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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.
 - Office: T.458.
 - Website: 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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⇒ Critical juncture.

- Economic history can some provide guidance.

Does the past have useful economics?

More Economic Facts

More Economic Facts

- 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

Better Economic Theory

- 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.

- Learn about mechanisms through institutional knowledge.

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- Analyze long-run processes.

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- Answer the big questions.

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⇒ 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

COVID-19 in Historical Perspective

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

⇒ Characterization will generate natural historical counterparts.

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

⇒ Characterization will generate natural historical counterparts.

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

Comparison Set

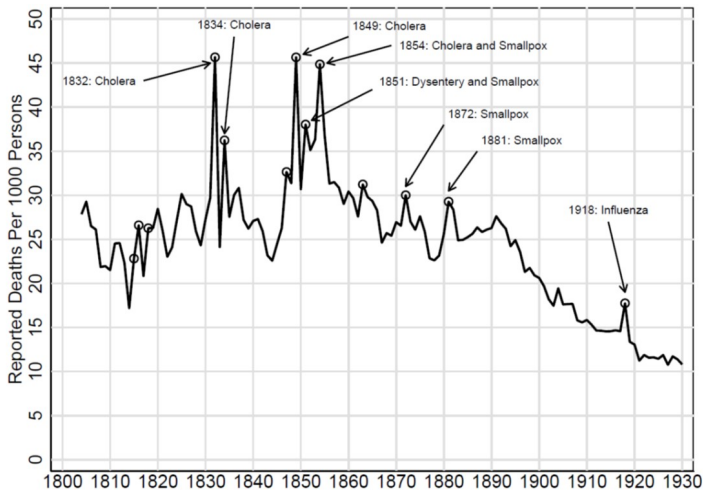
⇒ Epidemic risks were (nearly) part of everyday life.

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

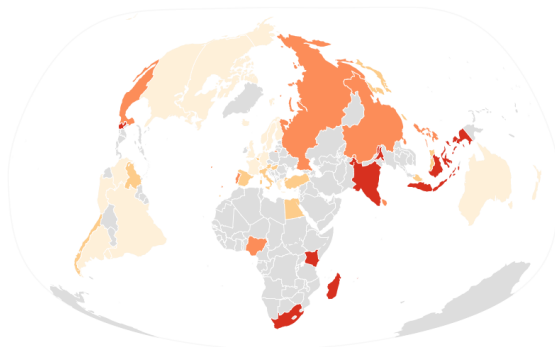
Epidemiology of COVID-19: Spatial Diffusion

- 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

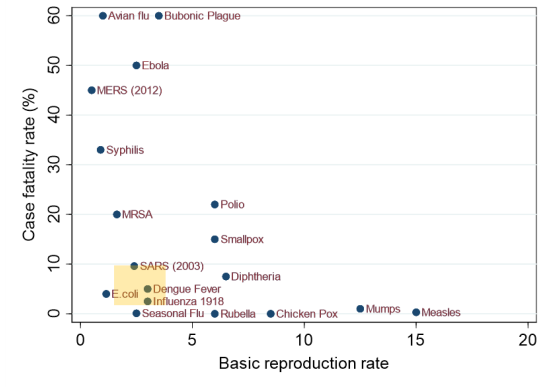
Worldwide Spread of 1918–1919 Influenza Pandemic

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: ~ 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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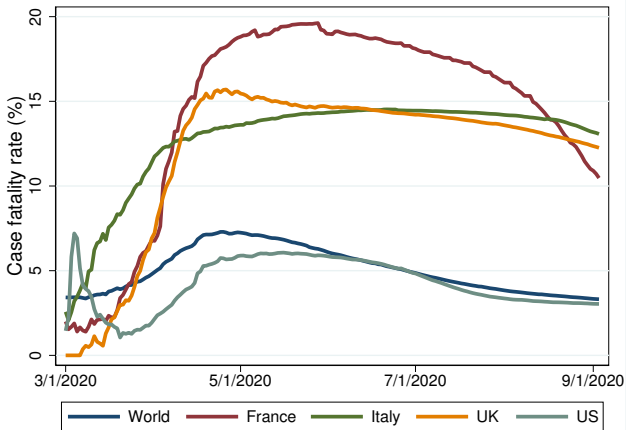
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- Much lower than Ebola, or smallpox.

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- Much lower than Ebola, or smallpox.

