

# How Covid-19 affects people's Mobility and Economics: An Approach of Combining Traditional and Non-traditional Data for Measuring Economic Activity

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# Introduction

## Background

- Increased need for high quality and real-time data in crisis time
- Indonesia impose social restriction, so some survey activities could not be conducted
- Need to modernize the data life cycle of compilation, production, and dissemination to make it robust to shocks, including pandemic.

## Contribution

- Combining traditional and non-traditional data sources, including big data on mobility and GDP data.
- Measuring economic activities under social restriction which lead to delay on data collection
- Utilizing big data as new data source; more reliable in presence of disruptions, including social activities restriction.





# Methodology :

*Combining traditional and non-*

*traditional data*

**Traditional Data**

- GDP
- Regional GDP

**Non-Traditional**

**Data**

- Google Mobility Index
- Apple Mobility Index



# Methodology: Process

Clustering each region

Based on Industry Contribution to Regional GDP

Calculate People Mobility Change

Based on Google Mobility Index and Apple Mobility Index

Estimated Regional GDP Growth

Regression interaction between Regional GDP, Mobility and cluster.

Estimated the GDP Change

Calculate the National GDP



# DISCUSSION





# Mobility Index

## 1 Parks

Visit to national parks, public beaches, marinas, dog parks, plazas, and public gardens

## 2 Transit Stations

Visit to public transport hubs such as subway, bus, and train stations

## 3 Workplaces

Visit to places of work

## 4 Retail & Recreation

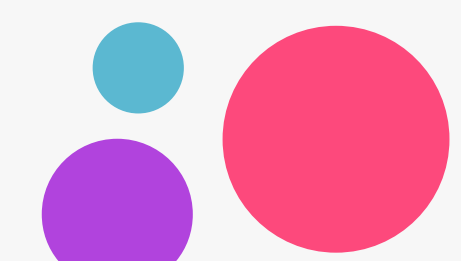
Visit to restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theaters

## 5 Grocery & Pharmacy

Visit to grocery markets, food warehouses, food shops, drug stores, and pharmacies

