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# TSE Inaugural Lecture 2020: What Can History Teach Us About the Potential Consequences of COVID-19?

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# What Can History Teach Us About the Potential Consequences of COVID-19?

Victor Gay

University of Toulouse 1 Capitole

Toulouse School of Economics

Institute for Advanced Study in Toulouse

September 2020



# A Few Words About Me

- In UT1 since September 2018:
  - Assistant Professor at TSE.
  - Research Fellow at IAST.
- Education: University of Chicago 2018.
- Fields: economic history, economics of culture, political economy.
- Dissertation: “The Legacy of the Missing Men: World War I and Female Labor in France Over a Century.”

# A Few Words About My Teaching

- Teaching in 2020–2021:
  - M1 S1: Economic History.
  - M1 S1: Applied Econometrics + group supervision.
  - M2 PPD S2: Institutions and Long-Run Development.
  - M2 ETE S2: Development (Part 2: Economic History, with M. Saleh).
  - DEEQA S2: Natural Experiments in History (with M. Saleh).
  - Supervision of M1 and M2 theses.
- Contact:
  - Email: [victor.gay@tse-fr.eu](mailto:victor.gay@tse-fr.eu).
  - Office: T.458.
  - Website: [victorgay.me](http://victorgay.me)

What can history teach us about the potential consequences of COVID-19?

- Most serious health and economic crisis of 21st century:
  - Since December 2019: nearly 900k fatalities, 26M cases.
  - No natural immunity, no cure yet.
  - Large-scale non-pharmaceutical interventions.
  - Large economic downturn, e.g., France: 2020 Q2/2019 Q2:  $-19\%$ .
  - Euro area 2020 GDP forecast:  $-11\%$  to  $-9\%$ .

⇒ Critical juncture.

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    - Large economic downturn, e.g., France: 2020 Q2/2019 Q2:  $-19\%$ .
    - Euro area 2020 GDP forecast:  $-11\%$  to  $-9\%$ .
- ⇒ Critical juncture.
- Economic history can some provide guidance.

Does the past have useful economics?



# More Economic Facts

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- More facts about economic growth
  - Penn World Tables: real GDP PPP 182 countries since 1950.
  - Maddison project database: real GDP since 1000.
- More facts about populations:
  - IPUMS USA: full count censuses 1850–1950.
  - IPUMS NAPP: full count censuses North Atlantic starting 1703.

# (Often) Better Economic Facts

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- Populations: no anonymity rule.
  - IPUMS USA: linked samples across censuses.
  - TRA France: linked families (vital and inheritance records).
- Full companies' records and manufacturing censuses.

# (Often) Better Economic Facts

- Populations: no anonymity rule.
  - IPUMS USA: linked samples across censuses.
  - TRA France: linked families (vital and inheritance records).
- Full companies' records and manufacturing censuses.
- Cautious approach to data as constructed objects.

# Better Economic Theory

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- Economic history to build economic theory.
  - Kaldor stylized facts and neoclassical growth.
  - Ricardo and rising land rents.

# Better Economic Theory

- Economic history to build economic theory.
  - Kaldor stylized facts and neoclassical growth.
  - Ricardo and rising land rents.
- Economic history to test economic theory.
  - Variety of past experiences and policy responses.
  - Better identification through exogenous variation.



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- Answer the big questions.

⇒ Design better economic policy.

McCloskey (1976) Abramitzky (2015) Cantoni and Yuchtman (2020)

# Economics and History Intertwined

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- Economics emphasizes generality: the “imperial science”?  
Stigler (1984)
  - Substitution and income effects.
  - Equilibrium responses.
  - Law of Demand.

# Economics and History Intertwined

- Economics emphasizes generality: the “imperial science”?  
Stigler (1984)
  - Substitution and income effects.
  - Equilibrium responses.
  - Law of Demand.
- Reality of economic mechanisms is historically conditioned.  
Arrow (1985)
- Context is crucial to determine equilibrium responses.

# Approach of this Lecture

- Characterize features COVID–19 crisis.
- Find commonalities (and differences) with past crises.
- Leverage past experiences.
- Useful references: [Alfani and Murphy \(2017\)](#) [Arthi and Parman \(2020\)](#) [Beach, Clay, and Saavedra \(2020\)](#)



- Features of COVID-19 in Historical Perspective
- Lessons from the Influenza Pandemic of 1918–1919
- Lessons from the Great Depression of the 1930s

# COVID-19 in historical perspective

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- Epidemiology of COVID-19.
- Demographic and distributional effects.
- Policy responses.

