

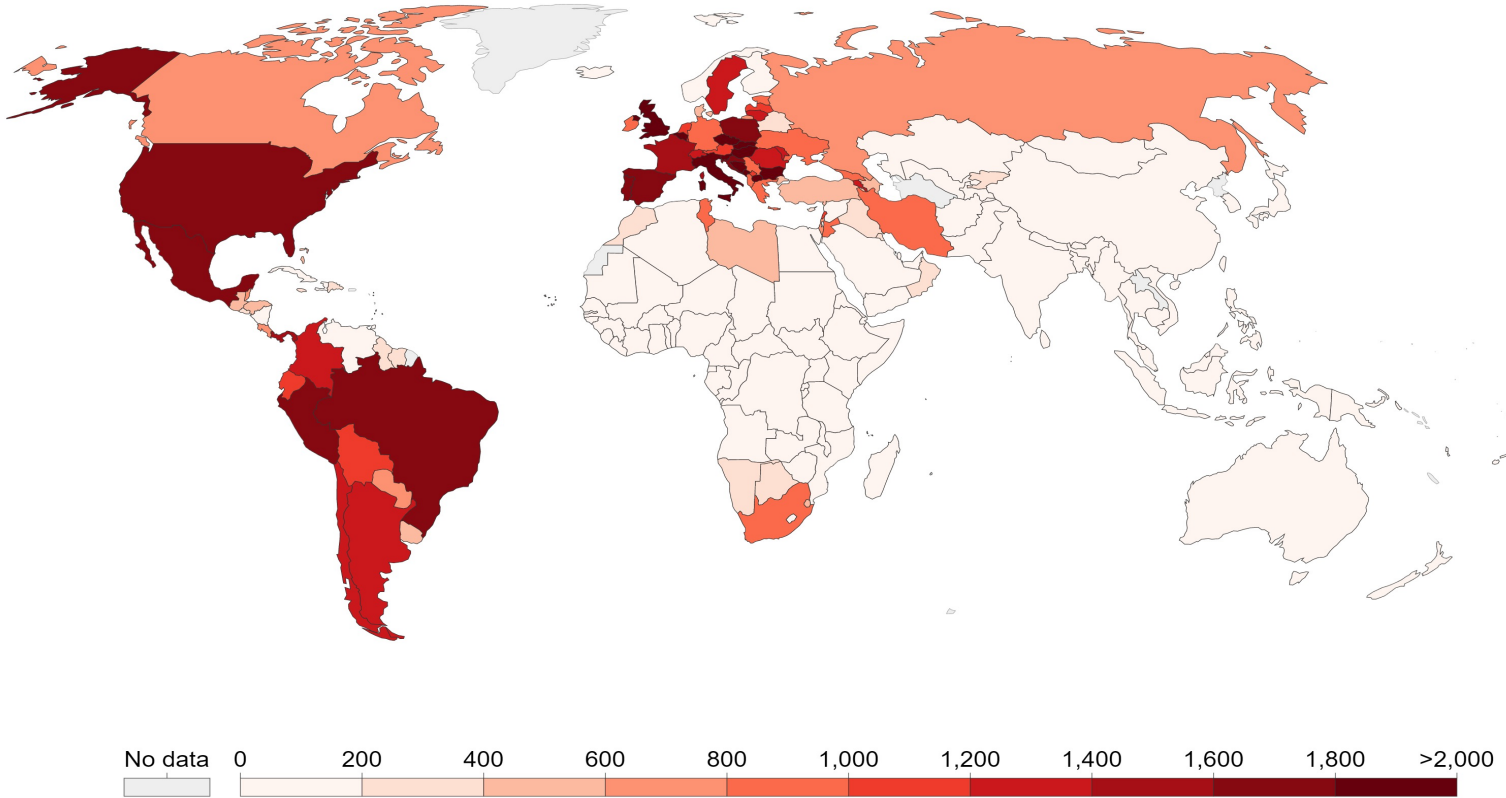
# **OECD problem: Effectiveness of Policy Interventions in Different Countries and Lessons for the Future**

Extended Problem Solving Workshop Presentation  
Friday, 23 April 2021

# A *Global* Pandemic?

## Cumulative confirmed COVID-19 deaths per million people, Apr 21, 2021

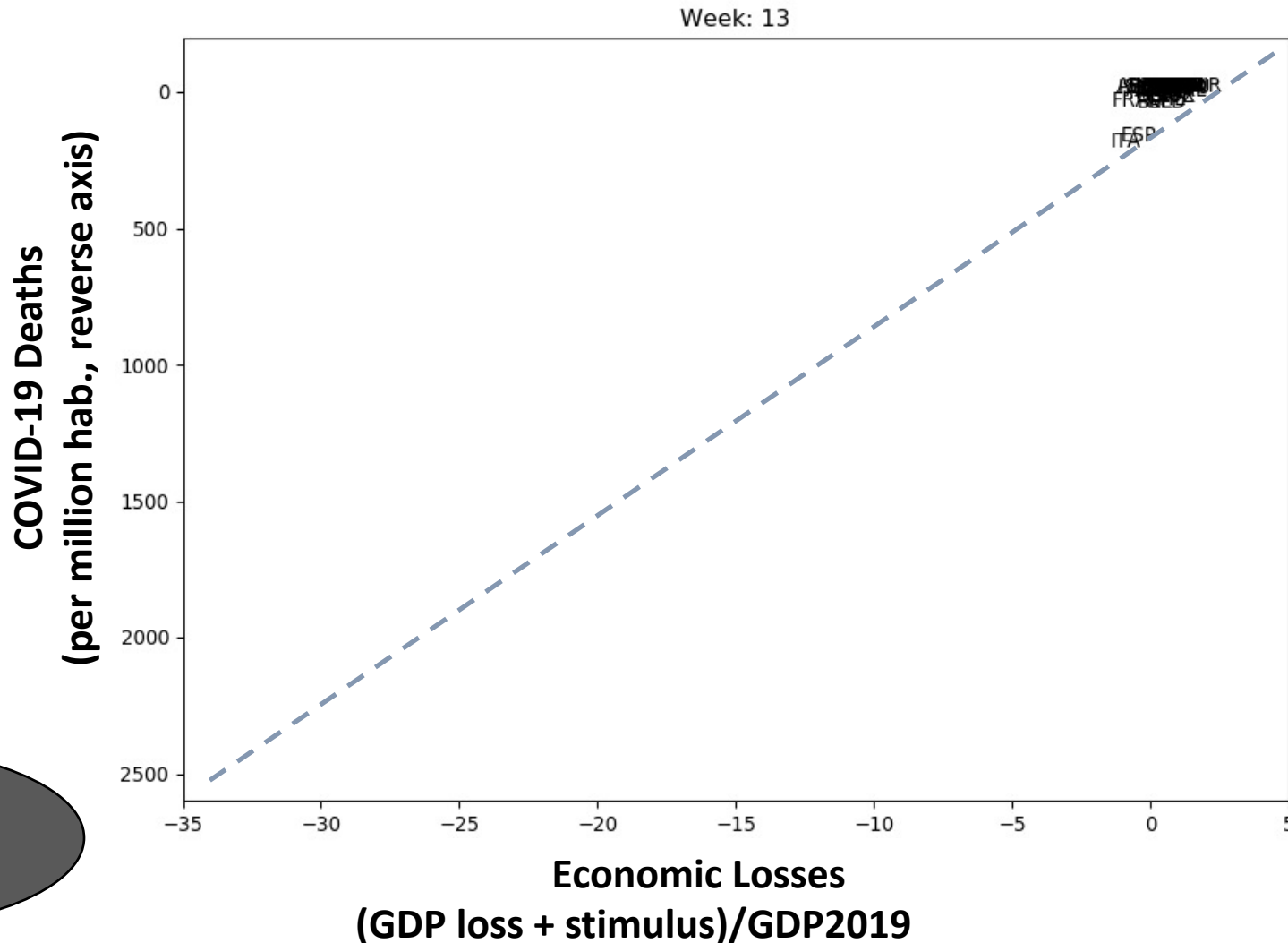
Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.



