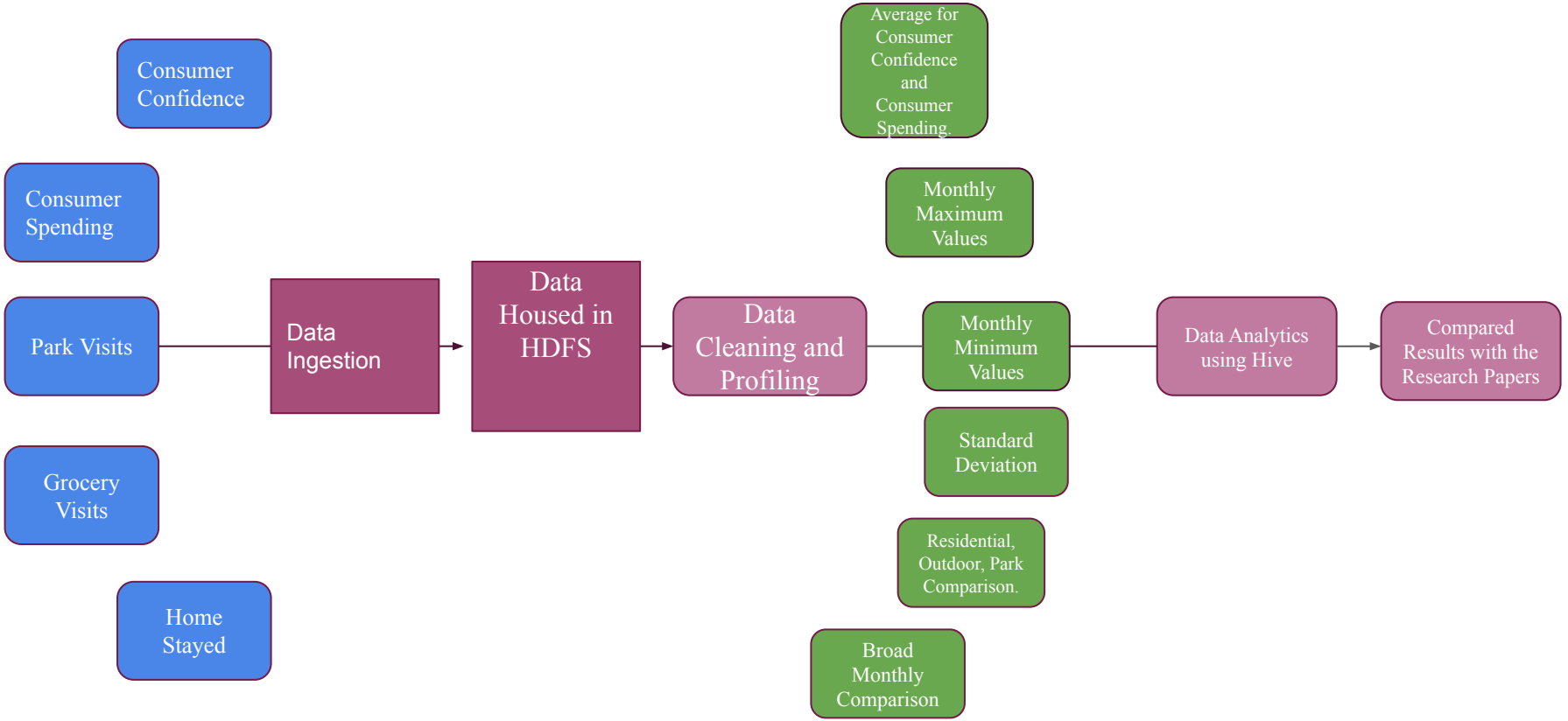
Data Sample 5 (Consumer Confidence)