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- Epidemiology of COVID-19.
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⇒ Characterization will generate natural historical counterparts.

- Health effects: Influenza (1918–1919).
- Economic effects: Great Depression (1930s).

# Comparison Set

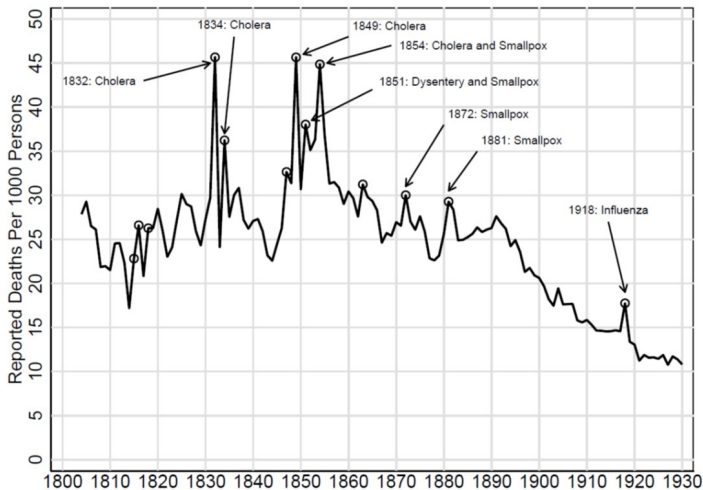
⇒ Epidemic risks were (nearly) part of everyday life.

Epidemics	Period	Regions	Deaths
Antonine Plague	160–180	Roman Empire	10–30%
Plague of Cyprian	249–270	Roman Empire	15–25%
Justinian plague	540–541	Eu., Med.	25–50M, 25–50%
Black Death	1347–1352	Eu. to Asia	~50M, 35–60% (Eu)
Italian plague	1629–1632	North. Italy	2M , 30–35%
Columbian Exchange	1492–1650	Americas	80–90%
Cholera Pandemics 1–6	1817–1923	Worldwide	1M+
Third Plague	1850s–1900s	China, India	12M
Russian Flu	1889–1890	Russia, Asia, Eu.	1M

## Some Major Historical Epidemics

Data from [Alfani and Murphy \(2017\)](#)

# Comparison Set



## Major 19th-century Epidemics in NYC

Figure from [Beach, Clay, and Saavedra \(2020\)](#) using data from [Rosenwaike \(1972\)](#) and other primary sources.

# A Word of Caution

COVID-19 data are provisional

# Epidemiology of COVID-19: Spatial Diffusion

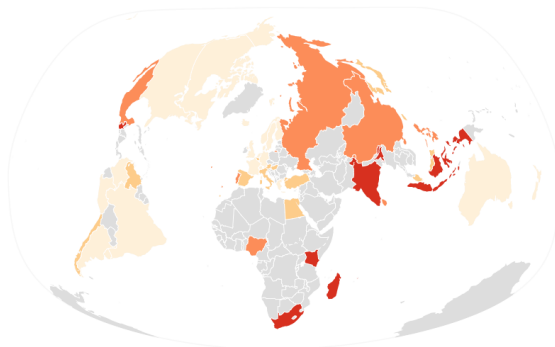
- Very rapid and global diffusion (World Mapper's dynamic cartogram).



# Epidemiology of COVID–19: Spatial Diffusion

- Very rapid and global diffusion (World Mapper's dynamic cartogram).
- Similar patterns in past pandemics: along trade routes, trading centers (Amsterdam, London, Venice. . . ).
- Most common with worldwide spread of 1918–1919 Influenza.

# Epidemiology of COVID–19: Spatial Diffusion



basemap from Natural Earth (CC0)



Made with Khartis

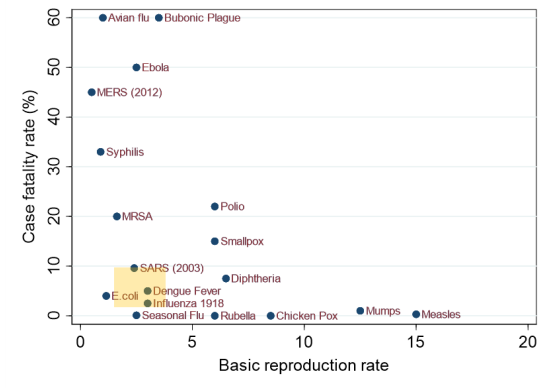
## Worldwide Spread of 1918–1919 Influenza Pandemic

Data for 48 countries from [Barro, Ursua, and Weng \(2020\)](#).