Source: Johns Hopkins University CSSE COVID-19 Data

CC BY

# Sacrificing Lives to Save the Economy or Saving Lives to Save the Economy?



Saving Lives and the Economy

Sacrificing Lives and the Economy

# Case studies: Lives, Economy, Stringency and Mobility

## Data:

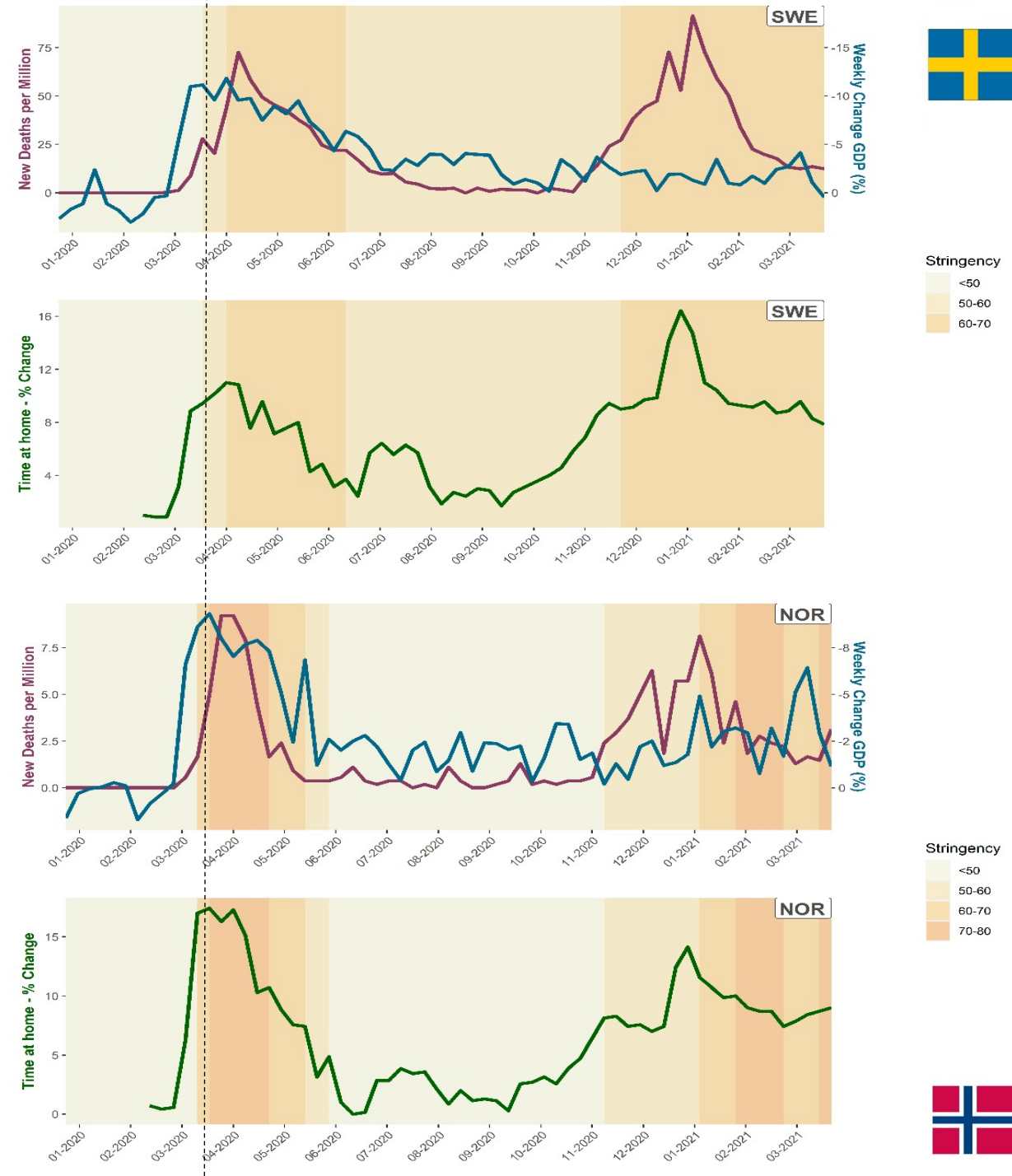
- **New Death by Million** (weekly average) – Our World in Data
- **Weekly GDP Tracker** (the % difference in GDP between a week and the same week a year earlier) – OECD Tracker
- **Stringency Index (0-100)** – Government Response Tracker Blavatnik School of Government and Oxford University
- **Change in time at home compared to baseline** – Google Mobility Data

## Our selection of Countries:

- **Sweden, Norway**  
(heterogeneity within Scandinavia)
- **United States, UK**  
(significantly impacted, not successful)
- **Japan, Australia, New Zealand**  
(well known success stories in Asia and Oceania)
- **Hungary, Czech Rep.**  
(Early success stories, recent failure)

# Heterogeneity within the Scandinavian group

- Both in **SWE** and **NOR** individuals **shift behaviour** (increasing time spent at home with respect to database) before restriction have actually been implemented. **GDP** starts to drop before deaths begin to rise and drop much less in the second wave.
- **NOR:** The Norwegian Directorate of Health introduced a number of measures from **12 March 2020. 6 April**, outbreak was "under control" and the reproduction rate had dwindled to 0.7 in the country.
- **SWE:** there has been no general lockdown: slow down the pandemic approach. The peak of **new deaths by million** is around **10 times higher** in **SWE** and the peaks **lasted much longer (higher cumulative results)**.



# Well Known Success Stories in Asia and Oceania

- **JAN/2020** - First COVID-19 confirmed case;
- **MAR/2020** - Lockdown;
- **MAY/2020** - Relax COVID-19 restrictions;
- **JUL-NOV/2020** – Renewed lockdown;
- **DEC/2020** - Stay-at-home order;
- **FEV/2021** – COVID-19 vaccination;
- **Pandemic Leave Disaster Payment.**



- **FEB/2020** - First COVID-19 confirmed case;
- **MAR/2020** - The closure of all borders and lockdown;
- **APR/2020** - Supervised quarantine.
- **JUN/2020** - Zero active COVID-19 cases;
- **COVID-19 Response and Recovery Fund.**



- **JAN/2020** - First COVID-19 confirmed case;
- **MAR/2020** - Several restrictions (stay at home, order closures of schools) ;
- **JUL/2020** - Raised the COVID-19 alert level;
- **SEP/2020** - Lowered the alert level;
- **NOV/2020** - Raised the COVID-19 alert level;
- **Emergency Economic Package Against COVID-19.**



## Australia

- Social distancing measures including by banning public gatherings of more than two people and shutting down non-essential businesses;
- Provided a **lump sum payment** to help workers during their 14-day self-isolation period.

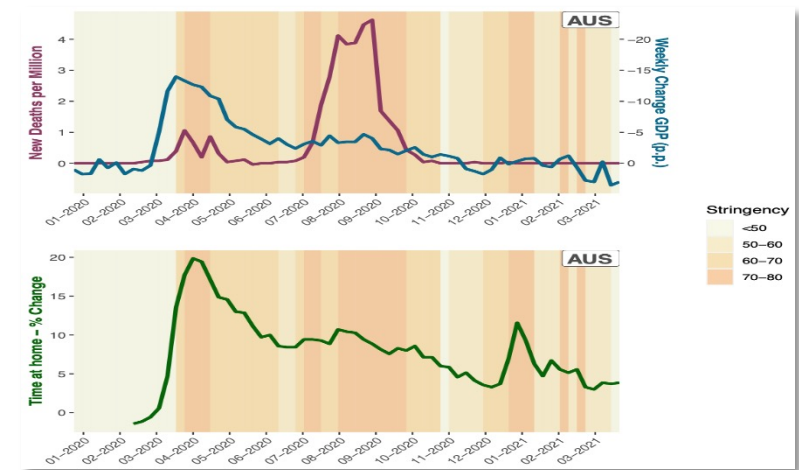
## New Zealand

- Border restriction to noncitizen/permanent residents;
- Contact tracing, testing and isolation of cases and quarantine of close contacts;
- Provided **social/financial support** during the COVID-19 pandemic and have existing **universal health coverage.**

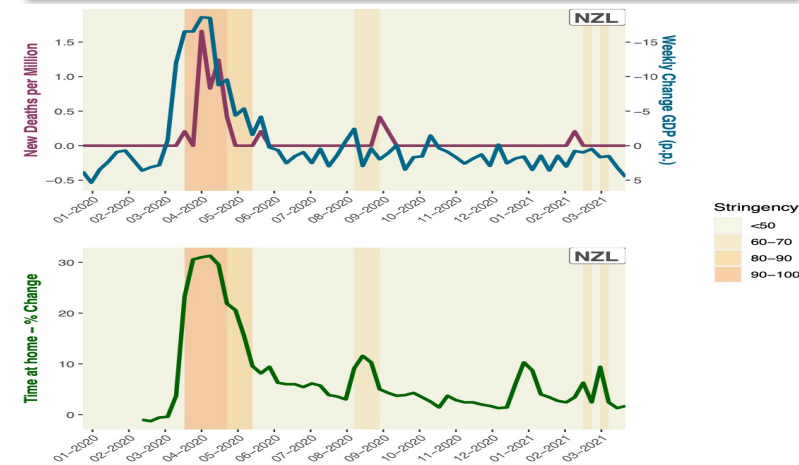
## Japan

- Easy adoption of protective measures as Hand-washing, physical distancing and the wearing of masks were already a part of Japanese culture.

