Lives and Livelihoods: Estimates of the global mortality and poverty effects of the Covid-19 pandemic

Inequality Seminar Series, III, LSE

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Intro

We evaluate the global welfare consequences of increases in mortality and poverty generated by the Covid-19 pandemic.

- Some policy responses imply a trade-off between lives and economic costs.
- Difficulty: joint evaluation of human lives and economic losses.
- Three main approaches
  - ◇ The price of a human life.
    But repugnant + distribution of losses.
  - ◇ Indirect mortality of economic losses.
    But strong assumptions on responses to these losses
    + Great Recession reduced mortality.
  - ◇ Social welfare defined as expected lifetime utility.
    But no parameter directly captures the trade-off
    ⇒ no decent basis for public debate.

Intro

We use an *approximation* of social welfare expressing key trade-off in years of human life (Baland et al, 2020).

- Covid-induced mortality: # lost-years (LY),
- Covid-induced economic losses: # poverty-years (PY),
- Normative parameter α: how many poverty-years are as bad as one lost-year?
  - ◇ **Thought exp.**: How many years of your remaining life would you be willing to spend in poverty in order to increase your lifespan by one year?
- We stay agnostic wrt α but present estimates of LY and PY.

Intro

Questions:

- Estimates of welfare consequences as of June 2020
  - ◇ Relative magnitude of mortality and poverty costs?
  - ◇ Do these magnitudes vary systematically across countries?

- Counterfactual "No-Intervention" scenario
  - ◇ How do estimated welfare costs compare to those of "No-Intervention"?
  - ◇ Does this comparison varies across countries?

Preview of results

As of June, poverty is in most countries the dominant source of welfare costs

- In 2/3 of high-income countries: $\frac{PY}{LY} > 10$, often $\frac{PY}{LY} > 100$
- In most developing countries: $\frac{PY}{LY} > 100$, often $\frac{PY}{LY} > 1000$
- In Belgium: $\frac{PY}{LY} = 3.6$

"No-Intervention" scenario has worse consequences than estimated consequences as of June

- In nearly all high-income countries: $LY^{NI} > 3 * (PY^A + LY^A)$,
- In minority of low-income countries: $LY^{NI} < PY^A + LY^A$.

$\Rightarrow$ No evidence that "the cure has been worse than the disease".

Preview of results

Relative size of LY vs PY varies a lot as a function of GDP

- For given infection rates, LY are several times larger in high-income countries,
  - ◇ Older population pyramid,
  - ◇ Longer residual life expectancy at given age,

- For given (negative) growth, PY are smaller in high-income countries.
  - ◇ Incomes are further away from poverty threshold.

Simple conceptual framework

Individual i's expected future lifetime utility

$$U_i = \sum_{t=2020}^{d_i} u(s_{it}) \qquad \text{where} \qquad s_{it} \in \{NP, P\}.$$

Pandemic potentially affects individual i through

- **Poverty**: for one or more years $t \geq 2020$:
  - $\Delta u_p = u(NP) - u(P)$ is instantaneous utility loss
- **Mortality**: advances the year of her death to $d_i' \leq d_i$
  - $\Delta u_d = u(NP)$ is instantaneous utility loss

The welfare impact of the pandemic $\Delta W = \sum_i (U_i - U_i')$ is a weighed sum:

$$\frac{\Delta W}{\Delta u_p} = \underbrace{\frac{\Delta u_d}{\Delta u_p}}_{\alpha} LY + PY \qquad \text{where} \qquad \alpha > 1.$$

Welfare costs as of June 2020

Subset of countries: Belgium, UK, Sweden, Pakistan, Peru and Philippines.

How do we compute our estimates?

Estimates of LY:

- # Covid-induced deaths by age categories,
- Residual life-expectancy at age of death.

Estimates of PY:

- Covid-induced recession: $GDP_{2020}^{Covid} \neq GDP_{2020}^{No\ Covid}$
- Income distribution in 2019 and national poverty threshold,
- Distribution-neutral recession: $\Rightarrow$ additional # poor.
- Additional poverty lasts only for one year.