# Epidemiology of COVID-19: Rate of Transmission

- Basic reproductive rate ( $R_0$ ): average number of secondary infections produced by a typical case in a population where everyone is susceptible.
- Estimates: 1.8–3.6, though debated. [Petersen et al. \(2020\)](#)
- Comparable to 1918 Influenza, yellow fever, or SARS:  $\sim 3$ .
- Much lower than measles, with  $R_0$  of above 10.

# Epidemiology of COVID-19: Rate of Transmission



Basic Reproduction Rates and Case Fatality Rates Across Epidemics

Data from [Arthi and Parman \(2020\)](#).

# Epidemiology of COVID-19: Severity

- Measuring COVID-19 severity while unfolding is challenging:
  - Case fatality rate: death from COVID / diagnosed cases of COVID.
  - Crude mortality rate: death from COVID / total population.
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- Much lower than Ebola, or smallpox.

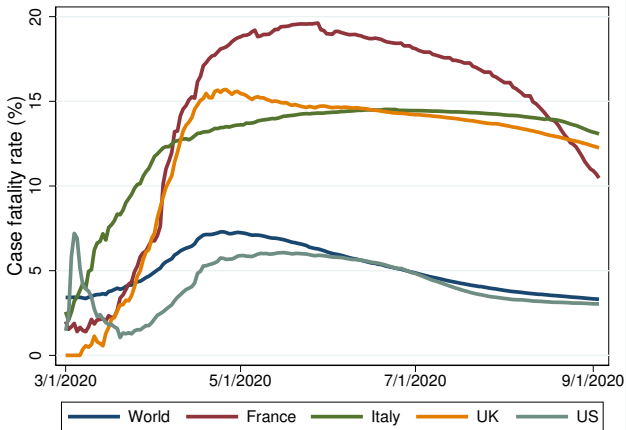
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⇒ Initial spread, transmission, severity comparable to Influenza.



# Epidemiology of COVID-19: Rate of Transmission

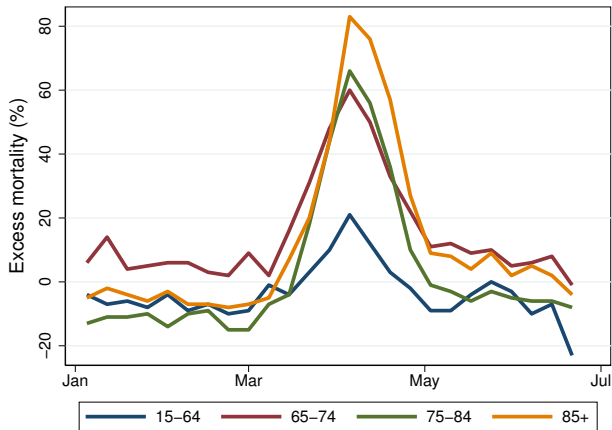


Case Fatality Rates

Data from [ECDC](#) and [ourworldindata.org](#).

# Demographic and Distributional Effects

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Excess Mortality in 2020 vs 2015–2019 by Age in France

Data from [ECDC](#) and [ourworldindata.org](#).

# Demographic and Distributional Effects

- Old age and worse baseline health.

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- Low SES: compounded risks.
  - High contact jobs, continuing during pandemic.
  - Likely low-paying jobs, more likely women and minorities.
  - Differential access to healthcare.

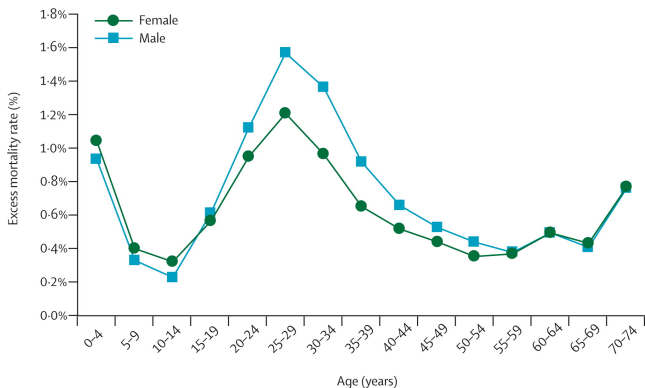
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  - Differential access to healthcare.
- Low SES more affected during Influenza (more later).
- Difference with Influenza: W shape in age susceptibility.

# Demographic and Distributional Effects



Median Excess Mortality Rate by Age and Sex (13 countries).

Figure from Murray et al. (2006)



- Absent of cure and limited medical capacities:  
⇒ Widespread non-pharmaceutical interventions (NPIs).