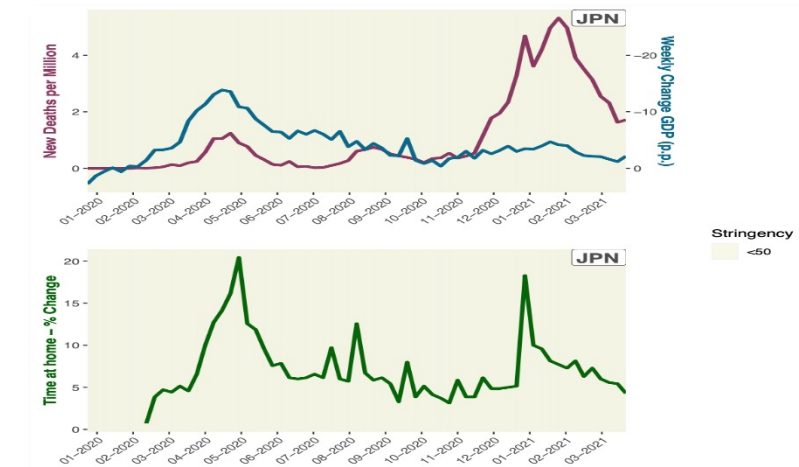
## Australia



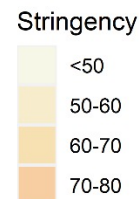
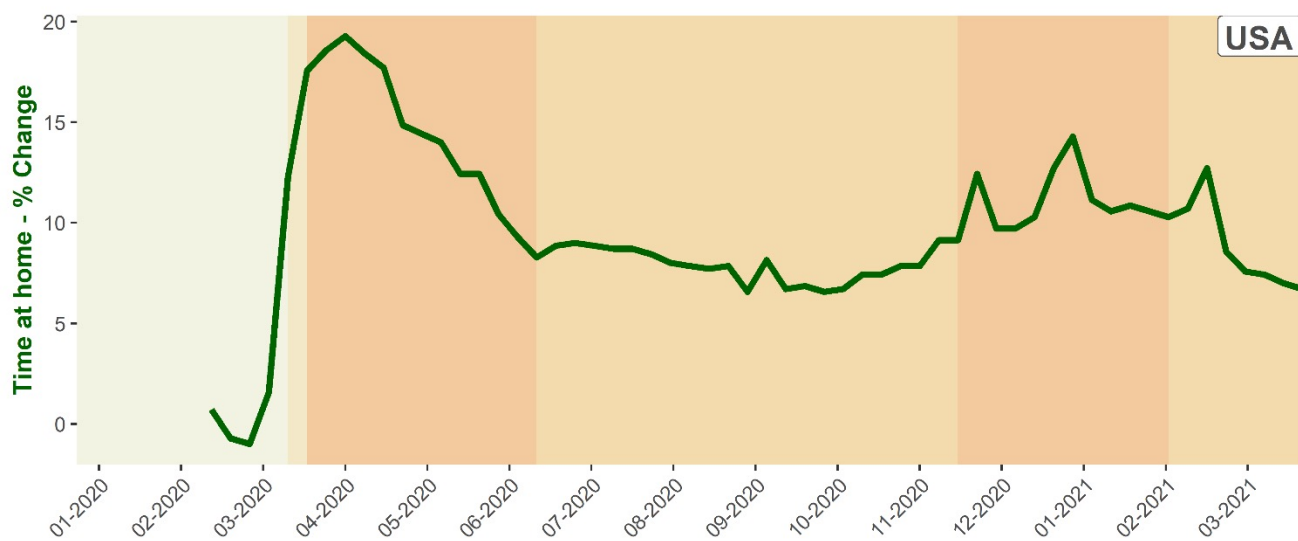
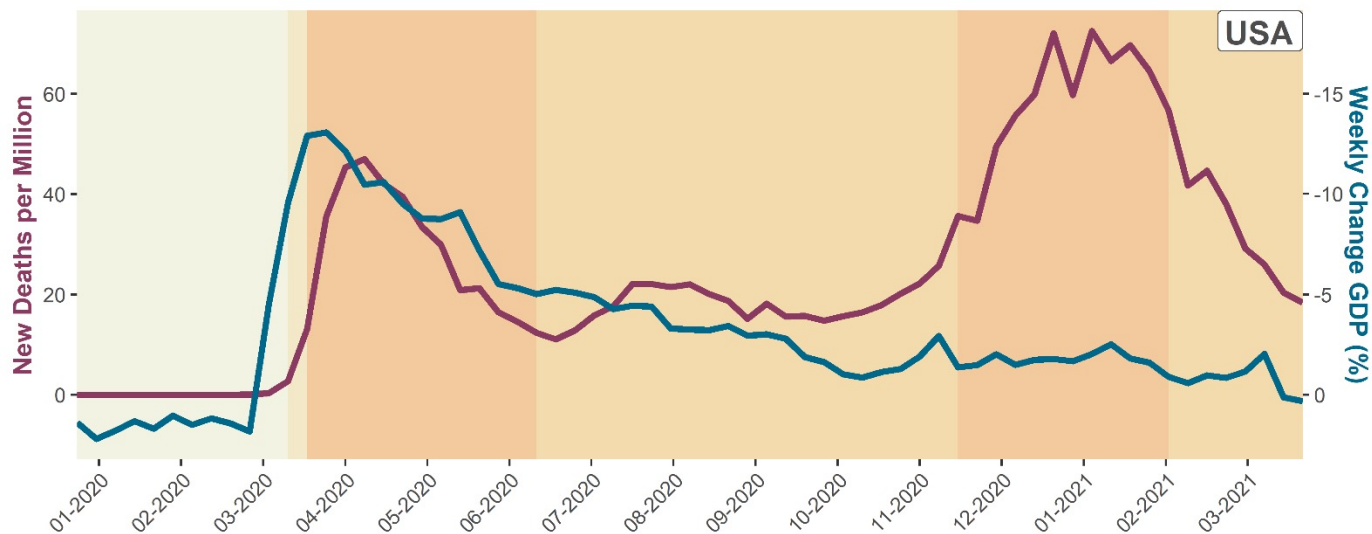
## New Zealand



## Japan

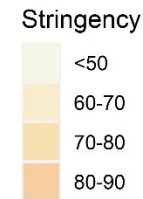
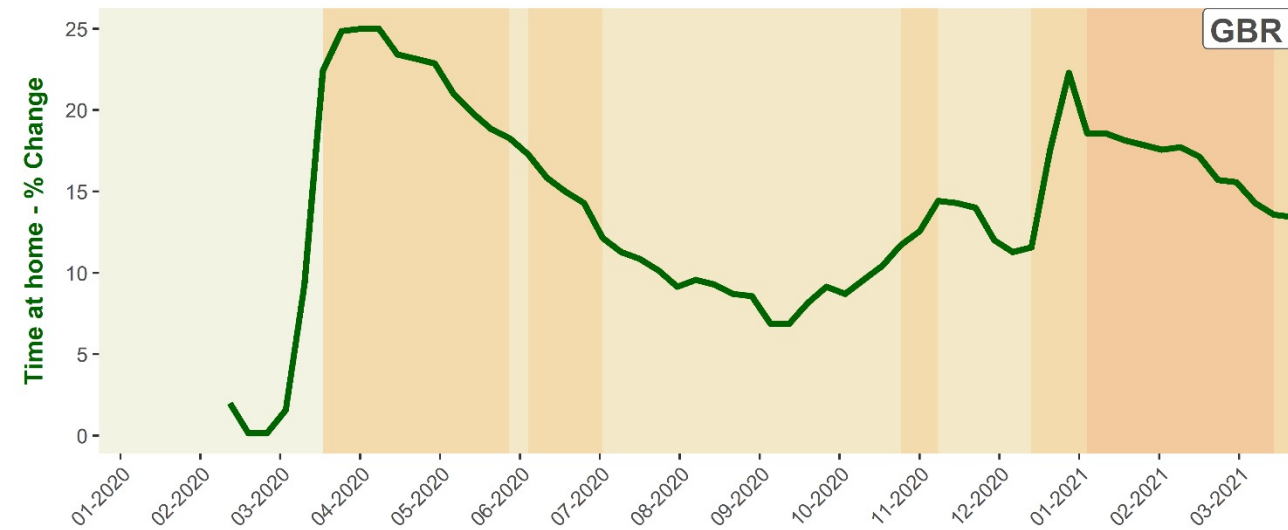
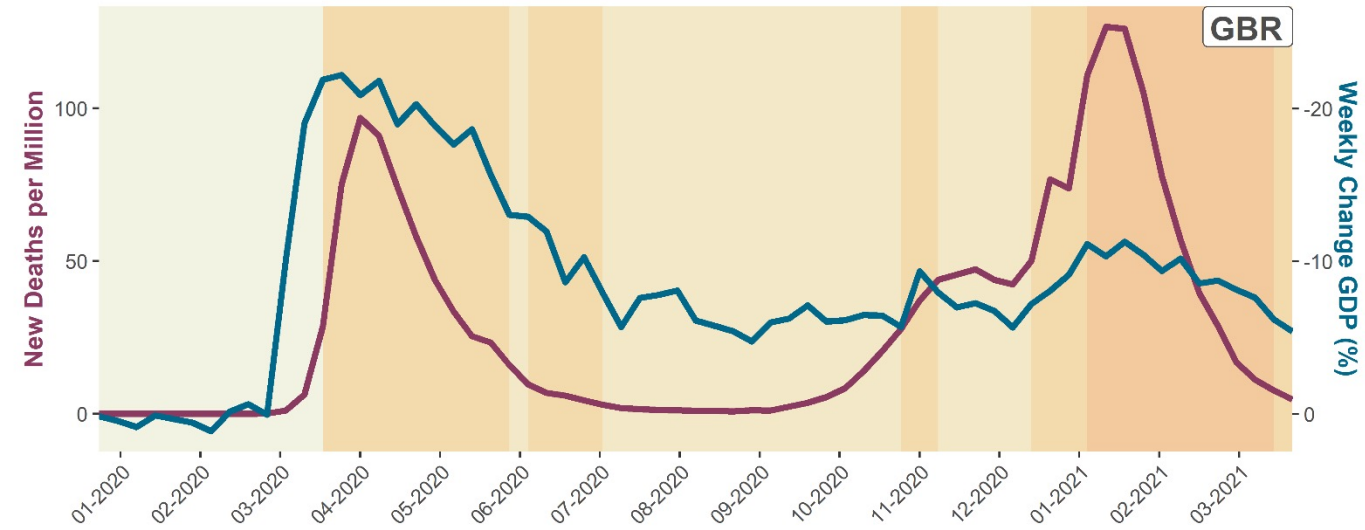


# United States



- As discussed by **Chetty et al. (2020)**, changes in consumer behavior during the pandemic could already be observed in the beginning of March, while government-imposed restrictions were put in place only after mid-March.
  - Not only government-imposed, but also **self-imposed containment measures** matter!
  - Government restrictions seem to add up to pre-existent shifts in **consumer behavior**, strengthening their negative spillovers.
- **Seasonalities**
- **No stimulus policies considered in the graph** (blue line could look much worse).
- **No clear relationship between stringency and time at home**

# United Kingdom



- Effect of the **UK variant** on time at home (fear?)
- The effect of **vaccination** – and lockdown – is clear after the second wave.
- **Stringency and Google Mobility Data** are not always consistent with each other.
- British population **remained at home** relatively more (even during summer) when compared with neighboring European countries
- Persistence of **GDP losses**