Country	Category	DateTime	Value	Frequency	HistoricalDataSymbol	LastUpdate
Sweden	Consumer Confidence	2020-01-31T00:00:00	92.9	Monthly	SWECCI	2020-08-27T08:06:00
Sweden	Consumer Confidence	2020-02-29T00:00:00	99.6	Monthly	SWECCI	2020-10-28T08:24:00
Sweden	Consumer Confidence	2020-03-31T00:00:00	89.4	Monthly	SWECCI	2020-09-29T07:41:00
Sweden	Consumer Confidence	2020-04-30T00:00:00	75.1	Monthly	SWECCI	2020-09-29T07:41:00
Sweden	Consumer Confidence	2020-05-31T00:00:00	78.3	Monthly	SWECCI	2020-10-28T08:24:00
Sweden	Consumer Confidence	2020-06-30T00:00:00	84.4	Monthly	SWECCI	2020-10-28T08:19:00

Data Sample 6 (Consumer Spending)

Country	Category	DateTime	Value	Frequency	HistoricalDataSymbol	LastUpdate
Sweden	Consumer Spending	2019-03-31T00:00:00	563394	Quarterly	SWEDENCONSPE	2020-08-28T10:53:00
Sweden	Consumer Spending	2019-06-30T00:00:00	567664	Quarterly	SWEDENCONSPE	2020-08-28T10:53:00
Sweden	Consumer Spending	2019-09-30T00:00:00	570490	Quarterly	SWEDENCONSPE	2020-08-28T10:53:00
Sweden	Consumer Spending	2019-12-31T00:00:00	576241	Quarterly	SWEDENCONSPE	2020-08-28T10:53:00
Sweden	Consumer Spending	2020-03-31T00:00:00	559734	Quarterly	SWEDENCONSPE	2020-08-28T10:53:00
Sweden	Consumer Spending	2020-06-30T00:00:00	516524	Quarterly	SWEDENCONSPE	2020-08-28T10:53:00

Design Diagram



Code Challenge

1. Privilege Error when Creating a Table
   a. create external table country (country string, category string, date_time string, data_value string, frequency string) row format delimited fields terminated by ',' location '/user/hk2874/project1/input11/';
   b.

```
Connected to: Apache Hive (version 1.1.0-cdh5.15.2)
Driver: Hive JDBC (version 1.1.0-cdh5.15.2)
Transaction isolation: TRANSACTION_REPEATABLE_READ
0: jdbc:hive2://babar.es.its.nyu.edu:10000/> create external table country (country string, category string, date_time string, da
ta_value string, frequency string) row format delimited fields terminated by ',' location '/user/hk2874/project1/input11/';
Error: Error while compiling statement: FAILED: SemanticException No valid privileges
 User hk2874 does not have privileges for CREATETABLE
 The required privileges: Server=server1->Db=default->action=*; (state=42000,code=40000)
```

Solution: hdfs dfs -mkdir /user/netiddirectory → To solve this issue, we created directories for each input files. Thus, we had total of 7

2. Hive Query(Joining Tables)
   a. We wanted to calculate monthly average values for visits to park, visits to grocery store, and time spent in residential areas. However, we had issues with joining the tables

Solution:

```
select
MONTH(TO_DATE(FROM_UNIXTIME(UNIX_TIMESTAMP(sg.date, 'yyyy-MM-dd')))) as month,
avg(sg.val) as average_parks_val_S,
avg(tg.val) as average_parks_val_T
from sweden_parks sg
inner join taiwan_parks tg on tg.date=sg.date
group by MONTH(TO_DATE(FROM_UNIXTIME(UNIX_TIMESTAMP(sg.date, 'yyyy-MM-dd'))));
```