Poverty is dominant welfare cost if $\underbrace{\frac{PY}{LY}}_{Break\ even\ \hat{\alpha}} > \alpha$.

Deaths are very concentrated among the old

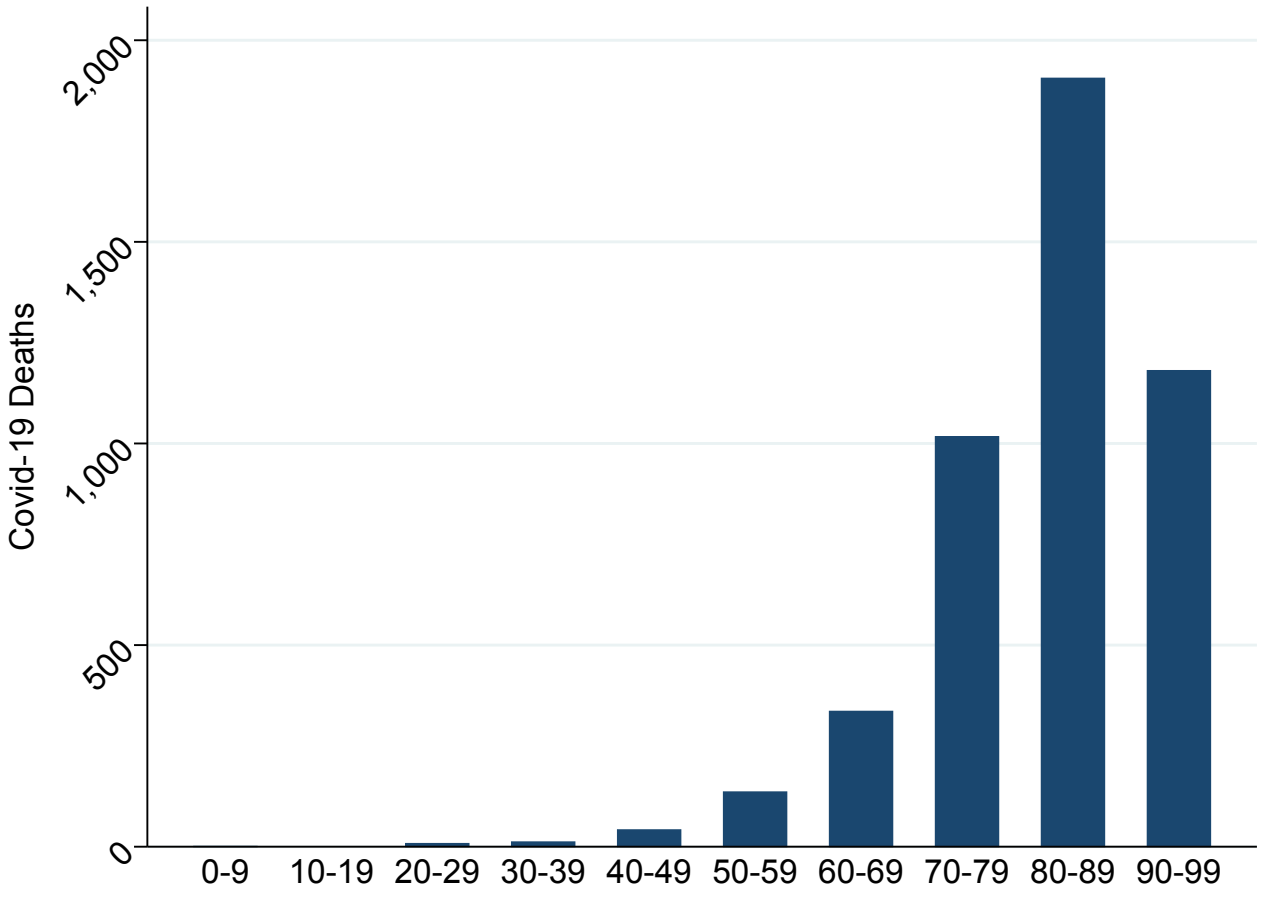


Figure: Distribution of Covid-19 deaths per age in Sweden as of June.