# Hungary and Czech Republic: Early Success, Recent Failure

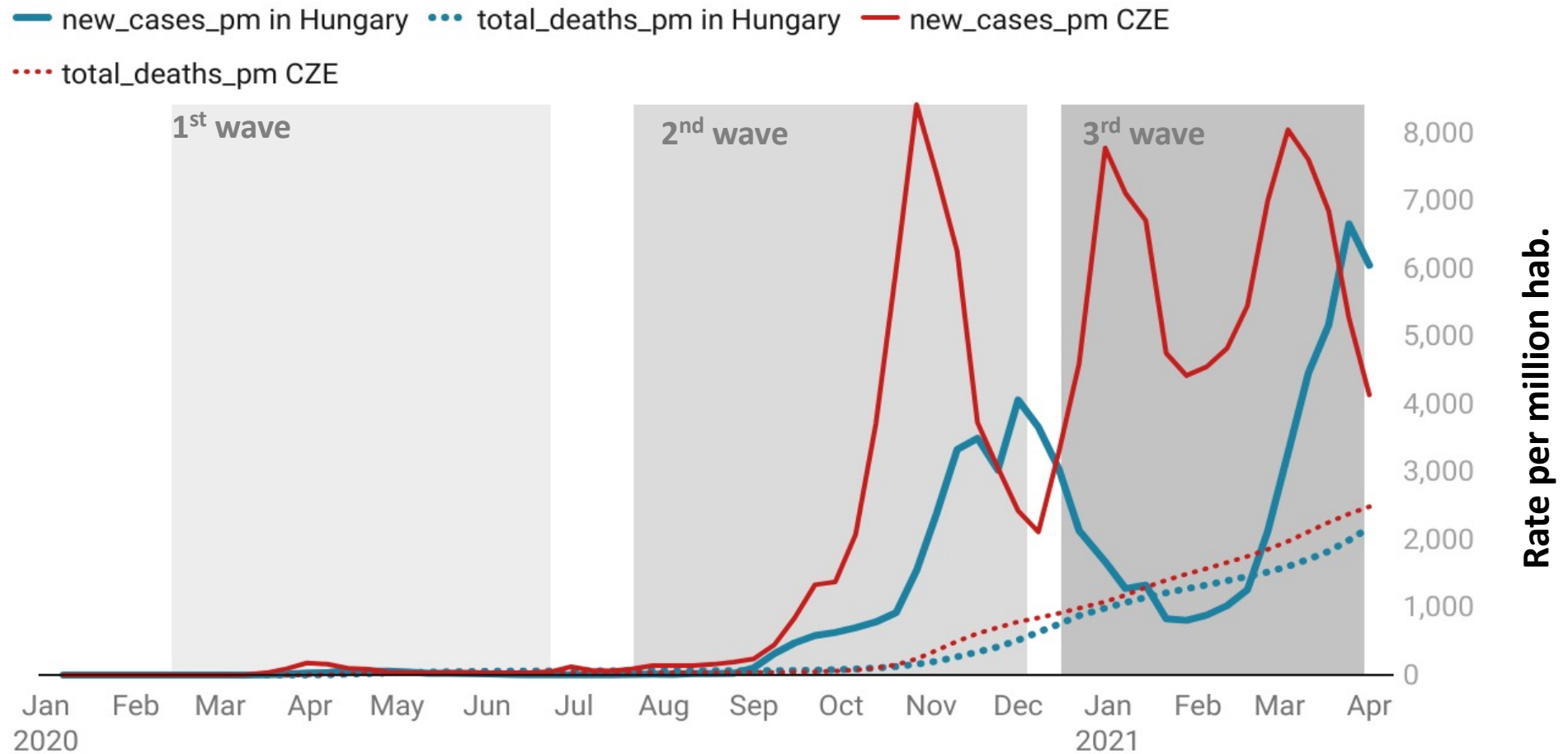
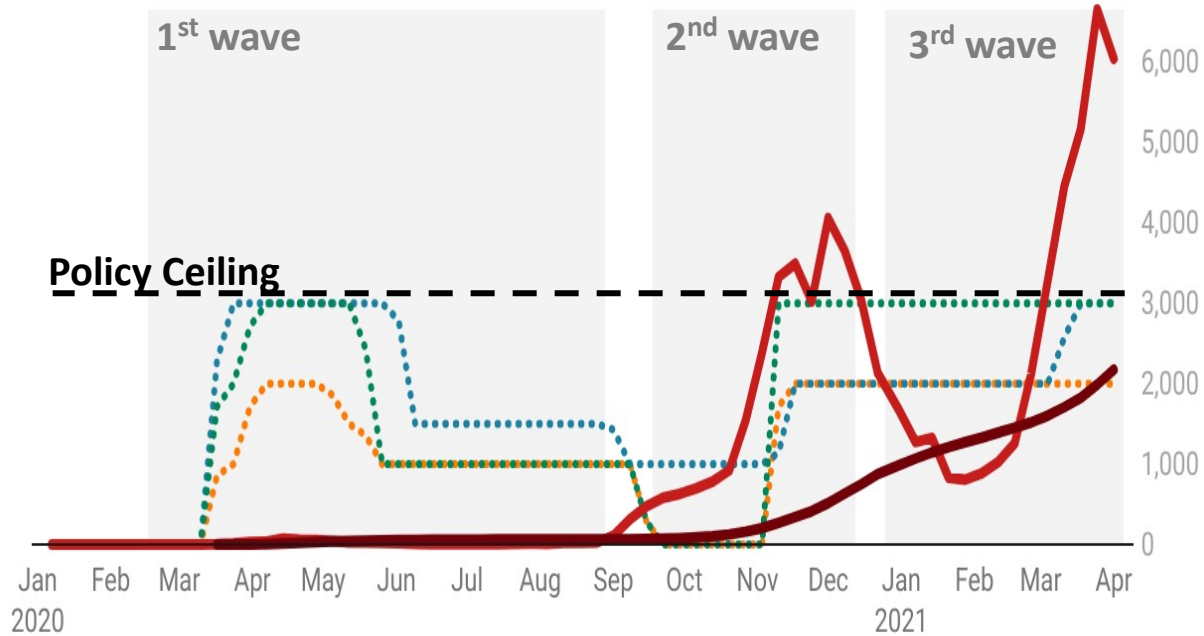


Chart: Adam Kerenyi • Source: Ourworldindata • Created with Datawrapper

# Hungary and Czech Republic: Policies

## Hungary

— new\_cases\_pm — total\_deaths\_pm ⋯ School Closures Normalized ⋯ Stay at home requirements  
⋯ Protection of Elderly People

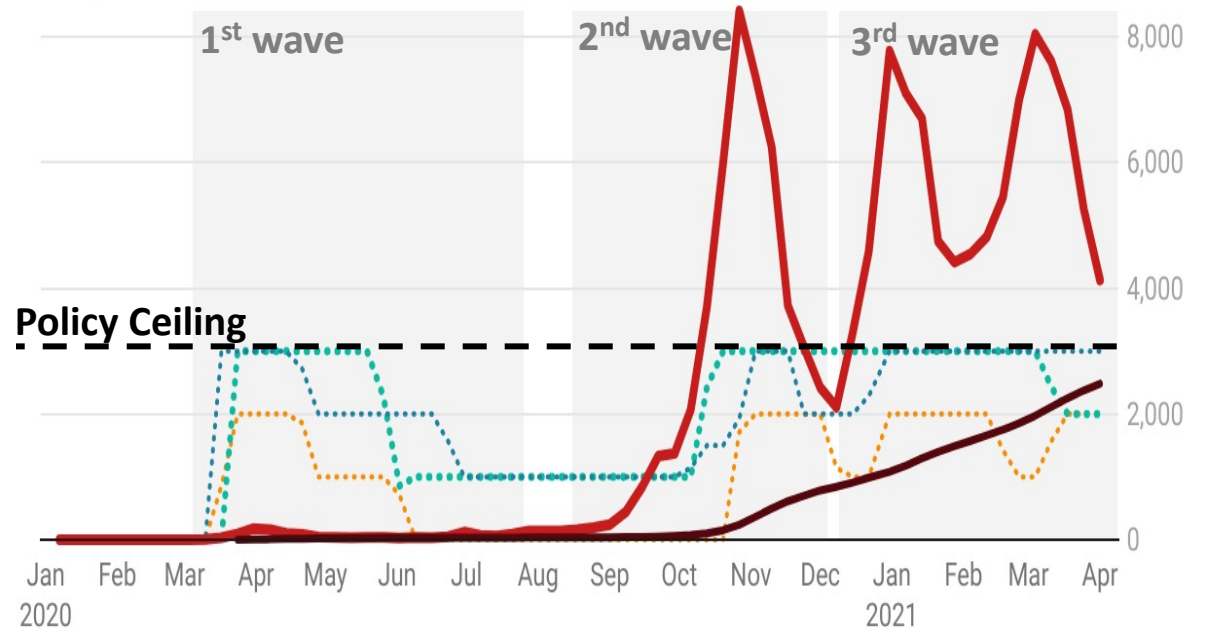


0-3000 is the range regarding the normalized policy measures

Chart: Adam Kerenyi • Source: Oxford Government Policy Tracker Ourworldindata.org • Created with Datawrapper

## Czech Republic

— new\_cases\_pm CZE — total\_deaths\_pm CZE ⋯ School Closures Normalized  
⋯ Stay at home requirements Normalized ⋯ Protection of Elderly People Normalized



0 is the lowest 3000 is the maximum value regarding the policy measures

Created with Datawrapper

# Research question

-> Look at countries' performances during the COVID-19 pandemic up to 2021 Q1:

- RQ: Could some countries have done better? What determines their health and economic performances?
  - **Role of Covid policies:** Is success entirely due to policies? What are the most relevant?
  - **Role of countries' structural characteristics:** Are there specific factors at the country level? What are they and how do they affect the effectiveness of policies?

## Methodology

- *Clustering analysis:* Group countries based on health and economic outcomes, structural characteristics, and policies. Identify success and failure stories.
- *Sankey diagrams:* visualize these relationships.
- *Econometric analysis:* assess what are the most relevant factors for success and failure stories.