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  - ⇒ Widespread non-pharmaceutical interventions (NPIs).
    - Shutdowns
    - Travel restrictions
    - Quarantines
    - Social distancing
    - Mask wearing
- Open, linked, updated dataset [Desvars-Larrive et al. \(2020\) \*Sci Data\*](#)

- Absent of cure and limited medical capacities:
  - ⇒ Widespread non-pharmaceutical interventions (NPIs).
    - Shutdowns
    - Travel restrictions
    - Quarantines
    - Social distancing
    - Mask wearing
- Open, linked, updated dataset [Desvars-Larrive et al. \(2020\) \*Sci Data\*](#)
- Quarantines very common in the past, some NPI during Influenza.
- Generally not as stringent and generalized as today.

# Lessons from the Influenza Pandemic of 1918–1919

# The 1918 Influenza Pandemic

- Key features:
  - Brief: Spring 1918–early 1919 (last wave in 1920 in some countries).
  - Worldwide diffusion (with substantial variation).
  - Severe fatalities: 20–50M deaths.
  - Some countries implemented NPIs.

# The 1918 Influenza Pandemic

- Key features:
  - Brief: Spring 1918–early 1919 (last wave in 1920 in some countries).
  - Worldwide diffusion (with substantial variation).
  - Severe fatalities: 20–50M deaths.
  - Some countries implemented NPIs.
- Useful to think about some potential consequences of COVID–19.
  - Short-run health and economic consequences.
  - Medium-run economic effects of NPIs.
  - Long-run health consequences.

# Key Empirical Issues

- Measurement of mortality.
  - Limited capacities for classification.
  - Political pressure and timely information in wartime.
    - ⇒ Scholars rely on excess mortality from all causes.

# Key Empirical Issues

- Measurement of mortality.
  - Limited capacities for classification.
  - Political pressure and timely information in wartime.  
⇒ Scholars rely on excess mortality from all causes.
- Simultaneity of WWI (e.g., France).
  - 180k civilians, 30k soldiers. [Darmon \(2000\)](#) [Guenel \(2004\)](#)
  - Civilian fatalities: 74 départements (*Statistique Sanitaire de la France*)
  - Military fatalities: no disaggregation (*Statistique Médicale*).
  - No correlation with military death rates. [Boehnke and Gay \(2020\)](#)



# What Explains Distribution of Influenza Fatalities?

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Clay, Lewis, and Severnini (2019a)

- Focus on U.S. case: better data, no WWI on soil.
- Total death toll: 600–700k in 1918.
- Spread from WWI bases and through troops movements.
- Evidence from the 438 cities  $>10k$  residents (1915–1925).

# What Explains Distribution of Influenza Fatalities?

- Measuring influenza mortality:
  - Predict 1918 mortality using city linear trend over 1915–1925.

$$M_{ct} = \alpha_c + \beta_c t + \varepsilon_{ct}$$

- $\alpha_c$ : city-specific intercept;  $\beta_c$ : city-specific trend; 1918 excluded.
- Excess mortality:  $M_{c1918} - \hat{M}_{c1918}$

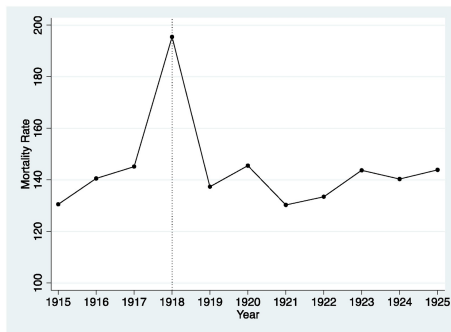
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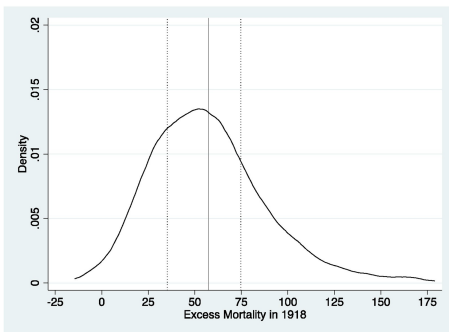
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- $\alpha_c$ : city-specific intercept;  $\beta_c$ : city-specific trend; 1918 excluded.
  - Excess mortality:  $M_{c1918} - \hat{M}_{c1918}$
- Similar results if predict 1918 with 1915–1917 data.