$\Rightarrow$ Ignoring the age distribution of deaths inflates the LY by a factor of 4.5

Current welfare consequences

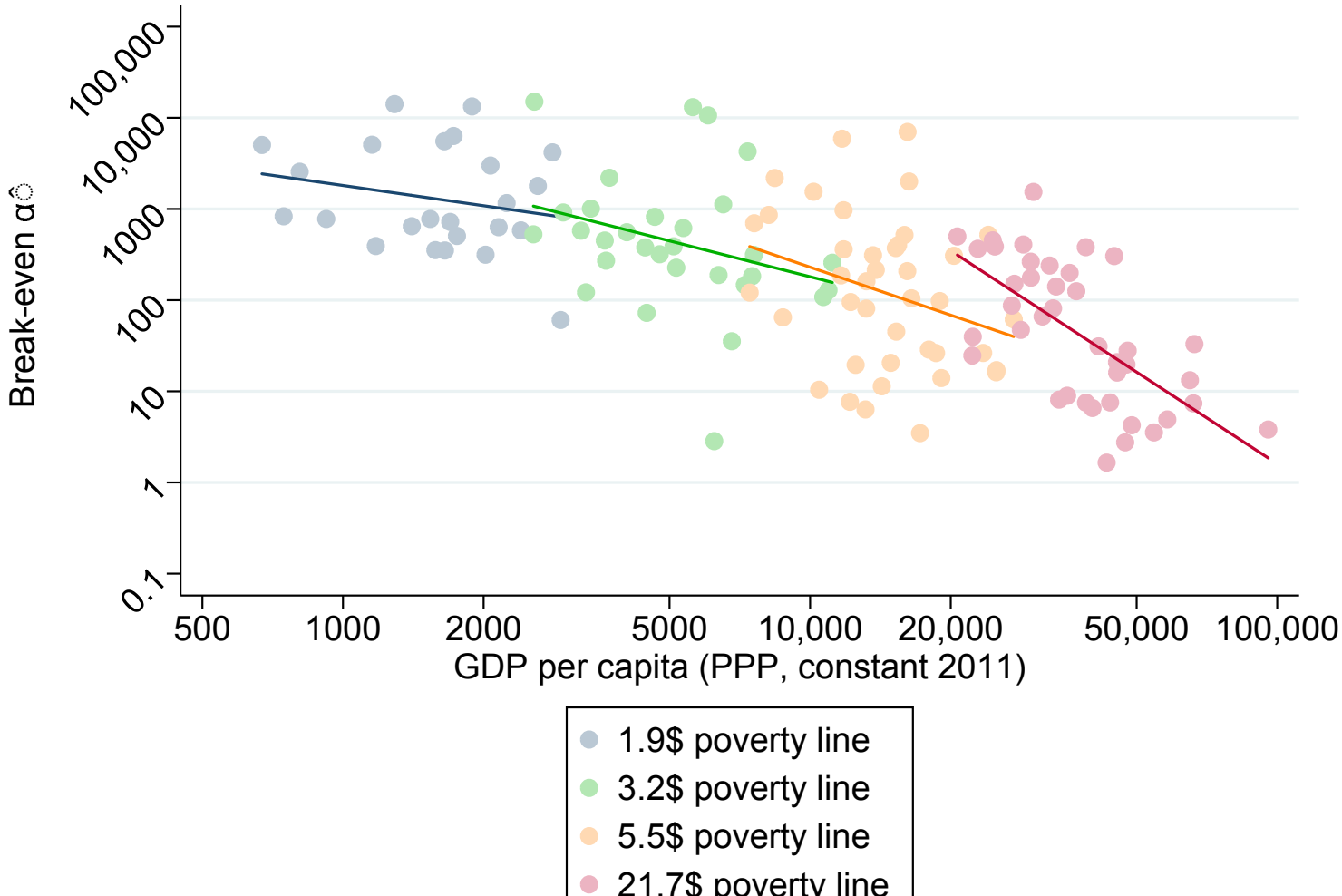
Table 1: Estimation of the pandemic's welfare costs in six countries as of early June 2020 (baseline, distribution-neutral contraction)