# Dataset: 46 countries, snapshot at 2021 Q1

- Total Deaths per million → Our World in Data
- Economic Losses
  - Quarterly GDP → OECD
  - Stimulus Data → IMF
- Policy variables
  - Containment and Health Measures → Gov. Response Tracker Oxford University
  - Stimulus Data → IMF
  - Mobility (proxy for compliance) → Google Community Mobility
- Structural Characteristics
  - World Development Indicators, Our World in Data, bilateral trade flow data (BACI-CEPII)

# Hierarchical clustering

- Objective: cluster countries in groups with similar characteristics
- Method: hierarchical agglomerative clustering
  - Start from a  $n \times m$  of  $n$  observations (countries) and  $m$  features
  - Remove features with correlation  $> 0.80$
  - Standardized variables (z-score)
  - Use a *distance metric* to capture the similarity of observations
  - Form clusters based on these similarities through a *linkage function*
  - External validation of clusters
- We cluster on three objects:
  1. Health/losses outcomes
  2. Structural characteristics
  3. Covid19 policies

# Clustering on structural characteristics

**Variables:** GDP pc, borders, trade network centrality, median age, life expectancy, diabetes prevalence, hospital beds, extreme poverty, political system, debt/GDP, services, trade, health expenditure to GDP, health expenditure out of pocket, SARS, H1N1, MERS, Top10 income share

## Clusters:

Cluster 1: **AUS, DNK, FIN, GBR, ISL, NOR, NZL, SWE**

Cluster 2: **ARG, BRA, CHL, COL, IDN, IND, MEX, ZAF**

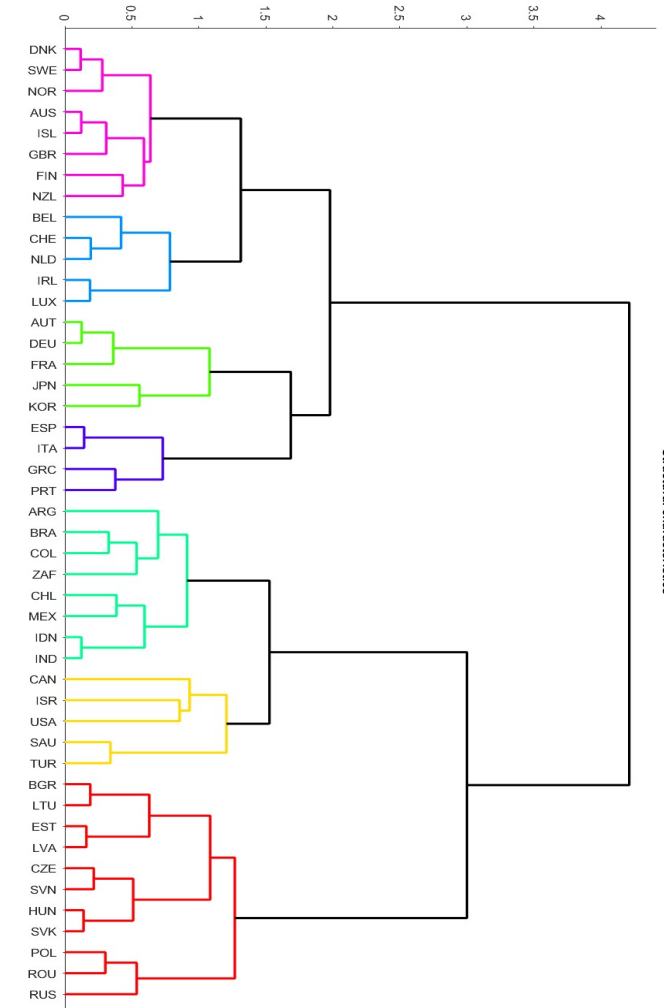
Cluster 3: **ESP, GRC, ITA, PRT**

Cluster 4: **BGR, CZE, EST, HUN, LTU, LVA, POL, ROU, RUS, SVK, SVN**

Cluster 5: **BEL, CHE, IRL, LUX, NLD**

Cluster 6: **CAN, ISR, SAU, TUR, USA**

Cluster 7: **AUT, DEU, FRA, JPN, KOR**

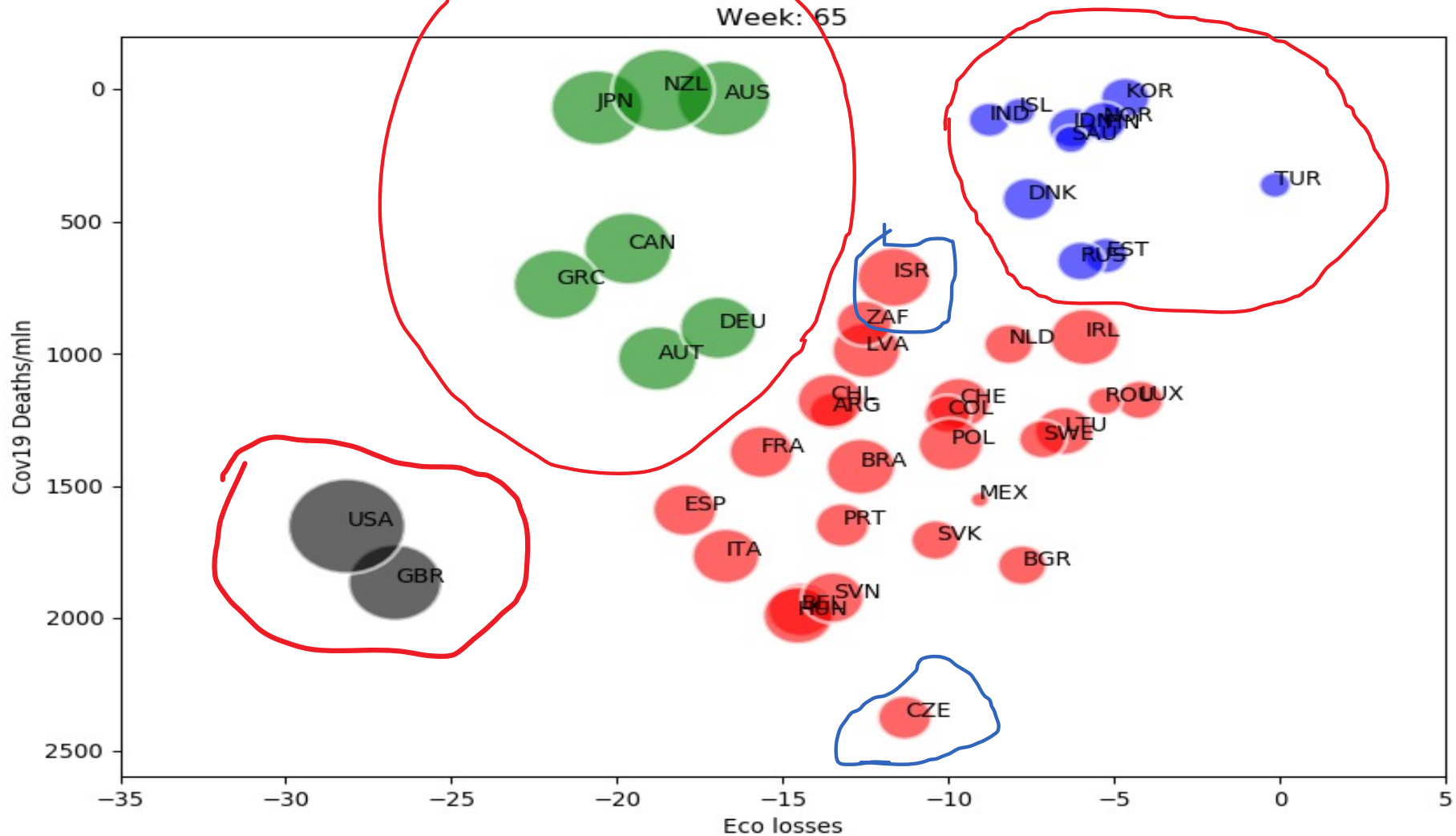


# Clustering on outcomes

## Variables:

Cov19 deaths per  
mln people

Economic losses  
(GDP losses + fiscal  
stimulus)/GDP19



# Clustering on policies

Invest in Testing and Tracing!