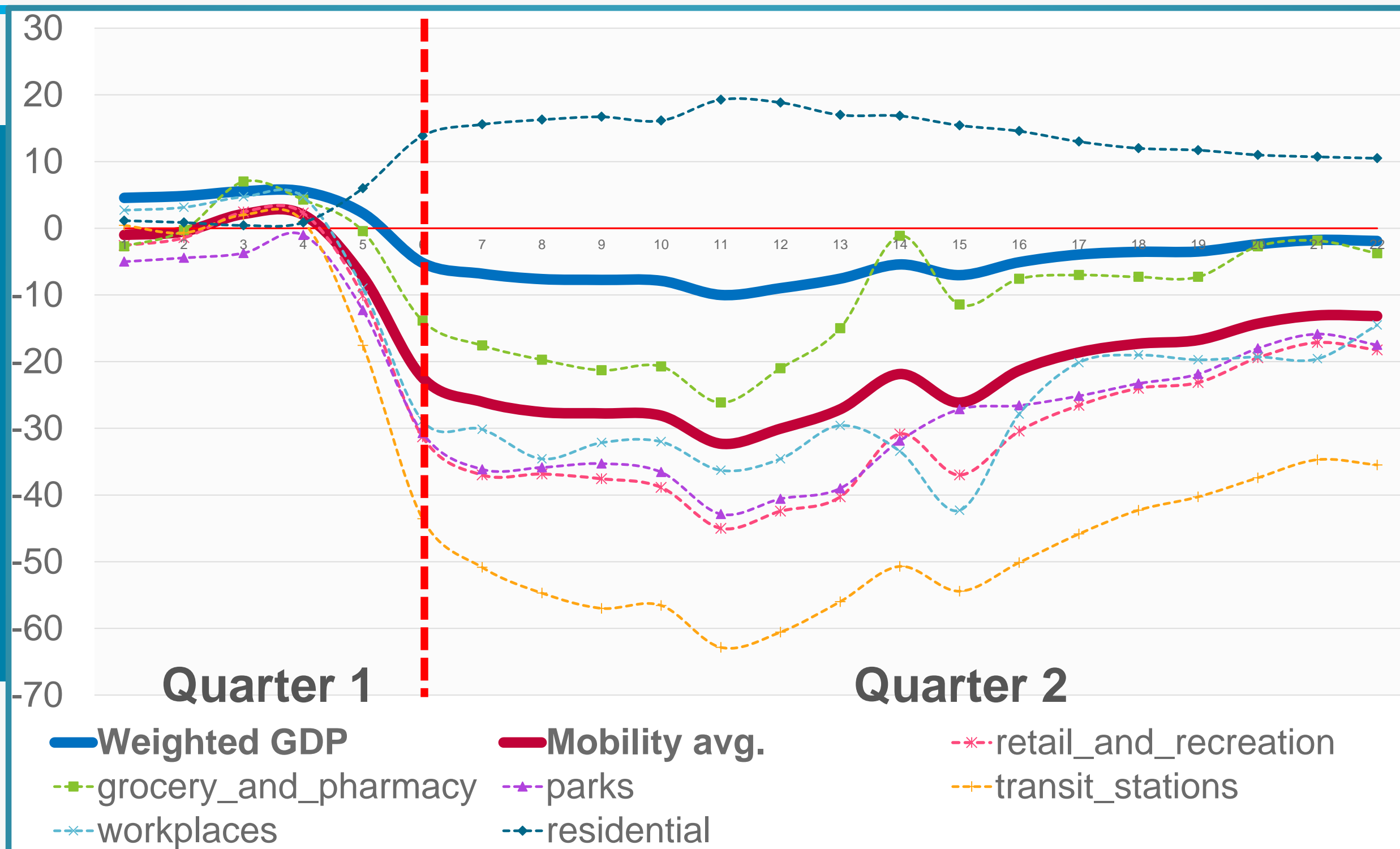
## 6 Residential

Duration (hours) spent in places of residence



# Mobility change

Activity increase in places of residence, while decrease in other place, such as workplace, retail, parks, recreation. (the traffic decreasing)