	(1) Belgium	(2) Sweden	(3) UK	(4) Pakistan	(5) Peru	(6) Philippines
Economic and demographic characteristics						
GDP p.c. in 2017 (2011 PPP$)	43,133	47,261	40,229	4764	12,517	7580.8
National poverty line (2011 PPP$)	27	28.9	25.8	2.8	5.3	2.6
Population (in millions)	11.59	10.10	67.88	221.0	32.98	109.5
Life expectancy at birth	81.18	82.31	80.78	65.98	80.24	69.51
Age (mean)	41.42	41.14	40.62	25.86	32.53	28.53
Residual life expectancy (mean)	42.01	43.06	42.40	46.25	50.55	44.92
Covid-19 mortality, current scenario						
Number of deaths	9605	4639	48,848	2056	5465	1002
LYs per death	9.467	9.479	10.14	18.46	21.97	16.90
LYs per person	0.00785	0.00435	0.00730	0.000172	0.00364	0.000155
Covid-19 economic shock						
On GDP per capita (in %)	-8.5	-11.5	-14.5	-6.7	-13.1	-8.4
On poverty HC (in million)	0.32	0.41	4.37	7.39	1.58	2.96
On poverty HCR	0.0279	0.0409	0.0644	0.0335	0.0480	0.0270
Break-even $\hat{\alpha}$	3.553	9.383	8.816	194.8	13.20	174.8

Current welfare consequences in the World

Estimates of LY without age-specific mortality:

- # Covid-induced deaths, IFR from China (Verity 2020) & France (Salje 2020)
- Given population pyramid, which infection rate matches # deaths, assuming contamination constant across ages.



No-intervention scenario

Cannot compare mortality in t as countries are at different phases of epidemic.

"No-Intervention" scenario

- Epidemic stops at 80% infection rate (Banerjee 2020).