## Variables:

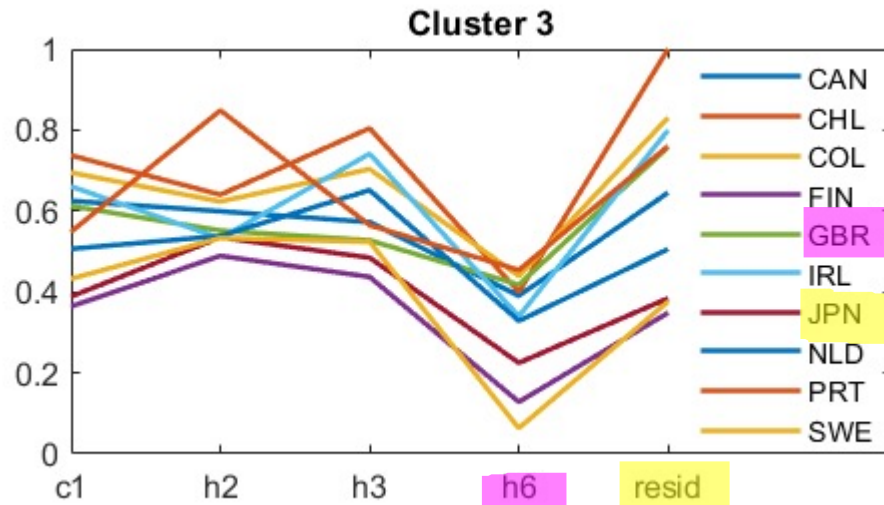
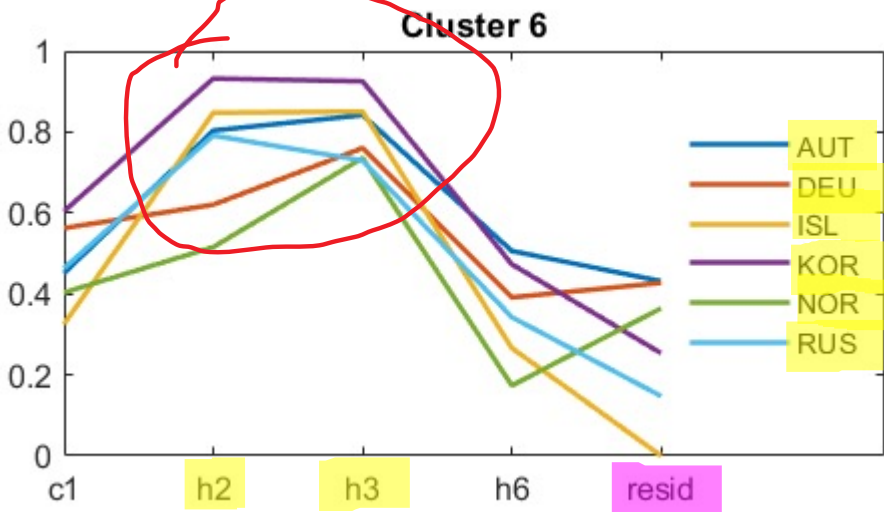
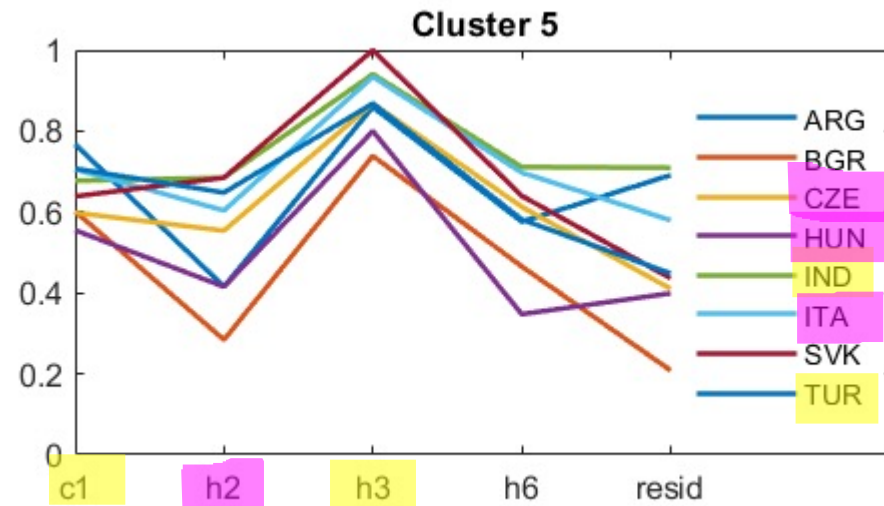
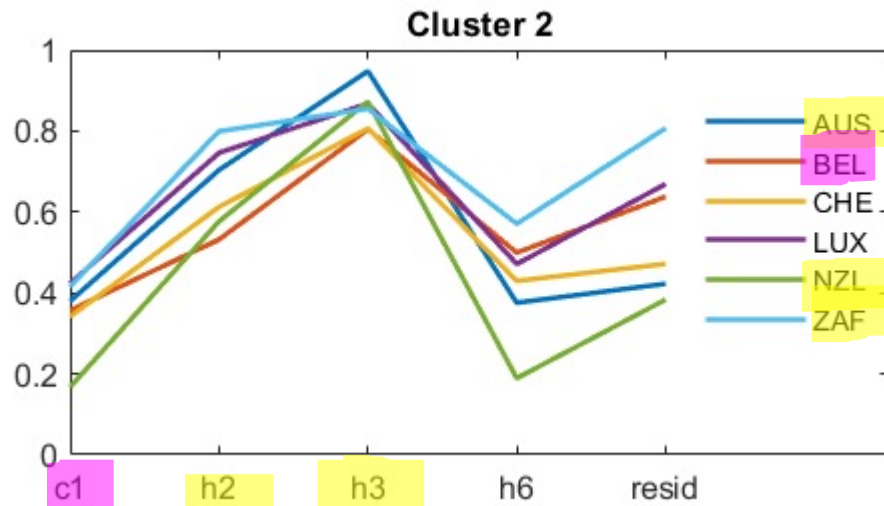
**c1** school closures