- Since Indonesia does not impose lockdown, some industries are still operated during the pandemic.
- Grocery and pharmacy has the lowest declining, while transit stations has the highest declining



# Mobility and Level of Economic Activity

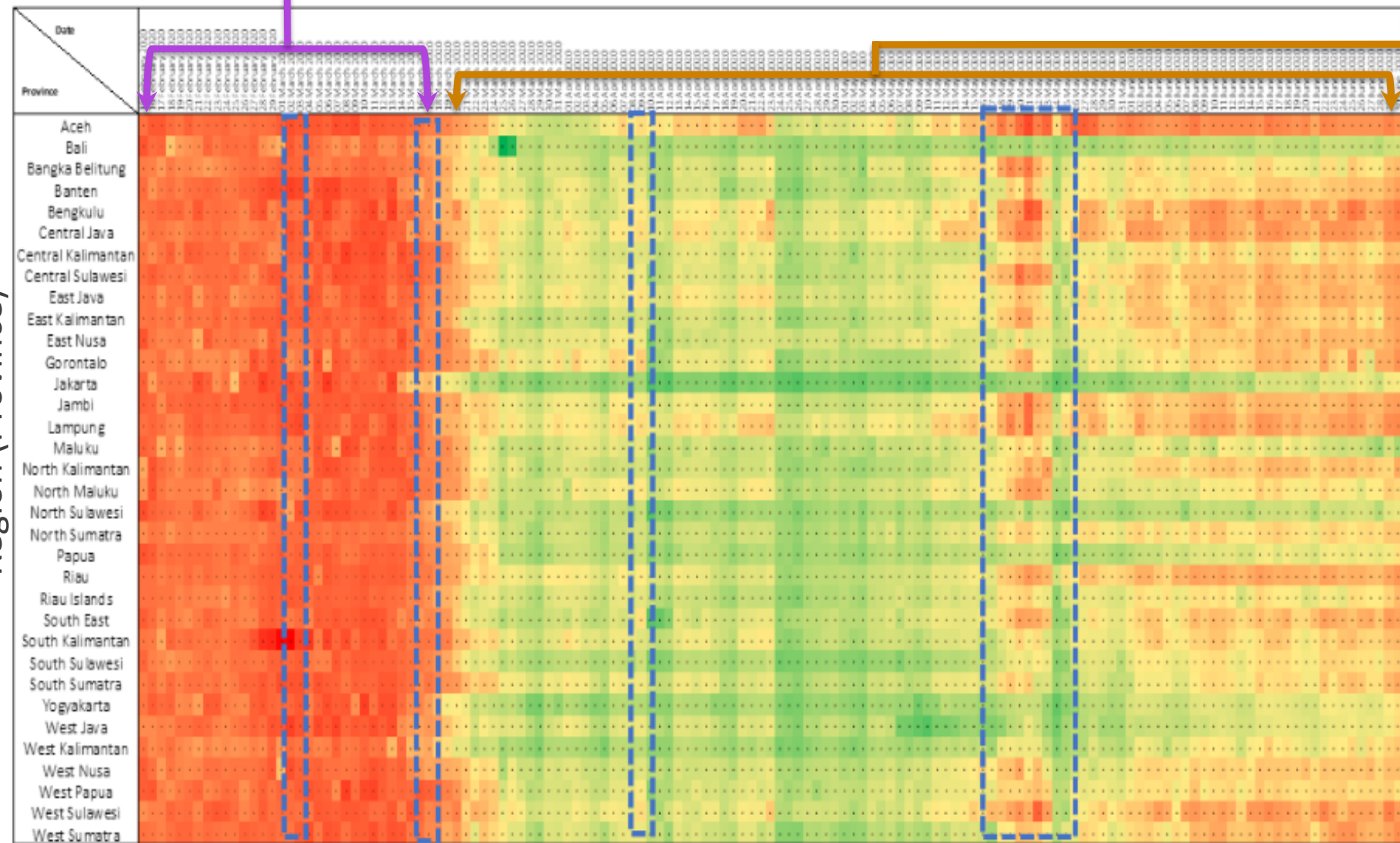
People Mobility → Road Traffic → Economic Activities  
 → Economic Growth

