Epidemics, Pandemics & Income Inequality

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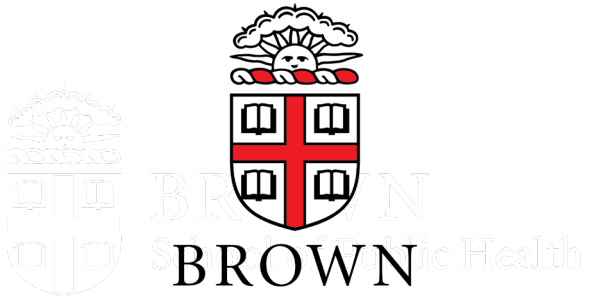
ASSA/AEA Annual Meetings
5 January 2021



Main take-aways

- *How do epidemics and pandemics affect income inequality during the first two decades of the 21st century?* We explore the effect on the Gini coefficient of a dummy variable that indicates the occurrence of an epidemic or a pandemic in a country in a given year

- Panel estimation with country and year fixed effects show that the dummy variable has a statistically significant and positive effect on income inequality

- To address potential endogeneity, we implement a three-stage least-squares (3SLS) technique. The 3SLS estimation still shows that the epidemic indicator has a statistically significant positive effect on income inequality

1. Background

BROWN
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Intuition

- Containment and mitigation measures (i.e., stay-at-home orders, shelter-in-place orders, restrictions on in-person transactions, lockdowns and social distancing) can cause loss of jobs that cannot be done remotely. Many of these jobs are likely to be low-skilled jobs

- On the other hand, many high-skilled jobs can be done remotely in an easier manner. Accordingly, more low-skilled jobs are lost during an epidemic or a pandemic than high-skilled ones. This can cause an increase in income inequality between low-skilled and high-skilled workers

- Other channels: education, technology use, health status (comorbidities), etc.

Methods

- Panel of 191 countries, 2000-18, to examine effect of epidemics & pandemics on income inequality. Several outbreaks of infectious diseases: MERS-Cov, H1N1, SARS, Ebola, etc. We use a dummy variable to indicate the occurrence of an epidemic or a pandemic in a country in a given year. In addition, we use a variable that captures fatality rate (i.e., deaths/cases):

$$Gini_{it} = \alpha + \beta EpiPan_{it-1} + X_{it-1}\gamma + \delta_i + \varepsilon_t + u_{it} \quad (1)$$

- We use country and time fixed effects estimation, as well as three stage least squares (3SLS):

$$\begin{aligned} Gini_{it} &= \alpha + \beta EpiPan_{it-1} + X_{it-1}\gamma + u_{it} \\ EpiPan_{it} &= \lambda + \tau Gini_{it-1} + Z_{it-1}\rho + e_{it} \end{aligned} \quad (2)$$

Data Sources

- World Health Organization (**WHO**) data and statistics used to identify location and time of epidemic or pandemic: e.g., SARS (2002-04), H1N1 (2009), MERS (2012), Ebola (2014-2016), etc.

- **WHO** data is also used for fatality rate: number of deaths caused by the epidemic or pandemic divided by the number of cases of the disease in a country in a given year

- Gini coefficient from: Standardized World Income Inequality (**SWIID**) database, v8. SWIID inequality estimates are based on reported Gini indices from published sources, including the OECD Income Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank, Eurostat, the World Bank's Povcal Net, the UN Economic Commission for Latin America and the Caribbean, national statistical offices, etc.

Income inequality control variables: *X* in Eq. 1

- GDP per capita: Penn World Tables version 8.
- Share of agriculture in labor force, share of agriculture in GDP, tax rate, inflation rate (consumer prices), trade openness: World Development Indicators (World Bank)
- Democracy (quality of political institutions): Polity IV Project, polity2 score captures political regime on a 21-point scale ranging from -10 (strongly autocratic) to +10 (strongly democratic)
- Corruption perception index: Transparency International

Epidemic/pandemic control variables: *Z* in Eq. 2

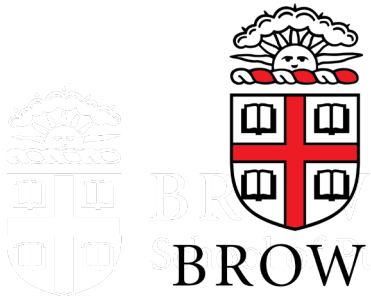
- *EpiPan* main control variables (Z) are: population density, urbanization, democracy and individualism. Identification strategy based on the intuition high level of population density contributes to faster spread of disease causing it to turn into an epidemic