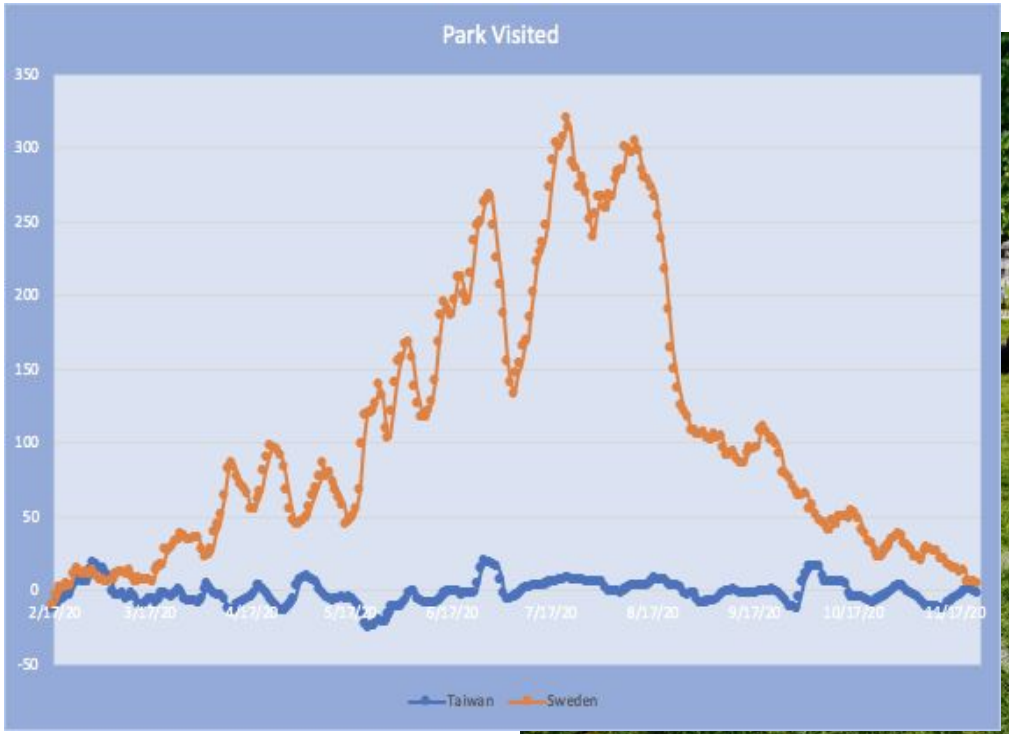
What Insights Can We Gain?

- Figure out changes in people's spending habits by comparing Pre-coronavirus and Post-coronavirus data sets of living expenses in Sweden where people's lifestyles are not restricted by their government
- From those changes, we will be able to compare the same data sets from other countries where the government imposes strict regulations on COVID-19.
- Will gain insights of correlations between governmental regulations and people's spending habits

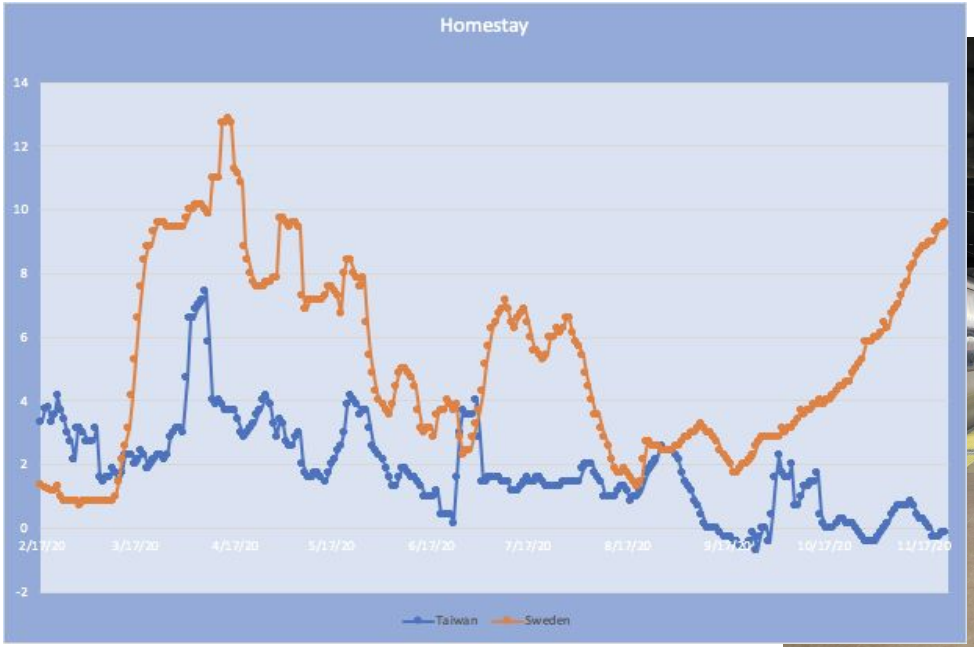
Consumer Confidence (2018-2020)