Estimates of LY: 80% infection rate

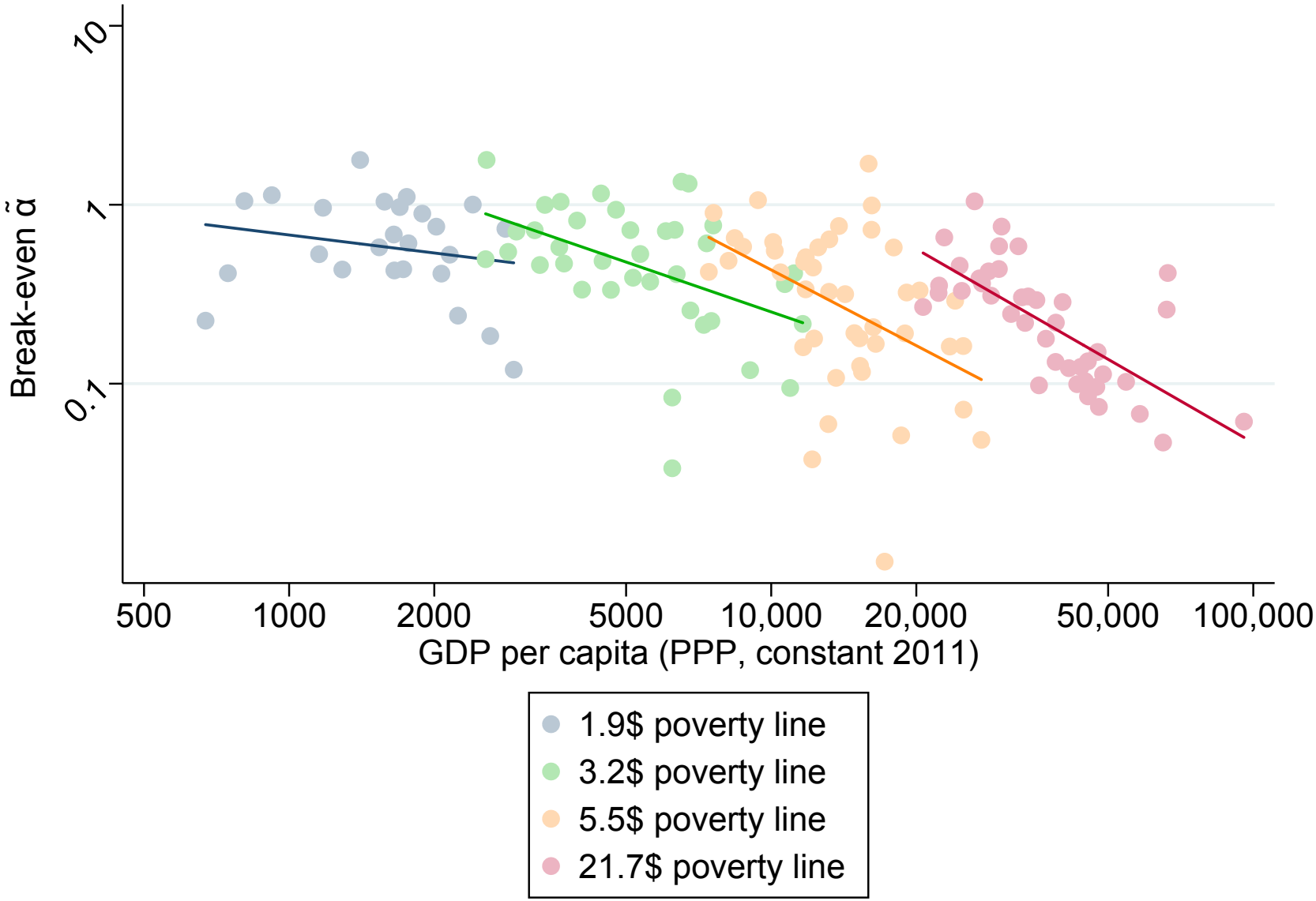
- IFR from China or France
- Two scenarios: hospitals saturated or not
- Differences in LY^{NI} come from
  - ◇ Population pyramids,
  - ◇ Residual life expectancies,
  - ◇ IFRs used (China and France),

Estimates of PY: Assume conservatively $PY^{NI} = 0$ (implausible)