# What Explains Distribution of Influenza Fatalities?



(a) Mortality, 1915-1925



(b) Excess Mortality in 1918

## All-age Mortality Across U.S. Cities

Figure from [Clay, Lewis, and Severini \(2019a\)](#)

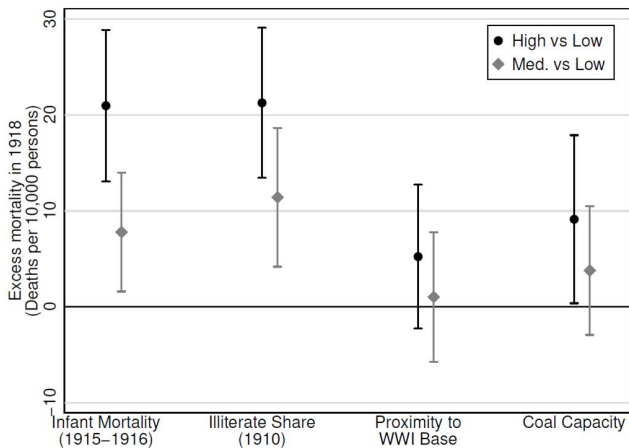
# What Explains Distribution of Influenza Fatalities?

- Pre-pandemic city-level characteristics analyzed:
  - Health conditions: infant mortality (1915–1916).
  - Economic conditions: illiteracy rate (1910).
  - Timing of pandemic: proximity to WWI base.
  - Environmental pollution: coal-fired electricity capacity.

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  - Economic conditions: illiteracy rate (1910).
  - Timing of pandemic: proximity to WWI base.
  - Environmental pollution: coal-fired electricity capacity.
- Regress excess mortality on these characteristics + share of urban population through a multivariate regression.

# What Explains Distribution of Influenza Fatalities?



Determinants of Excess Mortality in 1918

Figure from [Beach, Clay, and Saavedra \(2020\)](#) using estimates from [Clay, Lewis, and Severini \(2019\)](#)



# What Explains Distribution of Influenza Fatalities?

- Influenza more deadly in locations with worse baseline:
    - Health environment [Acuna-Soto, Vibond, and Chowell \(2011\)](#) [Bootsma and Ferguson \(2007\)](#)
    - Overall income [Grantz et al. \(2016\)](#) [Tuckel et al. \(2016\)](#)
    - Air quality [Clay, Lewis, and Severini \(2019b\)](#)
- ⇒ Aggravated pre-pandemic socioeconomic disparities.

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    - Air quality [Clay, Lewis, and Severini \(2019b\)](#)
- ⇒ Aggravated pre-pandemic socioeconomic disparities.
- Some issues:
    - Mostly focus on U.S. case.
    - Few individual-level studies.

# What Were the Economic Effects of Influenza?

# What Were the Economic Effects of Influenza?

- Short-run macroeconomic effects [Barro, Ursua, and Weng \(2020\)](#)
  - Panel 43 countries (1901–1929). Flu death rates  $\simeq 2\%$
  - Did flu deaths (and war deaths) generated differential changes across countries in rates of economic growth?
  - $\uparrow 1\text{pp flu death rates} \implies \downarrow 3\% \text{ real GDP per K.}$
  - In aggregate: pandemic  $\implies \downarrow 6\% \text{ real GDP per K.}$

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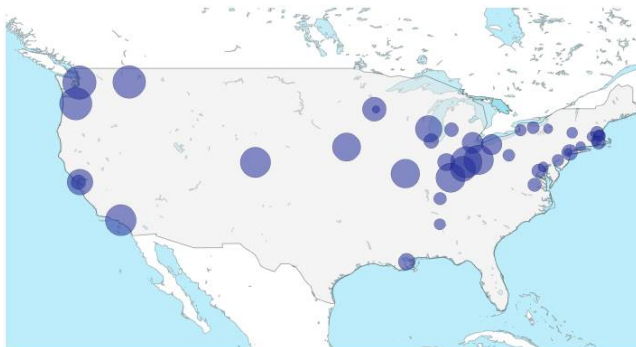
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  - In aggregate: pandemic  $\implies \downarrow 6\% \text{ real GDP per K.}$
- Medium-run economic effects (within-country analyzes):
  - Italy:  $\downarrow 6.5\% \text{ real GDP}$ , recover by 1922. [Carillo and Jappelli \(2020\)](#)
  - Denmark: short-lived  $\downarrow$  income growth. [Dahl et al. \(2020\)](#)
  - Complicated by WWI deaths and war production (esp. in U.S.).

# What Were the Economic Effects of NPIs?

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- U.S. cities implemented non-pharmaceutical interventions (NPIs).  
Markel et al. (2007)
  - NPIs: school closures, quarantines, bans on public assemblies.
  - Information for 43 cities with weekly influenza fatalities data.
  - *NPI Intensity*: cumulative number of days with each NPI.
  - More intensive toward the West.