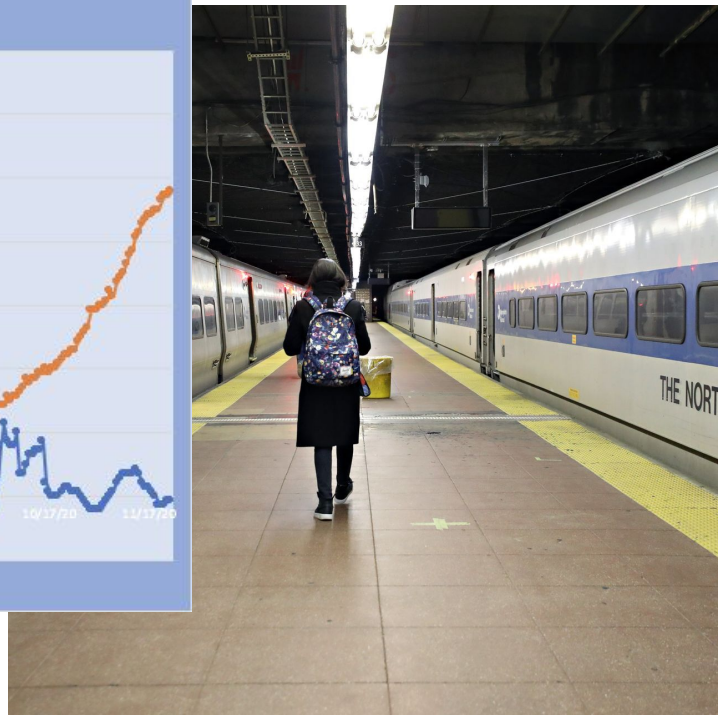
Consumer Spending (2018-2020)

Park Visit (Feb 2020 ~ Nov 2020)



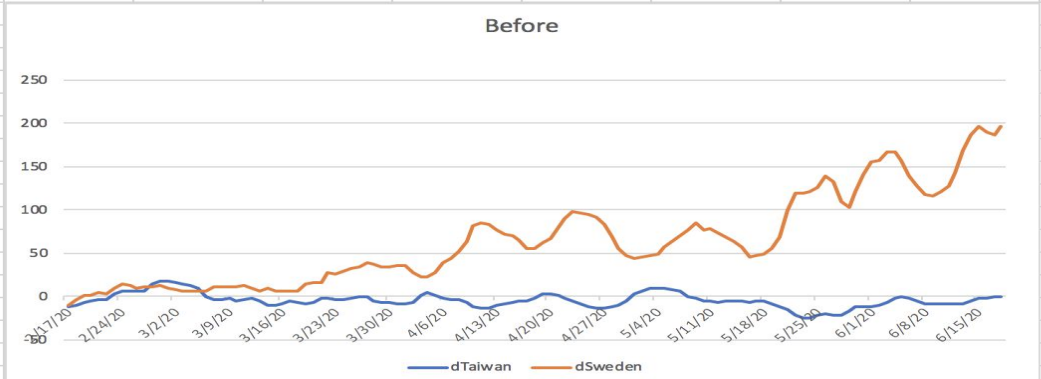
Time Spent at Home (Feb 2020 ~ Nov 2020)