⇒ Initial spread, transmission, severity comparable to Influenza.

Epidemiology of COVID-19: Rate of Transmission

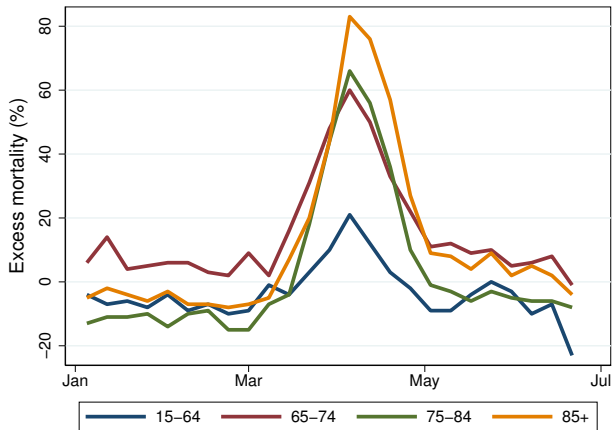


Case Fatality Rates

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

Demographic and Distributional Effects

Demographic and Distributional Effects



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.

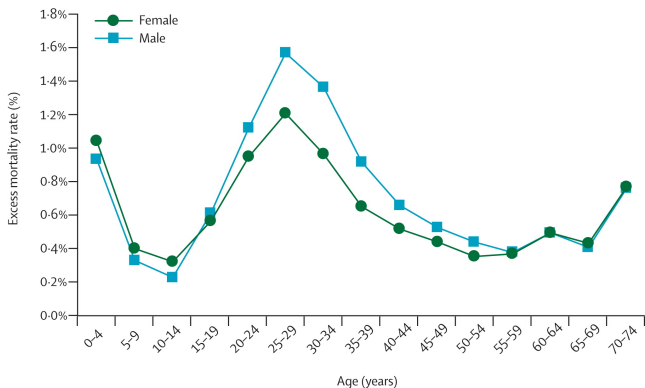
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Demographic and Distributional Effects

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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.
- 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:
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 - 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.

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- 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?

What Explains Distribution of Influenza Fatalities?

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.

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

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

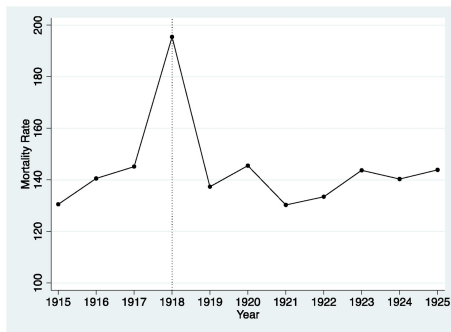
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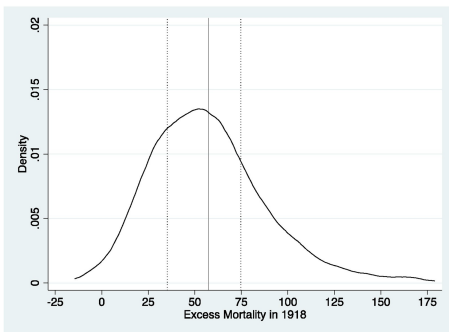
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- α_c : city-specific intercept; β_c : city-specific trend; 1918 excluded.
 - Excess mortality: $M_{c1918} - \hat{M}_{c1918}$
- Similar results if predict 1918 with 1915–1917 data.

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 \(2019a\)](#)

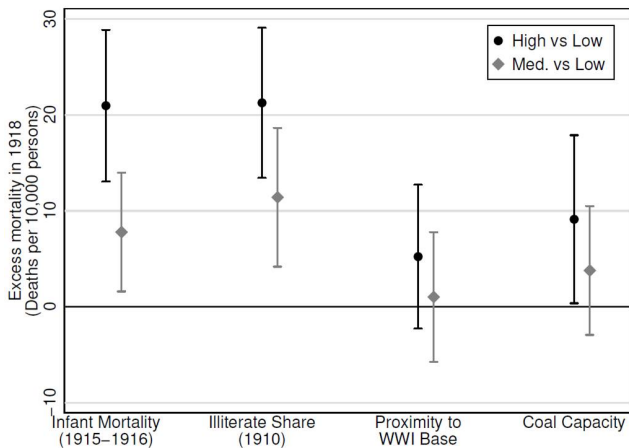
What Explains Distribution of Influenza Fatalities?