# What Were the Economic Effects of NPIs?



NPI Intensity Across 43 U.S. Cities

Figure from [Correia, Luck, and Verner \(2020\)](#) using data from [Markel et al. \(2007\)](#)



# What Were the Economic Effects of NPIs?

Correia, Luck, and Verner (2020)

- Health effects:
  - NPIs flattened the mortality curve.
  - High NPI cities: 45% ↓ in peak mortality relative to the mean.
- Is there a trade-off between economic and health effects?
  - Positive effects: mitigates transmission and lowers mortality.
  - Negative effects: short-run economic disruptions while in place.

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- Is there a trade-off between economic and health effects?
  - Positive effects: mitigates transmission and lowers mortality.
  - Negative effects: short-run economic disruptions while in place.
- Impact of NPIs on city-level economic activity.
  - Manufacturing employment (1904, 1909, 1914, 1919–1927).
  - Total national bank assets (1910–1925, annual frequency).

# What Were the Economic Effects of NPIs?

- Dynamic difference-in-differences specification:

$$Y_{ct} = \alpha_c + \tau_t + \sum_{j \neq 1914} \beta_j NPI_c \mathbb{1}_{j=t} + \sum_{j \neq 1914} X_c \gamma_j \mathbb{1}_{j=t} + \varepsilon_{ct}$$

- $\alpha_c$ : city FE;  $\tau_t$ : year FE.
- $X_c$ : city-level pre-pandemic population and employment controls.

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- $\alpha_c$ : city FE;  $\tau_t$ : year FE.
- $X_c$ : city-level pre-pandemic population and employment controls.
- Control for pre-treatment differences which relationship with outcomes might have changed over time.
- Faster growing cities (West) were more likely to implement NPIs.

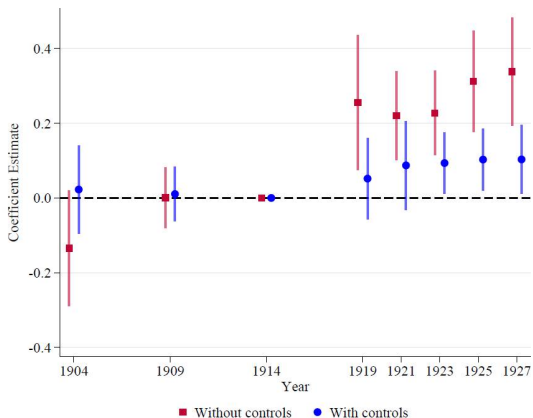
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- Control for pre-treatment differences which relationship with outcomes might have changed over time.
- Faster growing cities (West) were more likely to implement NPIs.
- Discussions of pre-trends: [Lilley et al. \(2020\)](#) [Correia et al. \(2020\)](#)

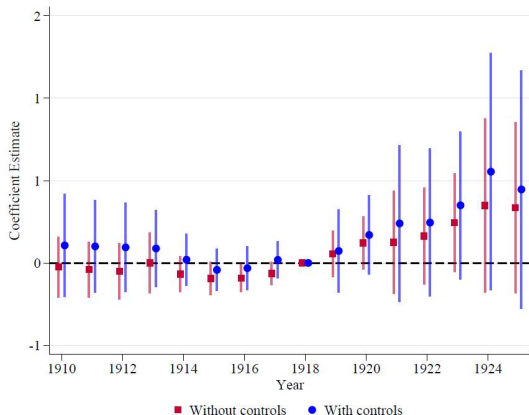
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NPI Intensity and log manufacturing employment

Figure from [Correia, Luck, and Verner \(2020\)](#)

# What Were the Economic Effects of NPIs?



NPI Intensity and log national bank assets

Figure from [Correia, Luck, and Verner \(2020\)](#)

# What Were the Economic Effects of NPIs?

- Little evidence for negative economic effects of NPIs.
- NPIs did not disrupt economic activities (no business closures).
- If anything, positive effects: through mitigating pandemics?
- Highly dependent on context e.g., deadly to prime-age workers.



# Were There Scarring Effects of Influenza?

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Almond (2006)

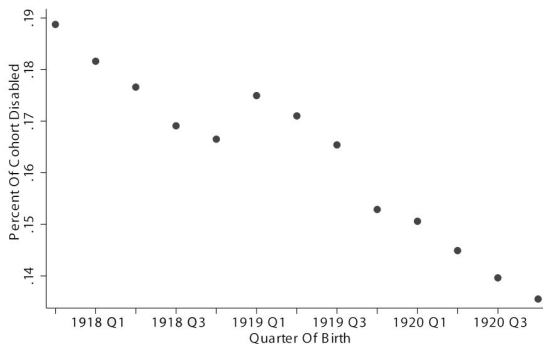
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- Socioeconomic outcomes in 1960–1980 depending on birth quarter.