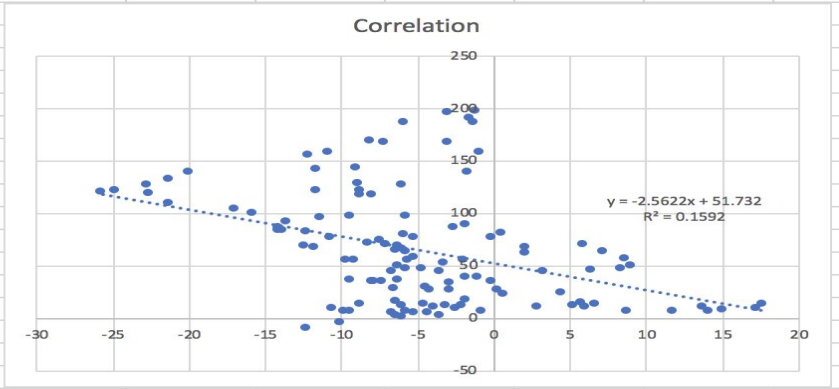


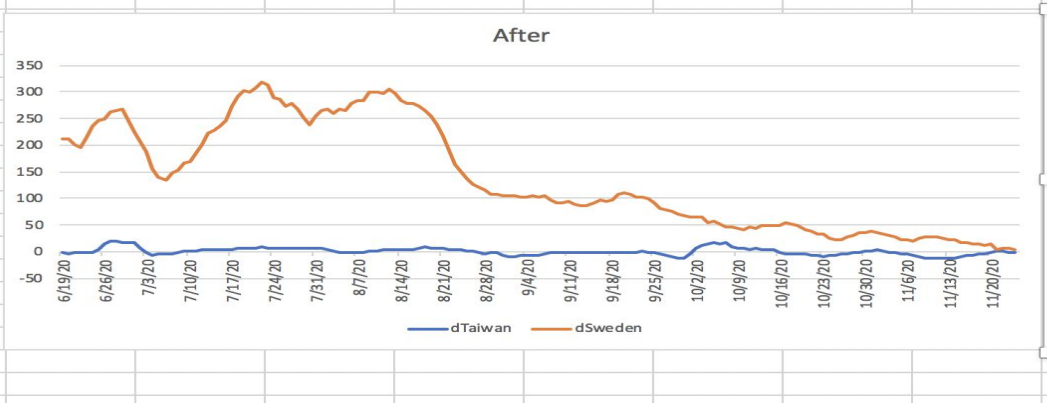


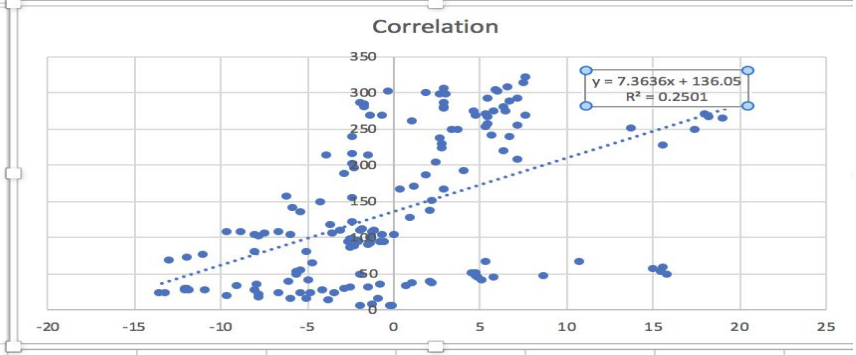
Grocery Store Visit

Park-Visits Correlation (Pre June vs Post June)