**BEFORE PANDEMIC**  
 (Baseline)

- pre-COVID people's normal mobility patterns as baseline
- Road Traffic is normal
- Economic activities in absence of shock

**DURING PANDEMIC** 🦠 🦠 🦠

- Social activities restrictions (less road traffic, less economic activities)
- Behavioural changes; e.g. work from home
- Adjustment in measuring economics of a pandemic



2020 Quarter 1

2020 Quarter 2

Red square: High People Mobility (changes in percent) Green square: Low Mobility (changes in percent)



# Clustering



## Motivation

- Each Region has different industry contribution to regional GDP
- Mobility changes affect each industry differently
- Minimizing bias due to mobility change effects on industry

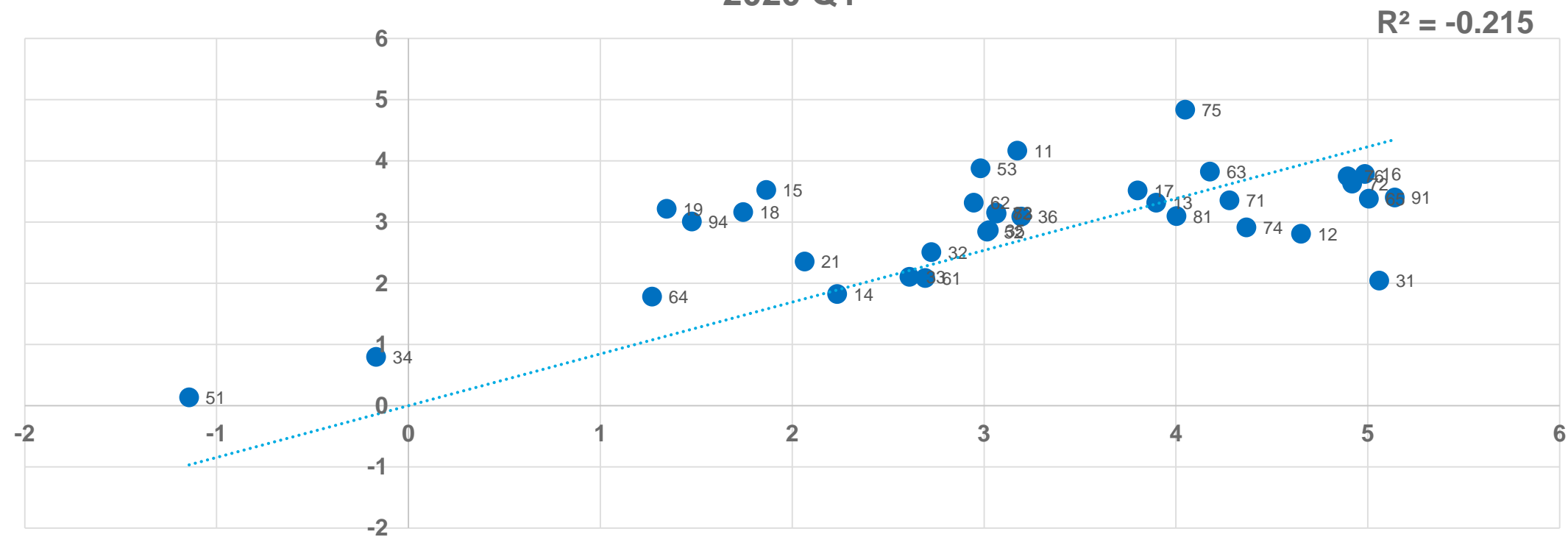


## Outcome

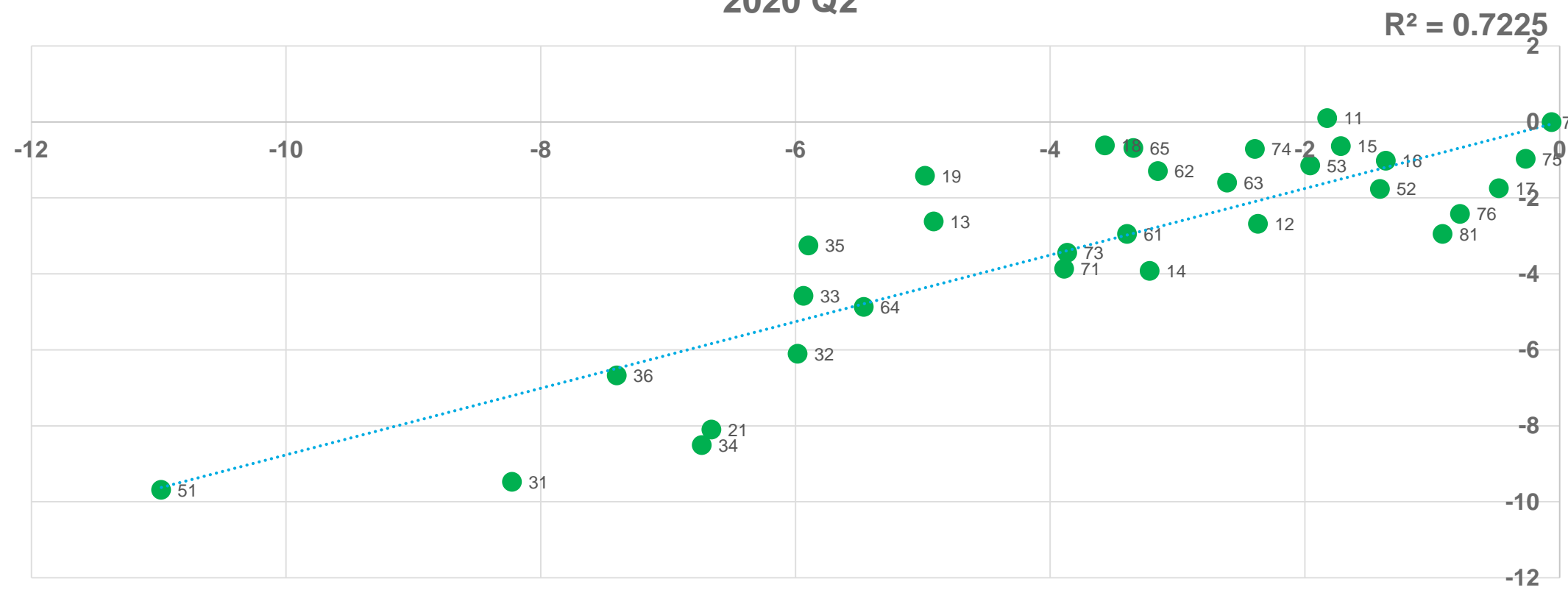
- Increases the explanatory power of mobility for regional GDP
- Provide better fit model to estimate the regional and national GDP

# Estimated and Official GDP Growth

Plot GDRP Growth with Estimated Growth  
2020 Q1



Plot GDRP Growth with Estimated Growth  
2020 Q2



## Estimated and Official GDP

- Mobility change can explain 89% GDP Growth in 2020 Quarter 1 and 88% GDP Growth in 2020 Quarter 2
- Estimated GDP Growth in 2020 Quarter 1 is 2.6% while Official National GDP is 3%
- Estimated GDP Growth in 2020 Quarter 1 is -5.2% while Official National GDP is -5.4%



# Conclusion

## Clustering

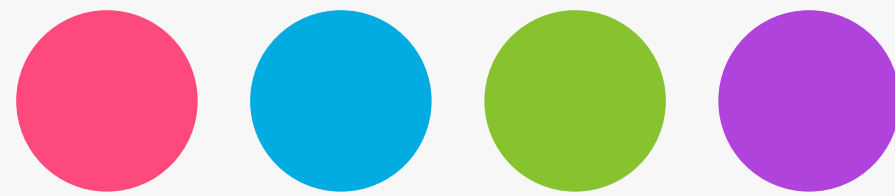
Each region is clustered based on industry contribution to Regional GDP to reduce the effect of some industries that are not significantly affected by mobility.