# Were There Scarring Effects of Influenza?

Almond (2006)

- Long-run scarring effects through in utero exposure (“fetal origins”)?
- Socioeconomic outcomes in 1960–1980 depending on birth quarter.
- Long-lasting compared to adjacent cohorts:
  - Disability rates.
  - Human capital accumulation.
  - Income level.

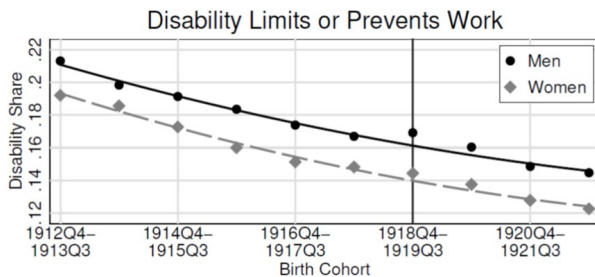
# Were There Scarring Effects of Influenza?



1980 Male Disability Rates by Quarter of Birth

Figure from [Almond \(2006\)](#)

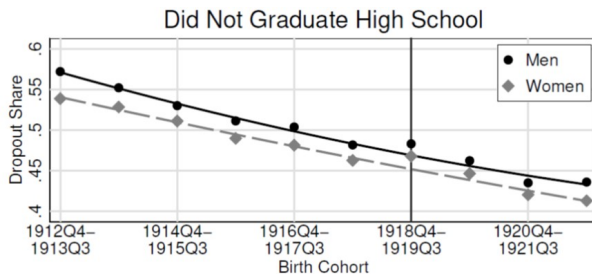
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1970 Disability Rates by Year of Birth

Figure from Beach, Clay, and Saavedra (2020) using results from Almond (2006)

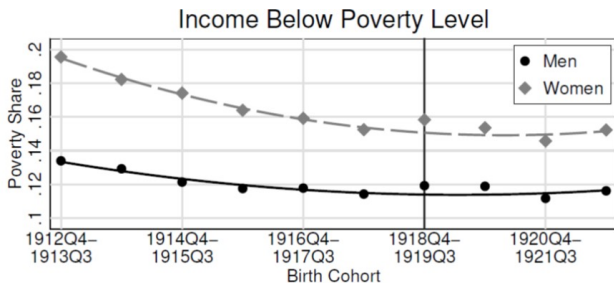
# Were There Scarring Effects of Influenza?



1970 High School Dropout Rates by Year of Birth

Figure from [Beach, Clay, and Saavedra \(2020\)](#) using results from [Almond \(2006\)](#)

# Were There Scarring Effects of Influenza?



1970 Poverty Rates by Year of Birth

Figure from [Beach, Clay, and Saavedra \(2020\)](#) using results from [Almond \(2006\)](#)

# Were There Scarring Effects of Influenza?

- Causal effect from Influenza exposure?
  - Resources reallocation toward healthier siblings. [Parman \(2015\)](#)
  - WWI veterans + selected  $\implies$  1919 cohort from lower SES. [Brown and Thomas \(2018\)](#)
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  - Most results hold even with linked census data + DiD strategy. [Beach, Ferrie, and Saavedra \(2018\)](#)
- Comparative evidence for Taiwan, Japan, Sweden, Switzerland, Brazil. [Lin and Liu \(2014\)](#) [Ogasawara \(2017\)](#) [Helgeretz and Bengtsson \(2019\)](#) [Neelsen and Stratmann \(2012\)](#) [Guimbeau et al. \(2020\)](#)

# Other Influenza Effects

- Fertility:
  - Drop in fertility during, baby boom after (e.g., Norway, Sweden).  
Mamelund (2004) Boberg-Fazlic et al (2017)
  - WWI as confounding factor.  
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- Migration
  - Increased internal mobility (e.g., India)? [Donaldson Keniston \(2016\)](#)

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⇒ For economic effects, the Great Depression more useful.

# Lessons from Great Depression of the 1930s

# Scarring Effects of the Great Depression?



## The Great Depression in the U.S.

Figure from [Moulton \(2017\)](#). Lebergott vs Darby: workers in government sponsored work programs considered unemployed.