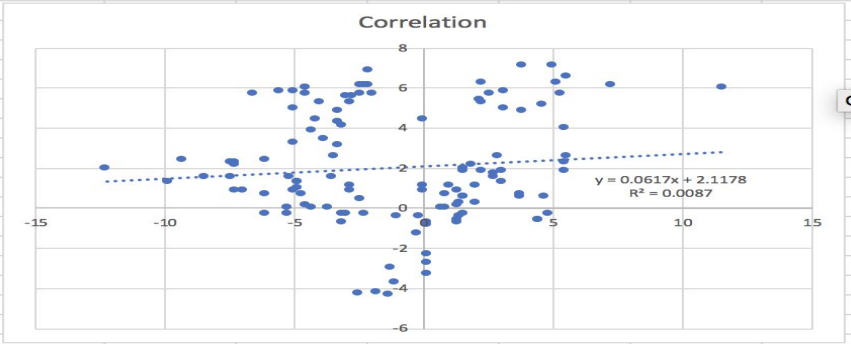


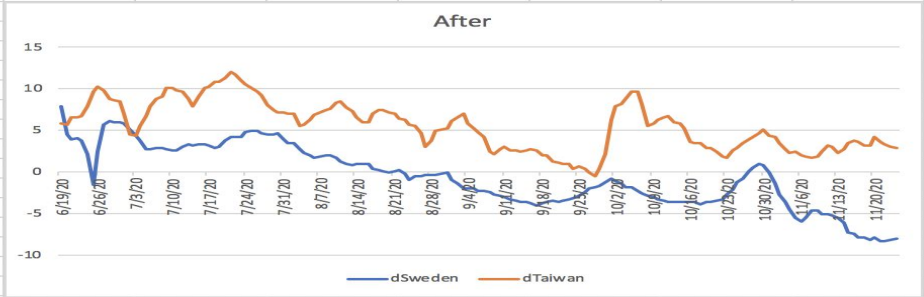


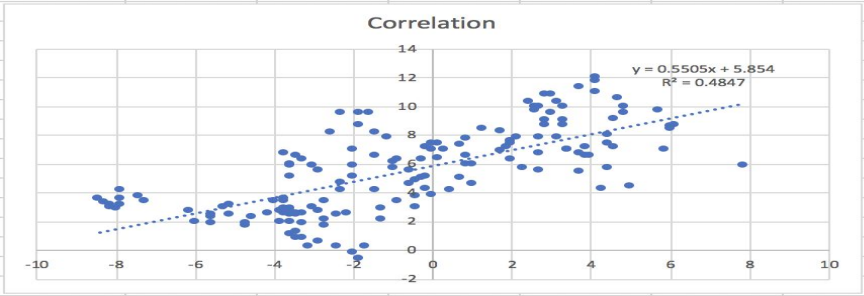




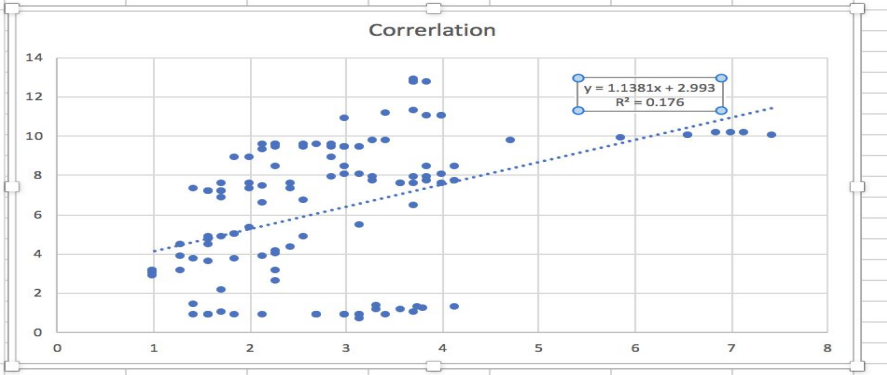
Grocery-Visit Correlation (Pre June vsPostJune