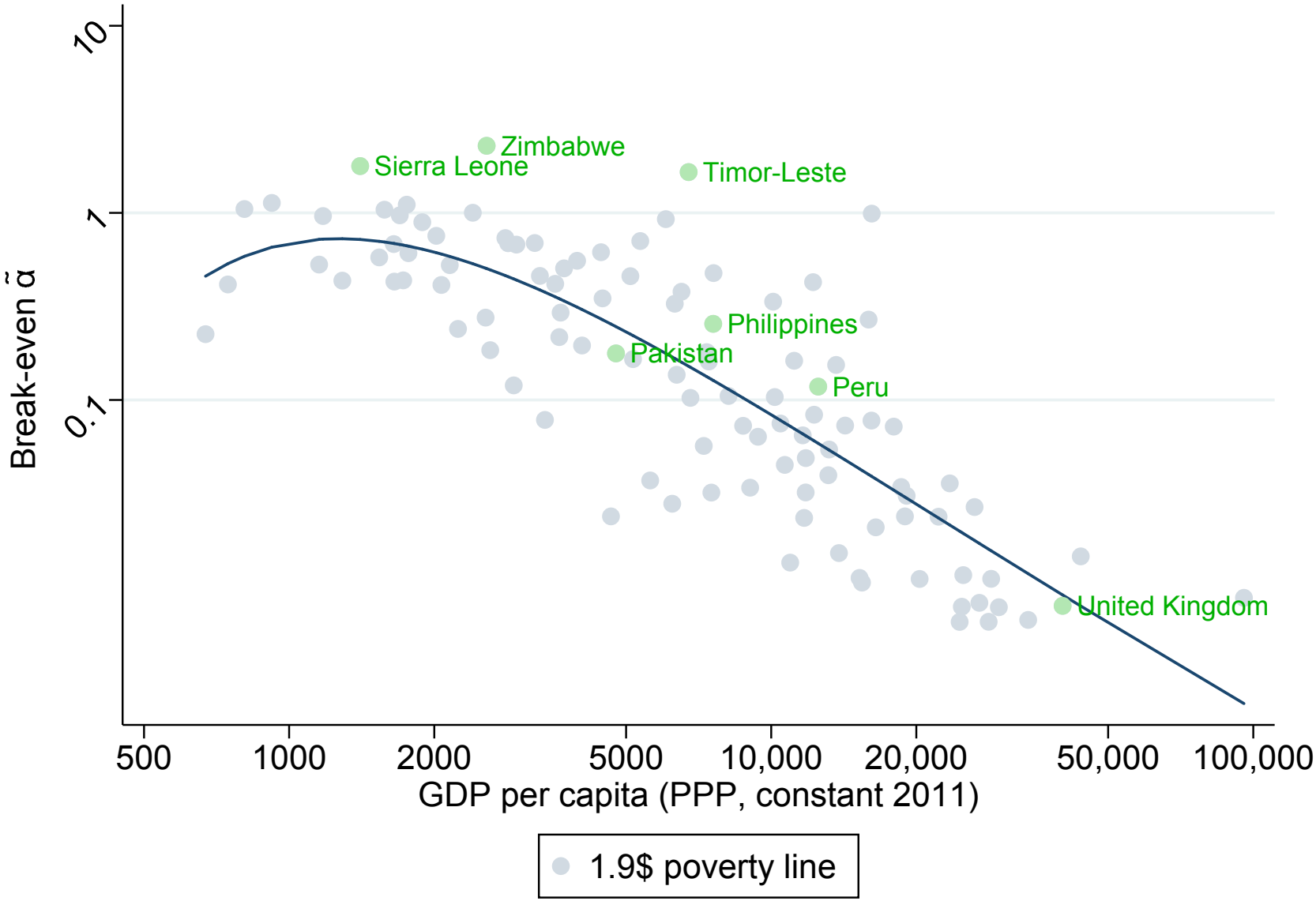
"No-Intervention" has larger welfare costs if $\alpha LY^{NI} > PY^{A} + \alpha LY^{A}$

$$\underbrace{\frac{PY^{A}}{LY^{NI} - LY^{A}}}_{Break\ \ even\ \ \tilde{\alpha}} < \alpha$$