**h2** testing

**h3** tracing

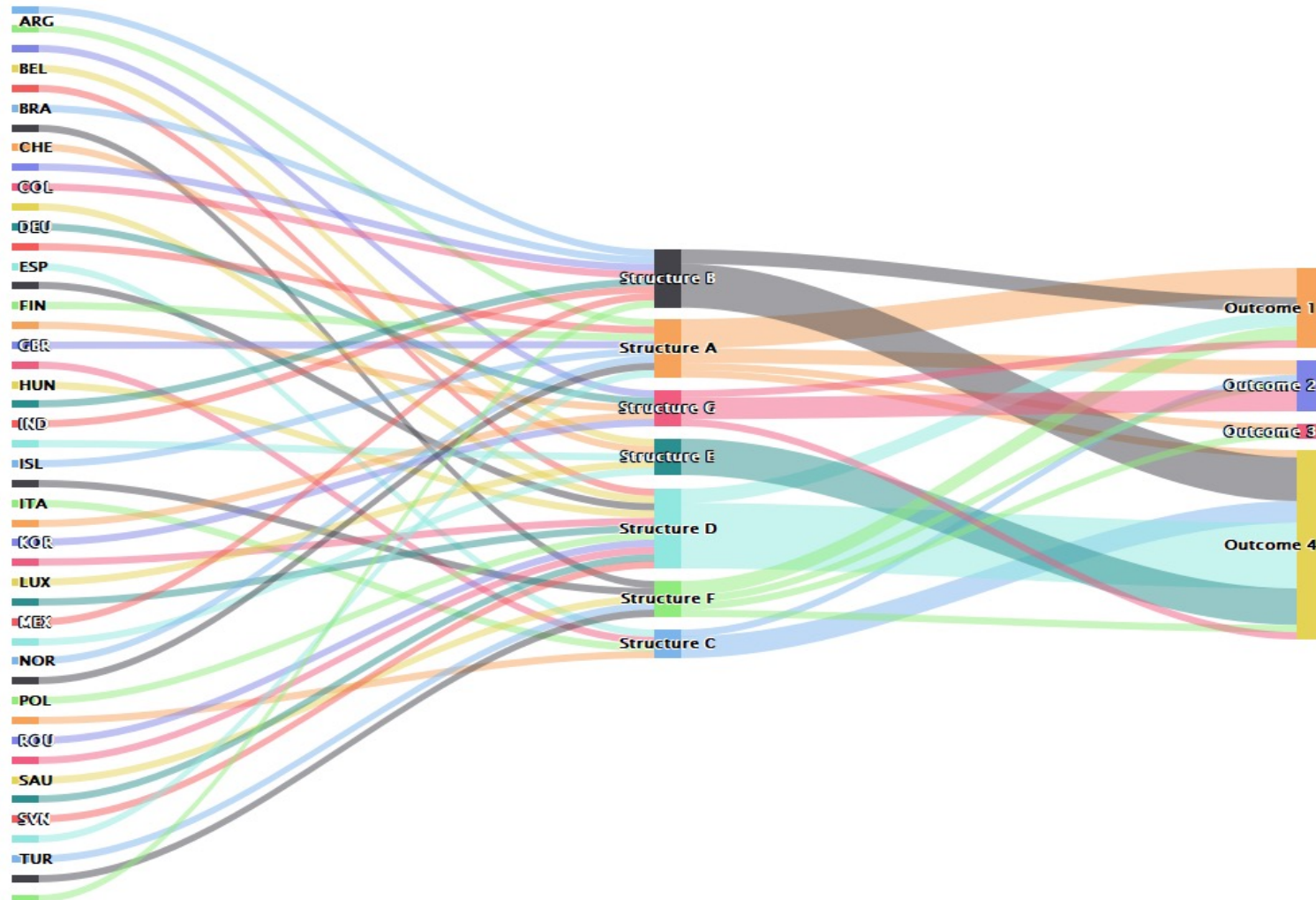
**h6** facial coverings

**resid** time spent at home





# Sankey diagram I: Countries, structure, outcomes

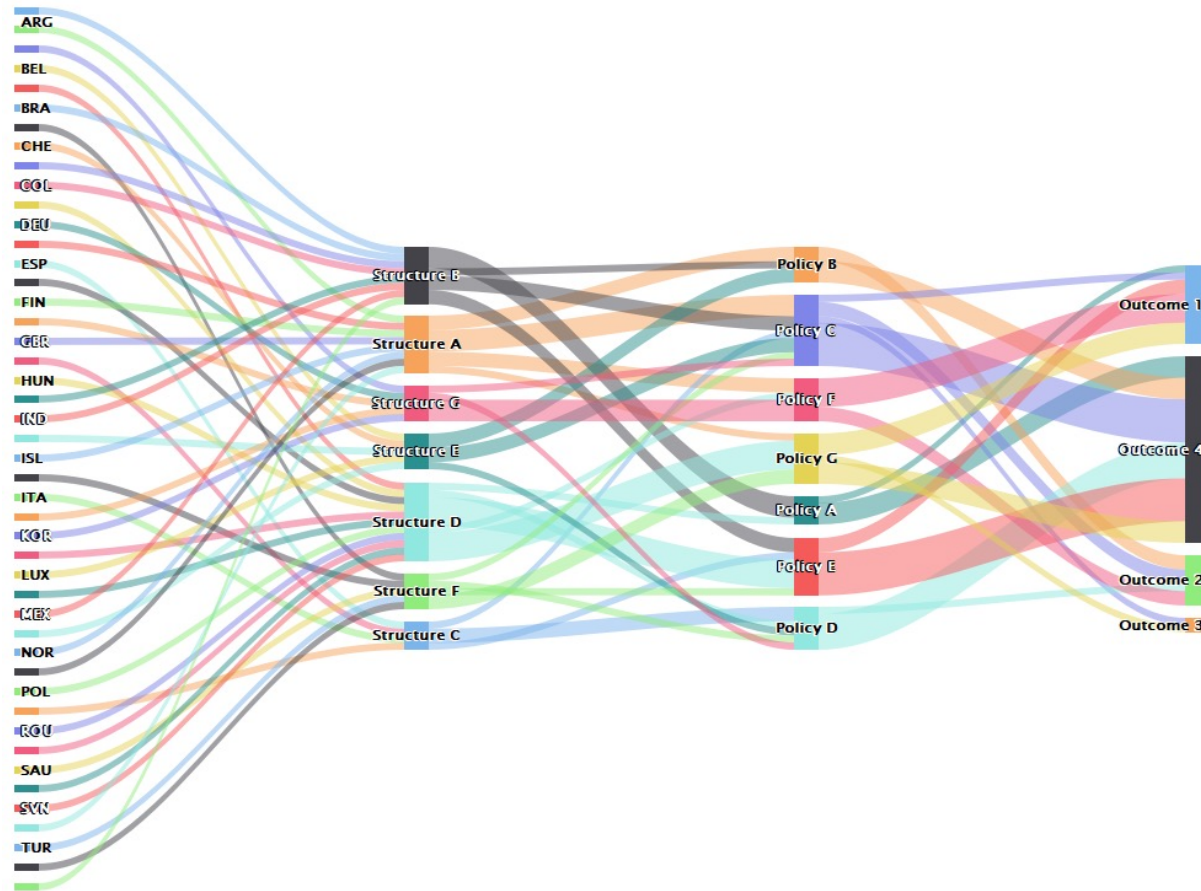


# Sankey diagram I:

## Countries, structure, outcomes

- Success stories:
  - **Outcome 1** → **Structure A** (DNK, ISL, FIN, NOR)  
**Structure F** (SAU, TUR)
- Failure stories:
  - **Outcome 4** → **Structure B** (ARG, BRA, CHL, COL, ZAF)  
**Structure D** (BRA, CZE, BGR, MEX)  
**Structure E** (CHE, IRL, LUX, NLD)

# Sankey diagram II: Countries, structure, policies, outcomes



# Sankey diagram II:

## Countries, structure, policies, outcomes

- Success stories:
  - Outcome 1 → Policy F & G
  - **Policy F** ← **Structure G** → **Outcome 1 & 2** (DEU, KOR)
  - **Policy F** ← **Structure A** → **Outcome 1 & 2** (ISL, NOR)
  - Special cases:
    - France (SG-PD-O4)
    - SA-PB (AUS, NZL), SA-PC (SWE, GBR)
- Failure stories:
  - **Outcome 4** → Policy C, D & E
  - **Policy C** → **Structure B** (ARG, BRA, CHL, IND, MEX)
  - **Structure A** (GBR, but also AUS, FIN, NOR)
  - **Policy E** → **Structure B** (IND)
  - **Structure D** (CZE, HUN, SVK)

# Regression Strategy

- Find variables that matter the most in determining a country's outcome.
- Logistic model: too many variables relative to the number of observations which produces perfectly determined results.
- Linear Probability Model (**LPM**): violate OLS assumptions.
- Robustness Check:
  1. **Logistic regression** on significant variables from LPM results.
  2. Model Selection (**Lasso**)

# Initial Conditions

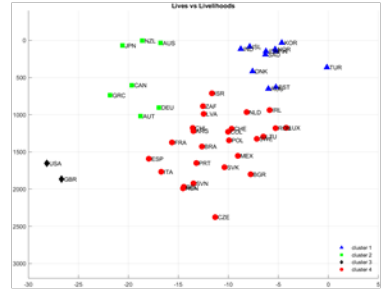
Covid Shock

- ### Fixed Endowment Factors
- Epidemic experience: SARS, H1N1
  - National health status prior to Covid
  - Healthcare sector resilience
  - Political system
  - Trade reliance
  - Geography, population density & age structure
  - Government budget & Debt limit
  - Distribution of income
  - Digitalization

# Policy Interventions

- ### Covid Policy
- Lockdown
  - Testing
  - Vaccination
  - Contact tracing
  - School closure
- ### Fiscal Policy
- Spending in healthcare
  - Spending in non-healthcare
  - R&D in vaccines
  - Taxation
  - Import of Covid related products
- ### Monetary Policy
- Interest rate
  - Quantitative easing
  - Forward guidance

# Clustering Analysis

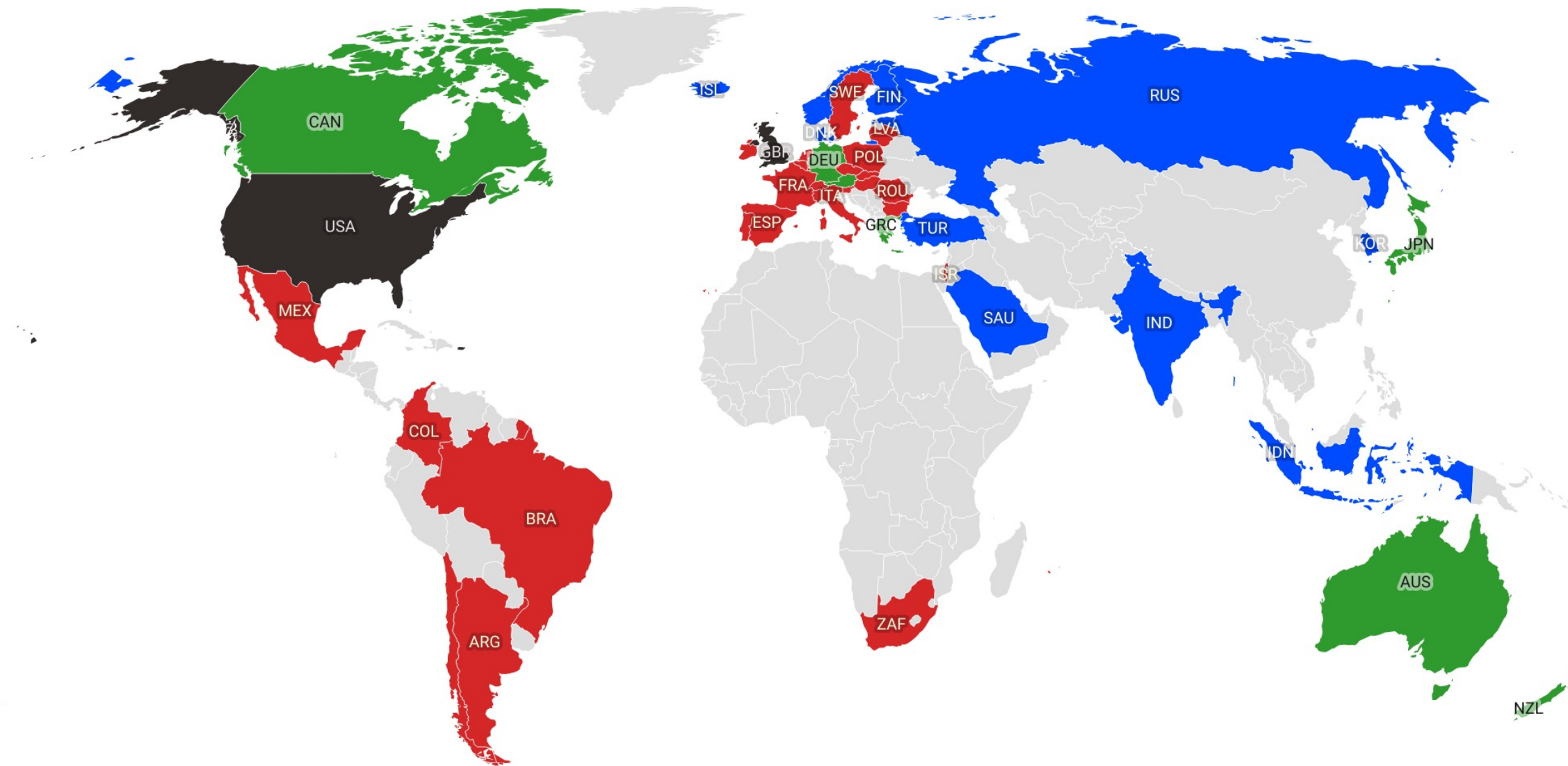


# Outcomes

- Success
- Lives over economy
- Mixed
- Failure

# Cross-country Comparison by Four Group Clustering

Data by 25th March 2021 for 46 selected countries.



Blue: Success, Green: Lives over economy, Red: Mixed, Black: Failure.

Map: Jason Wang • Source: OECD Group • Created with Datawrapper

**Table 1: LPM Regression Results for Covid Outcomes on Initial Conditions, March 2021**

	Blue	Green	Red	Black
Constant	2.758 (2.231)	0.516 (-2.135)	-1.351 (-2.874)	-0.923 (0.813)
H1N1 Death	0.000 (0.000)	-0.000*** (0.000)	0.000 (0.000)	0.000*** (0.000)
SARS Death	0.001 (0.002)	0.004** (0.001)	-0.003 (0.002)	-0.001 (0.001)
Tax Revenue (% of GDP)	-0.008 (0.016)	-0.005 (0.014)	0.010 (0.020)	0.003 (0.006)
Population density	0.087 (0.059)	0.040 (0.051)	-0.135 (0.076)	0.009 (0.021)
Share of population above 70	-0.058* (0.034)	-0.008 (0.030)	0.064 (0.043)	0.002 (0.012)
Poverty rate	-0.001 (0.010)	0.005 (0.008)	-0.007 (0.012)	0.003 (0.003)
Cardiovascular disease	0.001 (0.001)	0.000 (0.001)	-0.001 (0.002)	0.000 (0.001)
Diabetes prevalence	-0.102** (0.047)	-0.001 (0.041)	0.102* (0.061)	0.001 (0.017)
Hospital beds	-0.069* (0.037)	-0.020 (0.032)	0.092** (0.048)	-0.004 (0.013)
Trade reliance	-0.003** (0.002)	-0.001 (0.002)	0.005** (0.002)	-0.000 (0.001)
Income share of top 10%	-0.038* (0.020)	-0.015 (0.018)	0.055** (0.026)	-0.002 (0.007)
Digitalization	0.010 (0.022)	-0.005 (0.019)	-0.013 (0.028)	0.008 (0.008)
Democratic rating	-0.002 (0.006)	0.003 (0.005)	-0.002 (0.008)	0.000 (0.002)
Neighbouring countries	0.011 (0.029)	0.020 (0.026)	-0.022 (0.038)	-0.009 (0.011)
Government debt (% of GDP)	0.001 (0.002)	0.002 (0.002)	-0.002 (0.003)	-0.001 (0.001)
R-squared	0.855	0.842	0.822	0.916
Adjusted R-squared	0.565	0.525	0.466	0.747
F-Test (p-value)	0.0152	0.025	0.045	0.001
Number of observations	46	46	46	46

Standard Errors are reported in Parentheses.