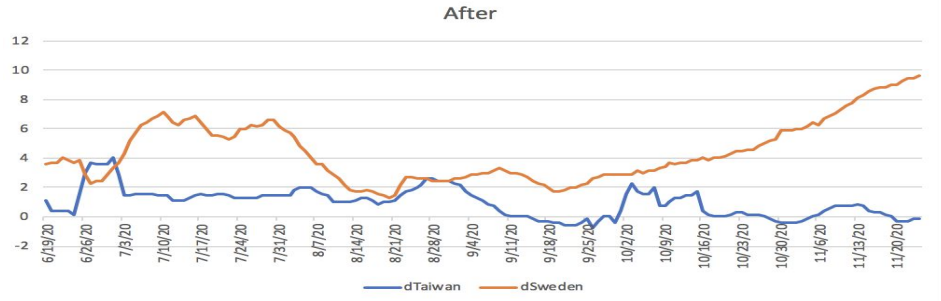


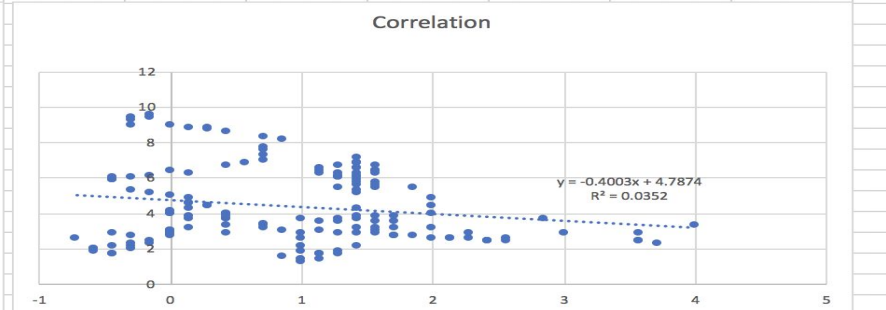




Residence Correlation(Pre June vs Post June)







Results

- Our data sets approved the impact of government response in how strictly they impose social distancing laws on consumer spending and outdoor activities.
- Analysis:
  - Lenient governmental regulations led people to autonomously control their behaviors in terms of social distancing.
  - Behaviors of People in Sweden were more unpredictable than those of people in Taiwan.
  - Regarding the stability of Taiwan’s trend on the graph, government's strict enforcement of social distancing does have long term effect on controlling people’s spending patterns, social behavior, and daily activities.