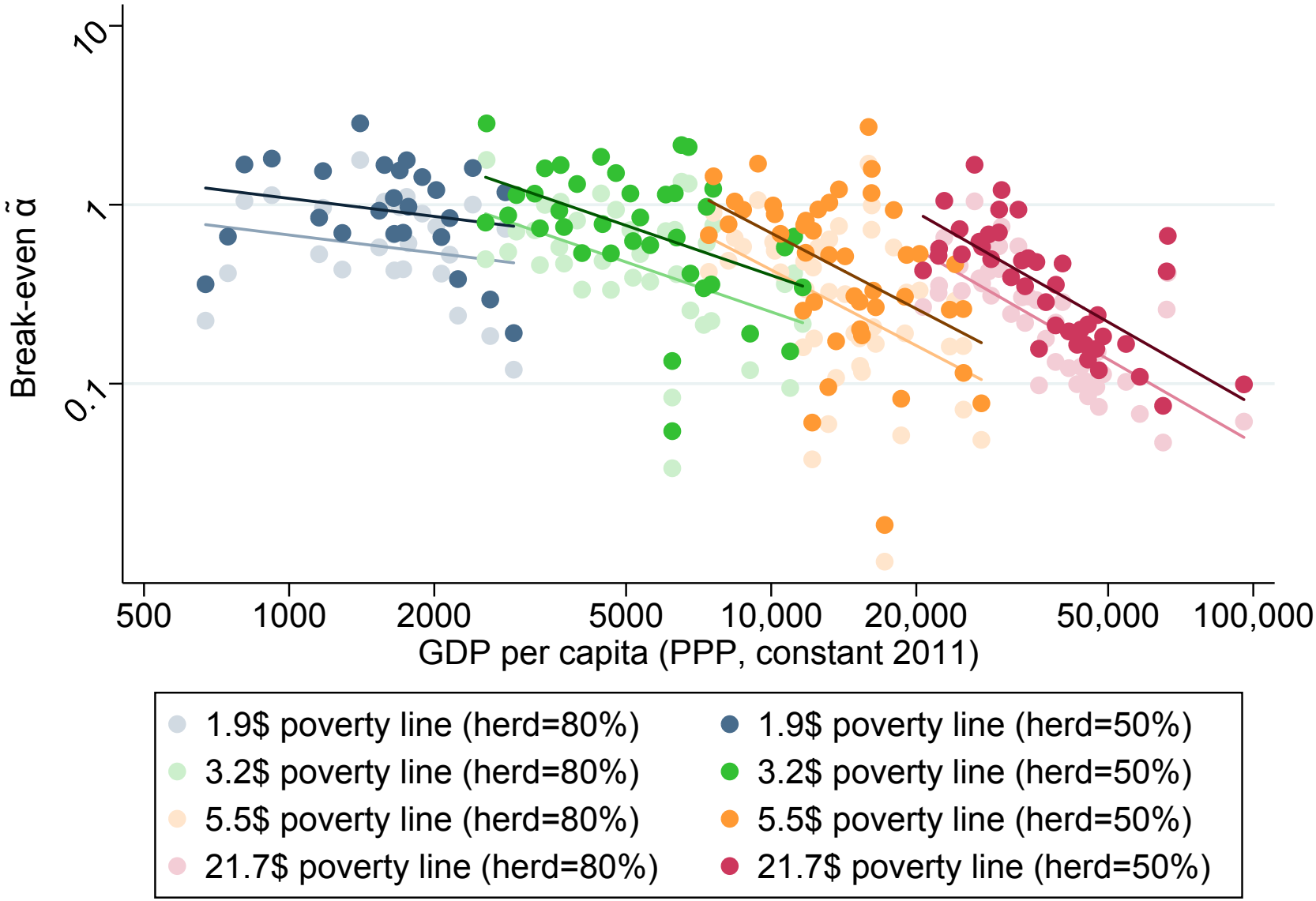
No-Intervention has worse welfare consequences