\*, \*\*, \*\*\* indicates significance at 90%, 95% and 99% level respectively.

# Initial conditions to look out for:

1. Learn from **past pandemic experience**: a lesson from SARS, H1N1 and Covid.
2. **Vulnerable group** needs more protection: low-income, elderly and diabetic group.
3. Countries rely heavily on trade are less likely to be successful: **transmission risks through trade**.



**Table 2: LPM Regression Results for Covid Outcomes on Policy Measures, March 2021**

	Blue	Green	Red	Black
School closures	0.010 (0.010)	0.002 (0.009)	-0.012 (0.013)	0.000 (0.004)
Workplace restrictions	-0.003 (0.009)	-0.006 (0.008)	0.009 (0.011)	-0.001 (0.003)
Cancelation public events	0.007 (0.008)	0.009 (0.007)	-0.016 (0.010)	0.001 (0.003)
Restrictions on gatherings	-0.020** (0.009)	-0.009 (0.008)	0.030*** (0.011)	-0.001 (0.003)
Close public transport	-0.006 (0.006)	-0.001 (0.005)	0.008 (0.007)	0.000 (0.002)
Stay at home requirements	0.002 (0.009)	0.003 (0.008)	-0.003 (0.012)	-0.001 (0.003)
Internal movement restrictions	0.002 (0.009)	0.004 (0.006)	-0.008 (0.009)	0.003 (0.002)
International travel rest.	-0.002 (0.007)	-0.007 (0.006)	0.009 (0.009)	-0.001 (0.002)
Public information rest.	0.007 (0.010)	0.004 (0.008)	-0.013 (0.012)	0.002 (0.003)
Testing policy	0.020*** (0.006)	0.006 (0.006)	-0.028*** (0.008)	0.003 (0.002)
Contact tracing	-0.003 (0.004)	0.002 (0.003)	0.002 (0.005)	-0.001 (0.001)
Facial coverings	-0.009 (0.006)	-0.008 (0.005)	0.016** (0.008)	0.000 (0.002)
Protection of elderly people	-0.012** (0.006)	-0.01* (0.005)	0.021*** (0.008)	0.001 (0.002)
Fiscal stimulus in Healthcare	-0.032 (0.066)	-0.047 (0.058)	-0.026 (0.085)	0.106*** (0.024)
Fiscal stimulus in Non-Healthcare	-0.035 (0.023)	0.072*** (0.020)	-0.040 (0.030)	0.002 (0.008)
R-squared	0.855	0.842	0.822	0.916
Adjusted R-squared	0.565	0.525	0.466	0.747
F-Test (p-value)	0.0152	0.025	0.045	0.001
Number of observations	46	46	46	46

Standard Errors are reported in Parentheses.

\*, \*\*, \*\*\* indicates significance at 90%, 95% and 99% level respectively.

# Policy measure matters the most:

**Testing:** Countries implemented more testing since the beginning of Covid on average are more likely to be successful.

- More testing → More Covid information → Better policy decisions judged by outcome
- More testing → People who tested positive will self isolate

**Table 3: Logistic Regression Results for Covid Outcomes on Significant Variables, March 2021**

	Blue	Red
Share of population above 70	-0.650** (0.272)	
Diabetes prevalence	-0.193 (0.278)	0.163 (0.263)
Hospital beds	-0.113 (0.259)	0.121 (0.327)
Trade reliance	-0.018 (0.012)	0.091** (0.046)
Income share of top 10%	-0.514** (0.249)	0.495** (0.222)
Restrictions on gatherings	-0.103* (0.058)	0.193* (0.115)
Testing policy	0.092* (0.050)	-0.124** (0.063)
Facial coverings		0.038 (0.042)
Protection of elderly people	-0.078* (0.044)	0.085* (0.045)
Constant	27.220 (10.886)	-34.442 (14.775)
F-Test (p-value)	0.000	0.000
Pseudo R-squared	0.5576	0.6185
Number of observations	46	46

Standard Errors are reported in Parentheses.

\*, \*\*, \*\*\* indicates significance at 90%, 95% and 99% level respectively.

## Robustness check: Logistic Regression

- **Logistic regression**: using significant variables from the linear model results.
- Majority of the variables are **significant** again.
- Conclusion on ‘testing’ and ‘low-income group’ are very robust.

# Robustness check: Model Selection (Lasso)

For previous exercise, variables were selected by us based on existing literature and economic rationality  
 What happens if we let the data choose the variables that most explain outcome variables?

Policy Variables	Blue	Blue+Green	Total Deaths per million	Economic Losses
Workplace restrictions		■	■	
Cancellation Public Events			■	■
Restrictions on Gatherings	■		■	■
Close Public Transport			■	
Stay at home requirements	■	■	■	
Internal Movement Restrictions	■			■
International Travel Rest.		■		■
Stimulus on Health Sector			■	
Stimulus on Non-Health Sector	■			
Public Information Campaigns			■	
Testing Policy	■	■	■	
Contact Tracing			■	
Facial Coverings			■	■
Protection of Elderly People	■	■	■	
Time at Home	■			

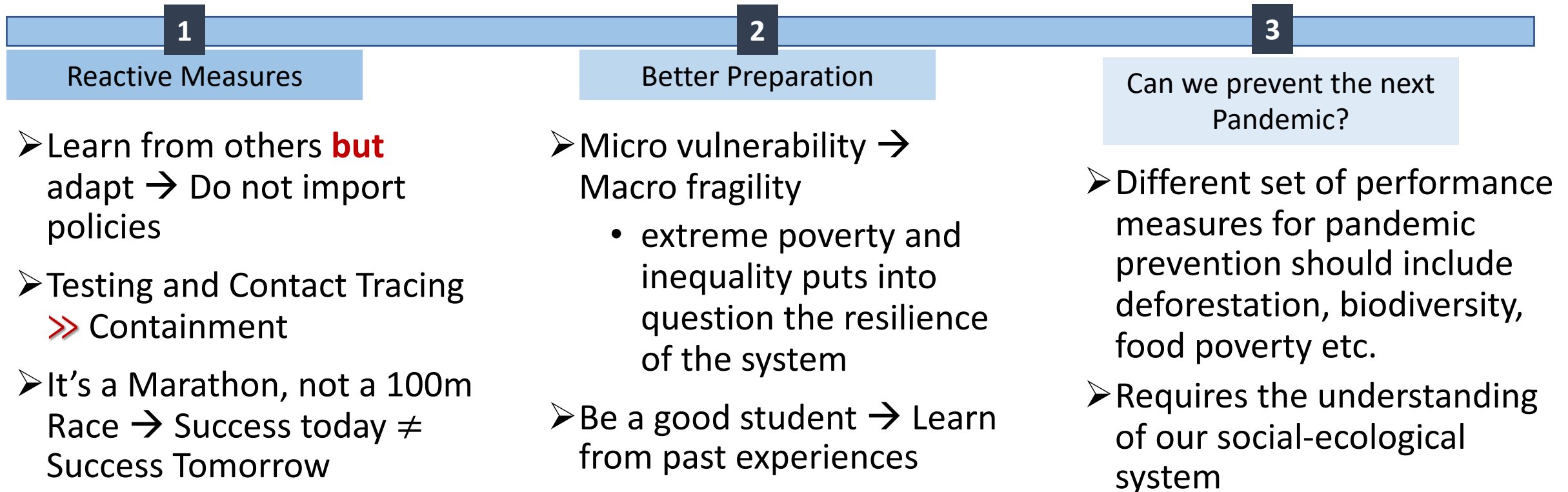
Structural Variables	Blue	Blue+Green	Total Deaths per million	Economic Losses
<i>Gross Debt General Government</i>				■
Manufacturing			■	■
Services	■	■	■	
<i>Trade</i>			■	
Median Age	■			
<i>Age 70 or older</i>			■	
<i>Cardiovascular death rate</i>			■	
Health Expenditure - out of pocket			■	
Hospital beds per 1000	■		■	
<i>H1N1 deaths per million</i>				■
Island			■	
Bordering Countries (#)			■	
East Asia and Pacific	■	■	■	
Latin America				■
South Asia	■	■	■	
<i>Political System</i>			■	■

In red variables identified in main exercise

Green square → variable was selected by Lasso for that outcome variable

# Taking Stock: Policy Objectives and Recommendations

1. Goal: Lives **and** Livelihoods
2. Structural characteristics matter for both outcome and policy
  - GDP per capita, fiscal space, population structure, geography among others



# Final Remarks and Next Research Steps

- ✓ This is a preliminary performance analysis
  - COVID is still rampant globally (55 countries more deaths in 2021 than in 2020)
  - Analysis up to 2021 – Q1 for 46 countries
- ✓ Does the timing of policy implementation matter? We believe it does!
  - How has vaccination news and rollout affect a country's COVID performance?
  - Does people's adaptability to the virus increases or reduces policy effectiveness?

# Thank you!

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Pêdra Andrade, Maria Cristina Barbieri Goes, Carla Corburger, Ettore Gallo, Andrea Gurgone, Adam Kerényi, Humberto Martinez B., Enrico Maria Turco, and Jason Wang