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- Long-run scarring effects through in utero exposure to negative income shocks in Great Depression. [Fishback and Thomasson \(2014\)](#)
- Labor market entry scarring. [Moulton \(2017\)](#)
  - Assess long-term impact of entering labor market in 1929–1930.
  - Cohorts 1911–1920.
  - RDD: compare entering before/after 1930 of 8th graders.
  - Running variable: birth year with cutoff = 1916 assuming entry at 14.
  - Outcome: income in 1940 census.

# Scarring Effects of the Great Depression?

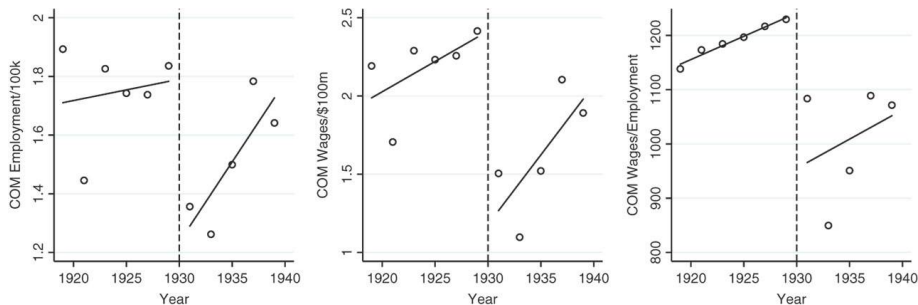
- RD specification:

$$Y_{isc} = \alpha + \beta_1 D_{isc} + \beta_2 \text{dist}_{1916}_{isc} + \beta_3 \text{dist}_{1916}_{isc} \times D_{isc} + BPL_s + \varepsilon_{isc}$$

- $D_{isc}$ :  $\mathbb{1}(\text{birth\_year}_{isc} \geq 1916)$ .
- $\text{dist}_{1916}_{isc}$ :  $\text{birth\_year}_{isc} - 1916$ .
- $BPL_s$ : birth state FE.
- $\beta_1$ : discontinuity of entering labor market in 1929 vs 1930.
- $\beta_2$ : trend in relationship between  $Y$  and birth year.
- $\beta_3$ : differences in trends across cutoff.



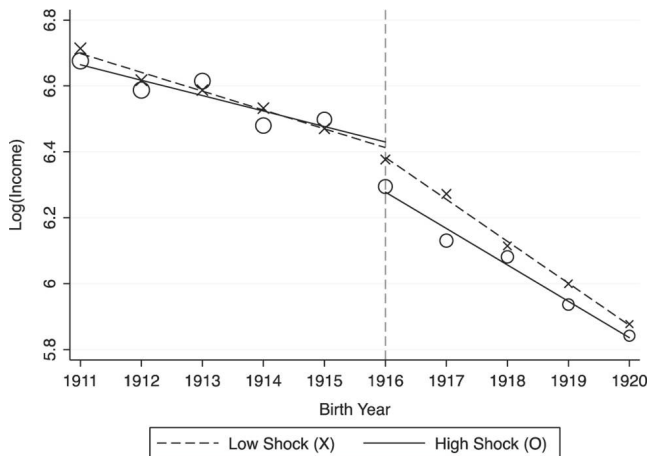
# Scarring Effects of the Great Depression?



Discontinuity in labor market conditions

Figure from [Moulton \(2017\)](#).

# Scarring Effects of the Great Depression?



Regression discontinuity of log(income).

Figure from Moulton (2017).

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  - Different to today.

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- Earnings penalties (15%) for less-educated in high shock states.
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  - Little evidence of differences in educational attainment.
  - Different to today.
- Occupational and residential displacement of younger cohorts.  
[Arthi, Eriksson, and Richardson \(2020\)](#)
- Small silver-lining: move to later dynamic sectors.

# Scarring Effects of the Great Recession?

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- Another historical case: 2007–2012 Great Recession.
- No long-run perspective, but some evidence (US). [Rothstein \(2020\)](#)
  - 2009–2015 entrants have 2–3% lower employment rates compared to pre-crisis entrants.
  - Only 2009 entrants have lower earnings (2%).
  - Employment scarring permanent, wage scarring temporary.
  - Employment break for entrants began in 2005.

⇒ If health-economy trade-off, especially acute in current context.

# Conclusion



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- More historical evidence needed:
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  - Long-lasting scarring effects.
- More historical evidence needed:
  - Original features of COVID-19: combines health and economic crises.  
⇒ How will these interact?
  - Scarring effects for young children (school closures, distancing, masks)?
  - Consequences for gender inequality, esp. working mothers?

Thank you for your attention!

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