Clear in rich countries under extreme poverty threshold



Robustness check for 50 % infection rate



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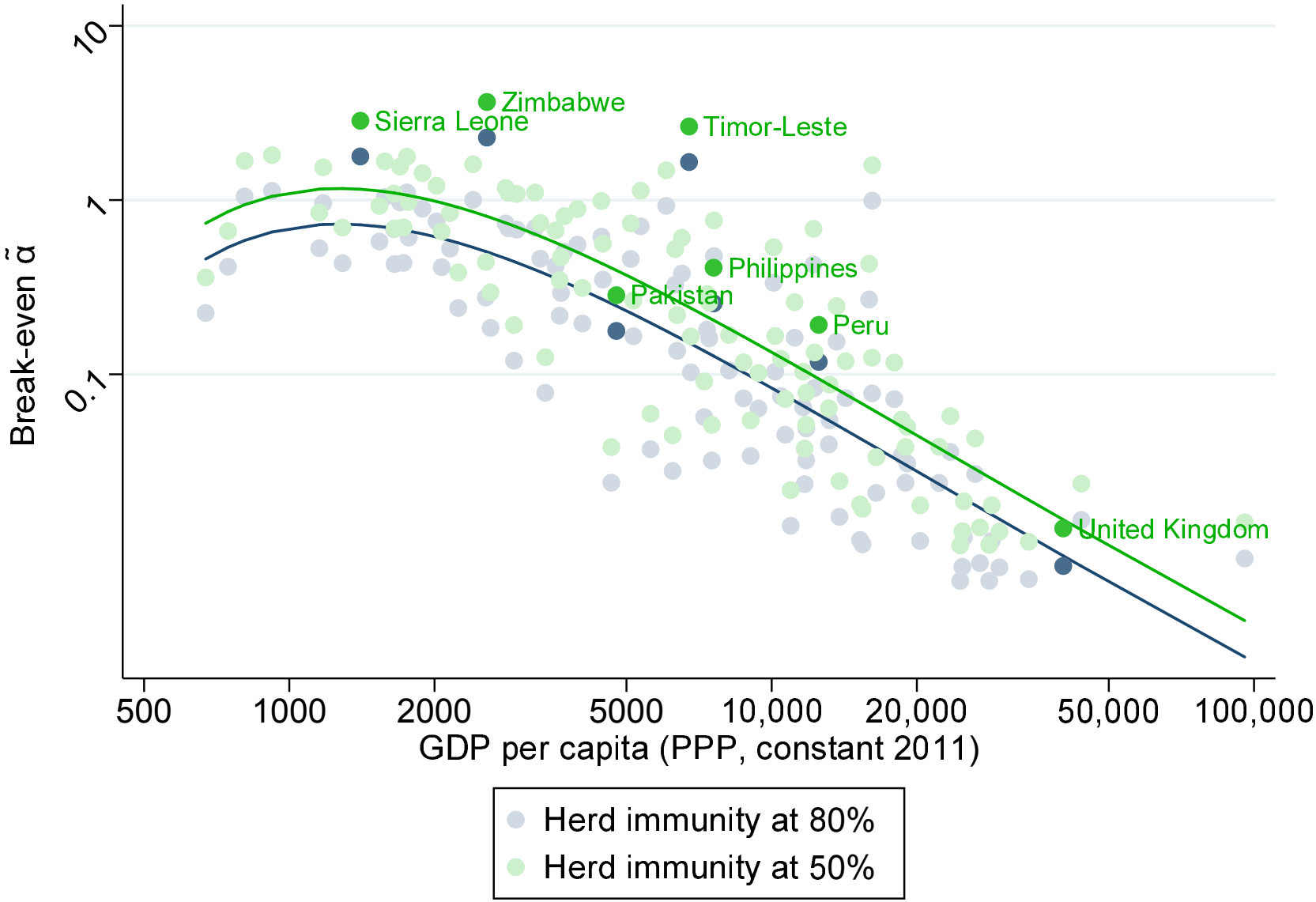

Summary

Estimating the current welfare consequences of the Covid-19 pandemic:

- As of June, poverty is in most countries the dominant source of welfare costs
- Counterfactual "No-Intervention" scenario has worse consequences than consequences as of June,

  $\Rightarrow$ the cure does not seem worse than the disease.
- The more developed a country, the larger are mortality costs and the smaller are poverty costs.

  $\Rightarrow$ Best policy responses might be more targetted towards containing infections in rich countries and towards containing poverty in poor countries.

Estimates of PY and LY

Table 4: Lives and livelihoods - pandemic's aggregate effects on mortality and poverty (Current = early June 2020)

	(1) LIC	(2) LMIC	(3) UMIC	(4) HIC	(5) World
Total number of Covid-19 deaths, in million					
Current scenario	0.000773	0.0171	0.0883	0.290	0.397
No intervention, no saturation	1.015	9.396	14.82	7.387	32.66
No intervention, saturation	1.159	10.23	15.61	13.28	40.32
Total increase in lost-years, in million					
Current scenario	0.0113	0.221	1.204	2.893	4.330
No intervention, no saturation	14.73	121.4	195.9	73.75	406.4
No intervention, saturation	20.59	153.7	227.8	157.9	560.7
Total increase in poverty-years, in million					
Distribution-neutral scenario					
1.9 PPP-$ poverty line	13.74	47.12	6.780	0.235	68.22
WB classification poverty line	13.74	138.7	53.90	28.46	234.8