- Population density (number of people per square kilometer of land area); urban population as a percentage of total population: World Development Indicators (World Bank)

- Polity score (as defined earlier)

- Individualism score: Geert Hofstede dataset

2. Results



Variable	Obs	Mean	Std. Dev.	Min	Max
Gini Coefficient	3629	39.52	7.98	22.4	66.2
Epidemic fatality rate	3629	0.558	5.318	0	100
Epidemic dummy	3629	0.049	0.217	0	1
GDP per capita	3648	11,534.14	17,405.60	0	118,824
Democracy	3010	4.016	6.178	-10	10
Agriculture/Labor	3344	28.433	23.45	0.1	92.3
Agriculture/GDP	3553	11.601	11.891	0	79
Tax rate	3344	6.368	4.58	0	32.075
Inflation rate	3533	24.87	1,099.91	-72.7	65,374.10
Population density	3552	215.316	723.722	1.543	7,953.00
Corruption	3629	-0.057	0.99	-1.87	2.47

Table 1: Summary Statistics for 191 countries for 2000-2018.

LAGGED VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Epidemic dummy	3.0228***	2.9961***	3.1936***	2.6321**	2.7827**	2.6815**	2.9062***	2.8180***
	(1.0635)	(1.0701)	(1.1092)	(1.1718)	(1.2199)	(1.2332)	(1.0955)	(1.0716)
Corruption		1.8390	1.8527	4.5834*	5.2815*	4.6194	6.1707**	6.2536**
		(2.5272)	(2.5703)	(2.7445)	(3.0098)	(2.9664)	(2.6764)	(2.6651)
GDP per capita			-0.0003***	-0.0003***	-0.0002***	-0.0003***	-0.0001*	-0.0001*
			(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Democracy				-0.3789	-0.4115	-0.4368	-0.0580	-0.1552
				(0.3047)	(0.3198)	(0.3279)	(0.3231)	(0.3016)
Tax rate					-2.0029***	-2.0819***	-1.0030**	-1.0709**
					(0.4962)	(0.4805)	(0.4570)	(0.4574)
Inflation rate						-0.0207	-0.0187	-0.0154
						(0.0460)	(0.0490)	(0.0498)
Agriculture/Labor							1.4682***	1.5638***
							(0.2264)	(0.2552)
Agriculture/GDP								-0.3179
								(0.2728)
Constant	28.0672***	28.1719***	31.6970***	34.2271***	47.7548***	48.8475***	-3.4017	-1.4782
	(0.0554)	(0.1575)	(0.7836)	(1.5064)	(3.6452)	(3.5783)	(8.2883)	(8.5372)
Observations	3,438	3,438	3,348	2,814	2,661	2,633	2,615	2,615
R-squared	0.0019	0.0025	0.0143	0.0146	0.0422	0.0439	0.1720	0.1766
Number of countries	191	191	191.0	164.0	150	149	148	148

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Effect of epidemics dummy on income inequality (Fixed Effects estimation). Dependent variable is the Gini coefficient.

LAGGED VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Epidemic fatality rate	-0.1076**	-0.1070**	-0.1066**	-0.1040**	-0.0844*	-0.0887*	-0.0596	-0.0595
	(0.0497)	(0.0496)	(0.0493)	(0.0482)	(0.0465)	(0.0472)	(0.0443)	(0.0441)
Corruption		1.8646	1.8762	4.5336	5.2017*	4.5153	6.0865**	6.1711**
		(2.5217)	(2.5693)	(2.7437)	(3.0110)	(2.9676)	(2.6779)	(2.6664)
GDP per capita			-0.0003***	-0.0003***	-0.0002***	-0.0003***	-0.0001*	-0.0001*
			(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Democracy				-0.3591	-0.3957	-0.4212	-0.0459	-0.1445
				(0.3020)	(0.3171)	(0.3252)	(0.3215)	(0.2996)
Tax rate					-1.9911***	-2.0717***	-0.9988**	-1.0675**
					(0.4959)	(0.4801)	(0.4571)	(0.4567)
Inflation rate						-0.0218	-0.0197	-0.0165
						(0.0458)	(0.0488)	(0.0496)
Agriculture/Labor							1.4631***	1.5599***
							(0.2256)	(0.2542)
Agriculture/GDP								-0.3217
								(0.2713)
Constant	28.2880***	28.3924***	31.9094***	34.3211***	47.7845***	48.8954***	-3.1549	-1.2134
	(0.0293)	(0.1445)	(0.7799)	(1.4881)	(3.6335)	(3.5665)	(8.2816)	(8.5275)
Observations	3,438	3,438	3,348	2,814	2,661	2,633	2,615	2,615
R-squared	0.0014	0.0020	0.0136	0.0148	0.0416	0.0436	0.1707	0.1754
Number of countries	191	191	186	159	150	149	148	148