## Mobility and Regional GDP

Consistently strong positive correlation between regional change of the average mobility and the percentage changes of Regional GDP

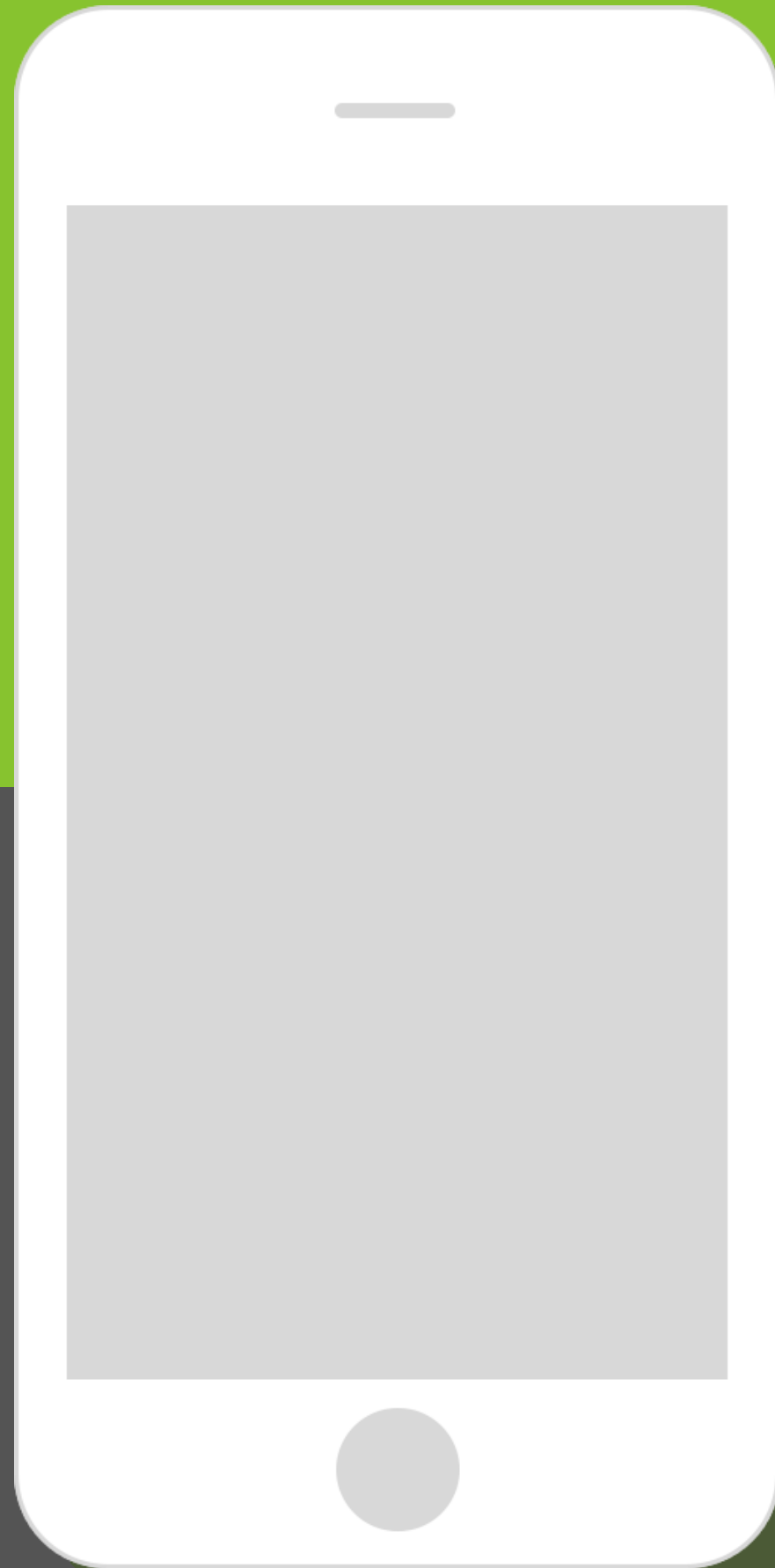
## National GDP

The estimated and the Official National GDP growth are close.



# COUNTRY





# Mobile Positioning Data (MPD)

- MPD is obtained from mobile network operator (MNO). This is a large-scale location data of subscribers of mobile network operator that can capture people's physical flow.
- Mobile positioning is locating (pinpointing) mobile telephones using radio wave

# Data

## Non Traditional Data

- MPD

## Traditional Data

- Population Projection
- Number of roaming SIM card and non-roamers

## Output

- Commuting Statistics
- Tourism Statistics
- Accommodation Statistics

# Thank You

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