- 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.

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.
- 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 Severnini \(2019\)](#)

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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 - Overall income [Grantz et al. \(2016\)](#) [Tuckel et al. \(2016\)](#)
 - 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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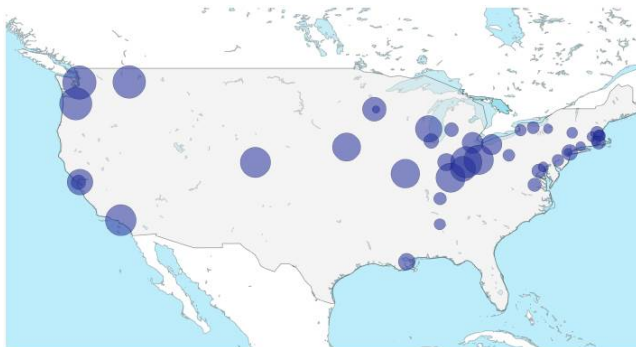
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 - In aggregate: pandemic $\implies \downarrow 6\% \text{ real GDP per K.}$
- Medium-run economic effects (within-country analyzes):
 - Italy: $\downarrow 6.5\% \text{ real GDP}$, recover by 1922. [Carillo and Jappelli \(2020\)](#)
 - Denmark: short-lived \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?

What Were the Economic Effects of NPIs?

- 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:

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

- α_c : city FE; τ_t : year FE.
- X_c : city-level pre-pandemic population and employment controls.

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- α_c : city FE; τ_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.

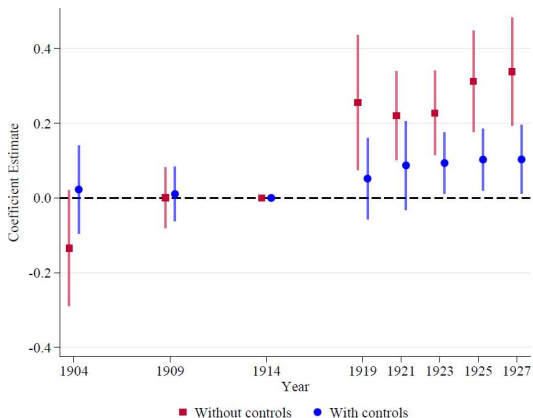
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- Control for pre-treatment differences which relationship with outcomes might have changed over time.
- Faster growing cities (West) were more likely to implement NPIs.
- Discussions of pre-trends: [Lilley et al. \(2020\)](#) [Correia et al. \(2020\)](#)

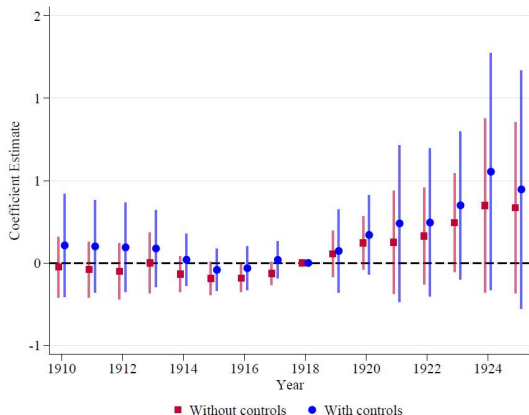
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NPI Intensity and log manufacturing employment

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)

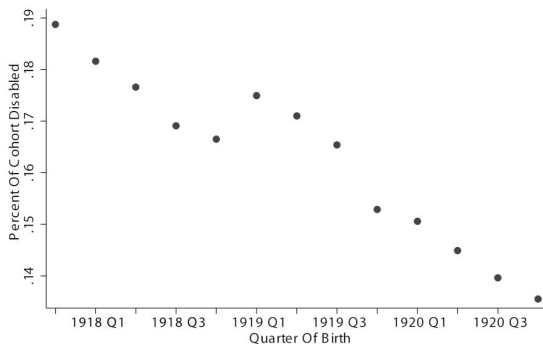
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Were There Scarring Effects of Influenza?

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.

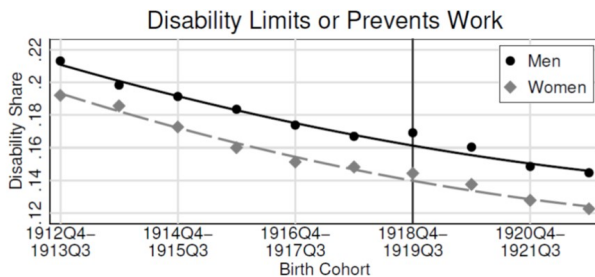
Were There Scarring Effects of Influenza?