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effect of epidemics fatality rate on income inequality (Fixed Effects estimation). Dependent variable is Gini coefficient.

LAGGED VARIABLES	(1) Gini	(2) Epidemic dummy
Epidemic dummy	5.0408***	
	(1.7455)	
Corruption	5.8816***	
	(0.7195)	
GDP per capita	-0.0002***	
	(0.0000)	
Inflation rate	0.2123***	
	(0.0696)	
Agriculture/GDP	-0.3038***	
	(0.1022)	
Agriculture/Labor	0.1133**	
	(0.0454)	
Democracy	0.0797*	-0.0005
	(0.0441)	(0.0006)
Tax rate	0.4269***	
	(0.0750)	
Gini		0.0002
		(0.0004)
Population density		0.0021
		(0.0063)
Urbanization		0.0004
		(0.0003)
Individualism*Population density		0.0000
		(0.0000)
Constant	32.4885***	0.0181
	(1.6853)	(0.0431)
Observations	1,545	1,545
R-squared	0.1023	0.0034

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

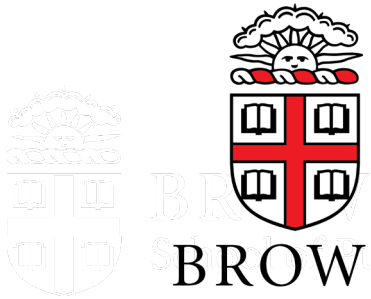
Table 4: Effect of epidemics dummy on income inequality (Three-Stage-Least-Squares).

LAGGED VARIABLES	(1) Gini	(2) Epidemics Fatality
Epidemic fatality rate	7.2131**	
	(3.2685)	
Corruption	5.9606***	
	(0.7203)	
GDP per capita	-0.0002***	
	(0.0000)	
Inflation rate	0.2187***	
	(0.0697)	
Agriculture/GDP	-0.3011***	
	(0.1024)	
Agriculture/labor	0.1112**	
	(0.0454)	
Democracy	0.0775*	0.0002
	(0.0441)	(0.0003)
Tax rate	0.4223***	
	(0.0750)	
Gini		0.0000
		(0.0002)
Population density		-0.0013
		(0.0034)
Urbanization		0.0002
		(0.0002)
Individualism*Population density		-0.0000
		(0.0000)
Constant	32.7690***	0.0051
	(1.6770)	(0.0231)
Observations	1,545	1,545
R-squared	0.1003	0.0013

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Effect of epidemics fatality rate on income inequality (Three-Stage-Least-Squares).

3. Discussion



Country and year fixed effects estimation

- Table 2 shows epidemic/pandemic dummy has a positive effect on income inequality in all specifications. When we include all control variables in column 8, the coefficient is 2.818. This implies that Gini is higher by 2.8 points in the case of the occurrence of an epidemic or a pandemic compared to the case when there are no such health crises.

- Table 3 includes the results using the epidemic and pandemic fatality rate as our variable of interest. Column 1 of table 3 shows the results without control variables. We add the control variables in the subsequent columns. The results show that the fatality rate does not have a significant coefficient when we add all the control variables.

3SLS results

- Tables 4 and 5 show that the epidemic/pandemic dummy has a significant and positive effect on the Gini coefficient

- Coefficient for the epidemics dummy is 5.041. This implies that the Gini is higher by 5.04 points in the case of the occurrence of an epidemic or a pandemic compared to the case when there are no such health crises

- Coefficient of fatality rate is 7.213. This implies that an increase in the fatality rate by one unit increases Gini by 7 points. These results confirm our previous finding that epidemics and pandemics tend to exacerbate income inequality

Thank you!
Comments welcome

Full working paper available at AEA website and also at https://www.york.ac.uk/media/economics/documents/hedg/workingpapers/2020/2022.pdf

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