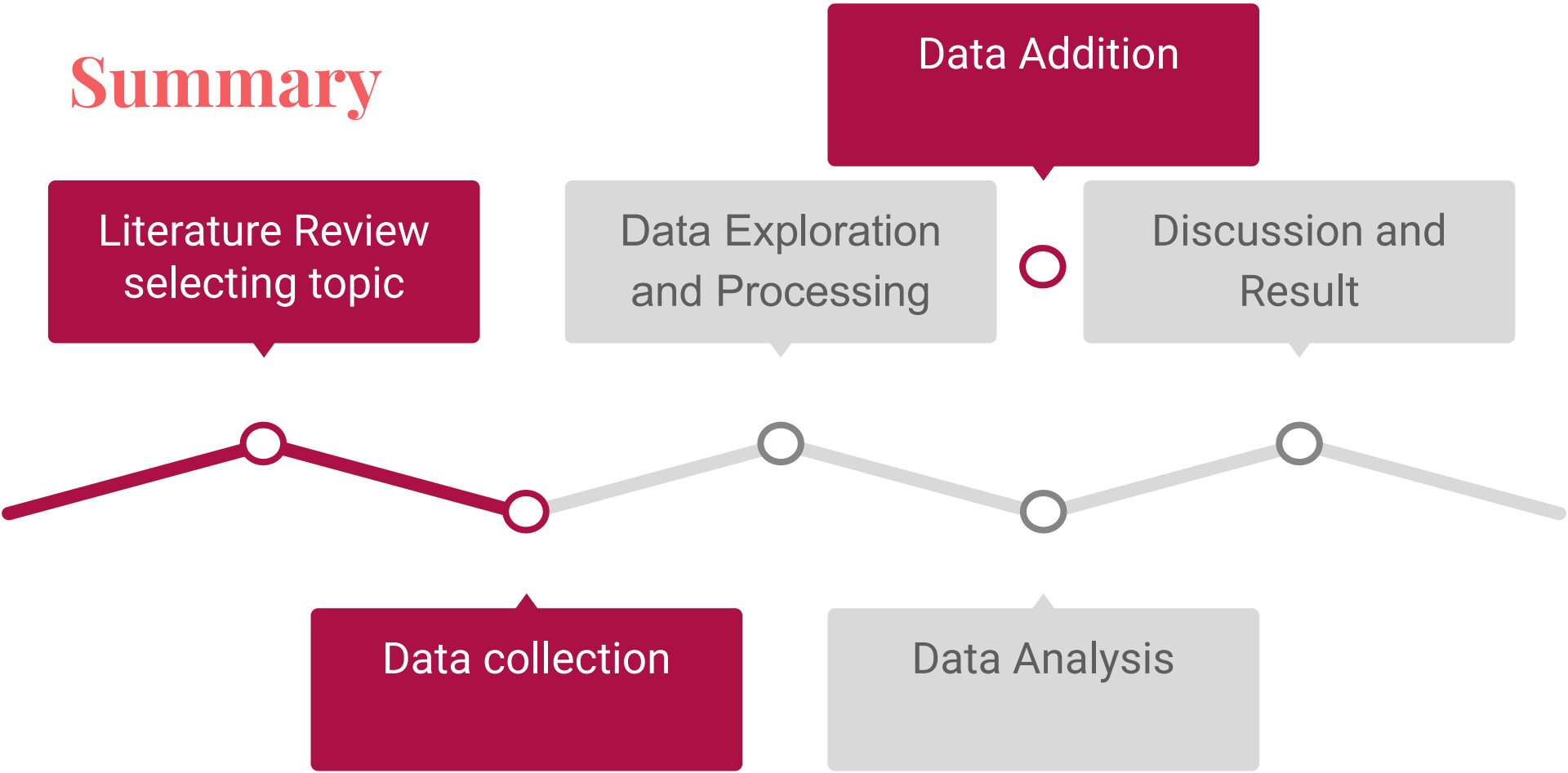
Continued

- We found that there was a change in the graph of Sweden on June.
  - It was the time when Sweden decided to strengthen government regulation.
  - The graph becomes similar to the graph of Taiwan's starting from June.
  - The correlation of Sweden and Taiwan was negative at the beginning then changed positive after June for Park Visit and Residence.
- Rate of the number changes in Taiwan also had some changes but was relatively steady than that of Sweden
  - People's visit to park had not really changed.
  - Time spent at home steadily decelerated.
  - Grocery shopping visit steadily increased until July but slowly decreased afterwards.

Obstacles

1. Finding the right data
    - Private transaction data
    - Could not relate park visiting data with other data.
    - Some files were not up to date (Did not contain enough 2020 data).
2. Finding the right criteria for comparing different data sets
3. Absence of quantitative comparison of government regulation strictness > Solved at the end!
4. Comparing more than two countries could have gave us more clear insights.

Summary


Literature Review selecting topic
Data collection
Data Exploration and Processing
Data Analysis
Data Addition
Discussion and Result

Acknowledgments

Trading Economics

Our World In Data

NYU Dumbo

References

- Chang, Hung-Hao, and Chad Meyerhoefer. “COVID-19 and the Demand for Online Food Shopping Services: Empirical Evidence from Taiwan.” *NBER*, 29 June 2020, www.nber.org/papers/w27427.
- Additional information Notes on contributors Jon Pierre Jon Pierre is Professor of Political Science at the University of Gothenburg, and References Adam. “Nudges against Pandemics: Sweden's COVID-19 Containment Strategy in Perspective.” *Taylor & Francis*, www.tandfonline.com/doi/full/10.1080/14494035.2020.1783787.
- C. Jason Wang, MD. “Response to COVID-19 in Taiwan: Big Data Analytics, New Technology, and Proactive Testing.” *JAMA*, JAMA Network, 14 Apr. 2020, jamanetwork.com/journals/jama/article-abstract/2762689.