1980 Male Disability Rates by Quarter of Birth

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

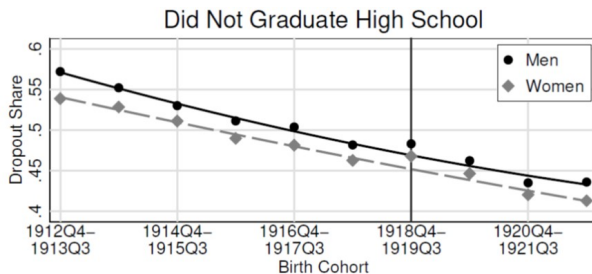
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1970 Disability Rates by Year of Birth

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

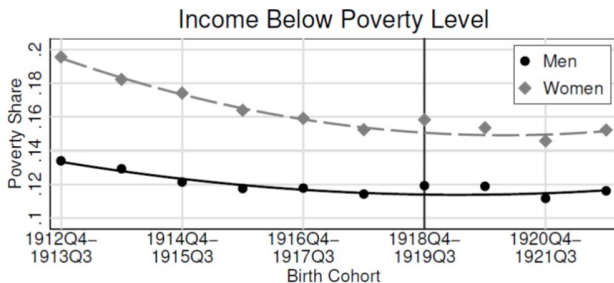
Were There Scarring Effects of Influenza?



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 \(2018\)](#)
 - Most results hold even with linked census data + DiD strategy. [Beach, Ferrie, and Saavedra \(2018\)](#)

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- 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:
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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.

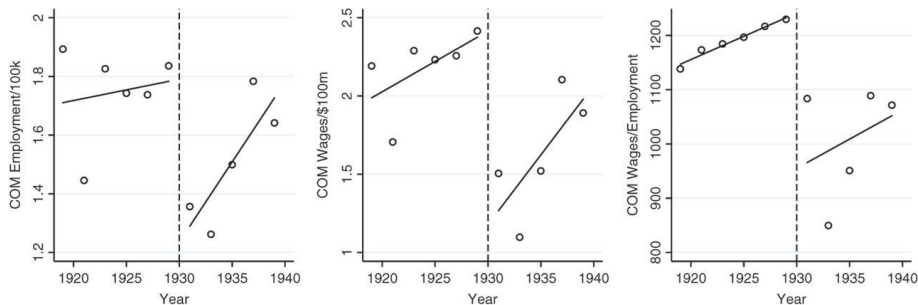
Scarring Effects of the Great Depression?

- 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} : $\mathbb{1}(\text{birth_year}_{isc} \geq 1916)$.
- dist_1916_{isc} : $\text{birth_year}_{isc} - 1916$.
- BPL_s : birth state FE.
- β_1 : discontinuity of entering labor market in 1929 vs 1930.
- β_2 : trend in relationship between Y and birth year.
- β_3 : differences in trends across cutoff.

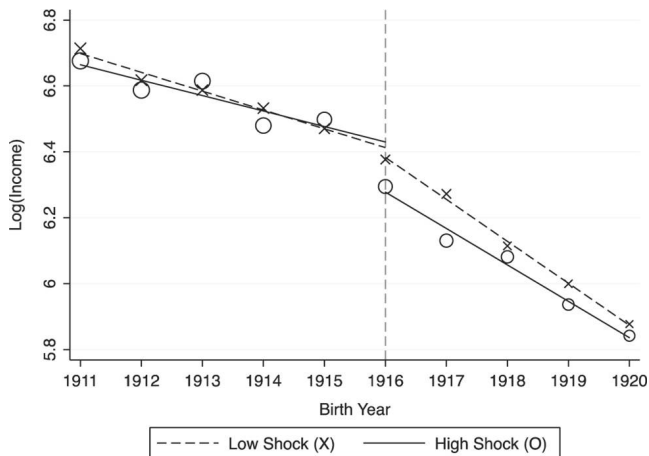
Scarring Effects of the Great Depression?



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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 - Limited options to borrow and prolonging education.
 - 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?

- Another historical case: 2007–2012 Great Recession.

Scarring Effects of the Great Recession?

- 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.

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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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