Growth and Inequality convergence: the role of environmentally related impacts on human capital

Angela Cindy Emefa Mensah Edward B. Barbier

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  - In all, WHO estimates 13.7 million deaths, representing 24 percent of all global deaths, are linked to environmental factors each year (Prüss-Üstün et al. 2016).

Note:

- This paper focus on the number of life years lost due to morbidity and mortality resulting from disease burden due to air pollution from solid fuels and ambient ozone, unsafe water and sanitation, soil and water pollution from chemicals or biological agents, anthropogenic climate change, and ecosystem degradation

- This is generally called environmentally related disability-adjusted life years(DALYs)

- and in this paper, we call it **Environmentally related impact on health (EIH)**

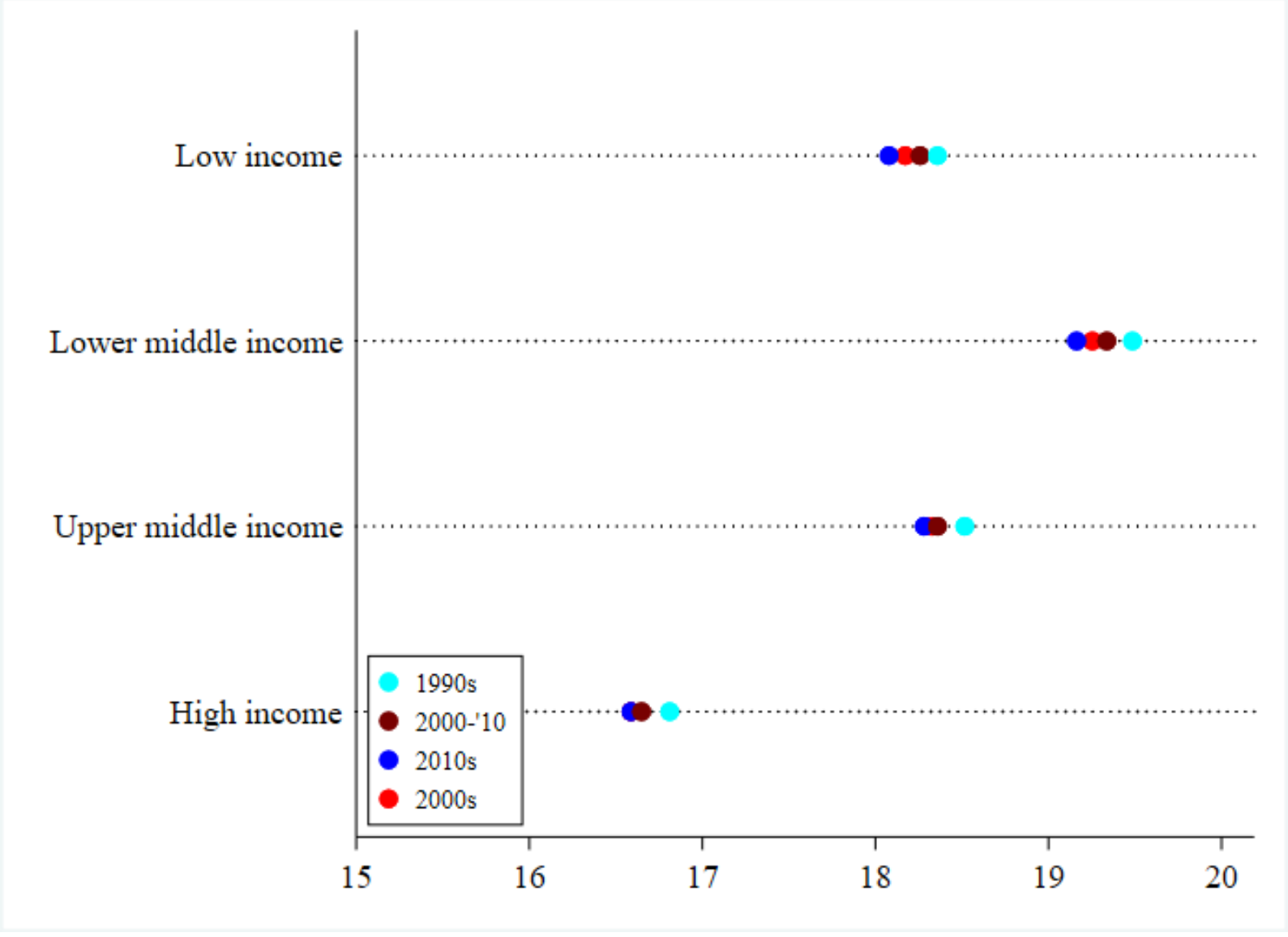
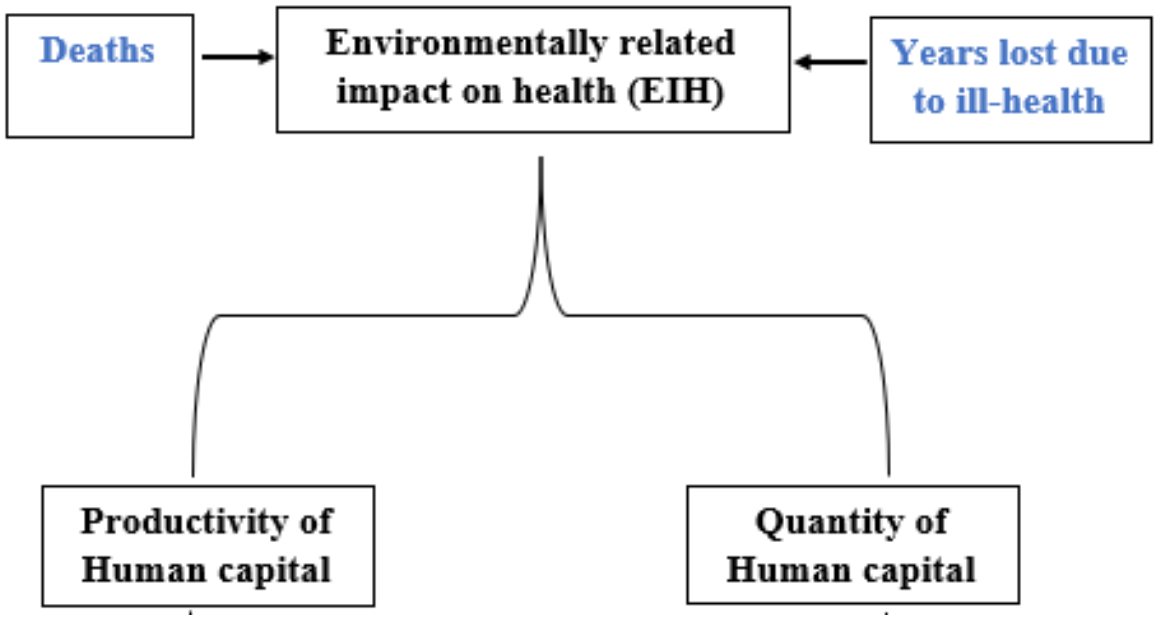
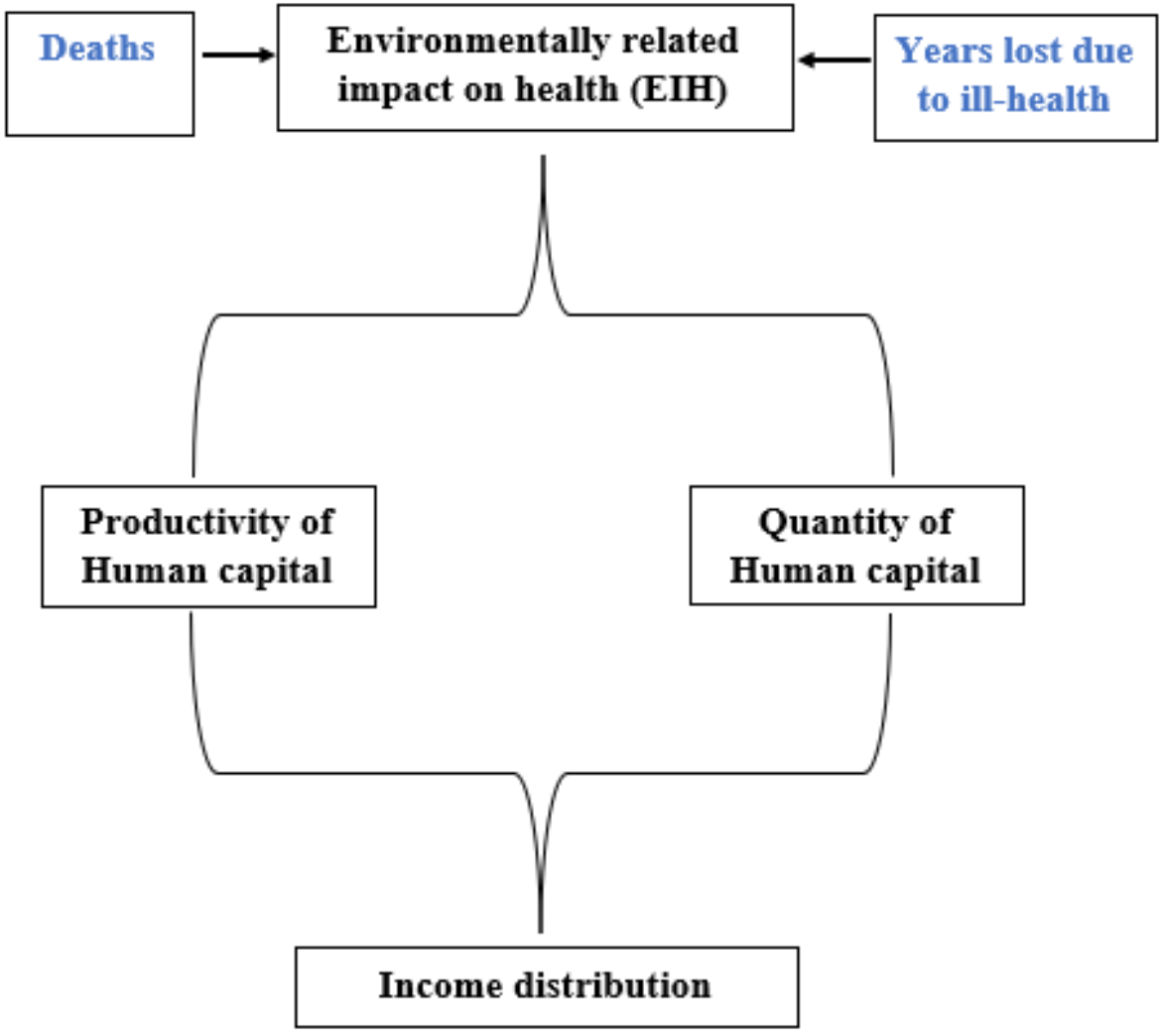


Figure 1. Decadal average of log EIH


Deaths
Environmentally related impact on health (EIH)
Years lost due to ill-health
Productivity of Human capital
Quantity of Human capital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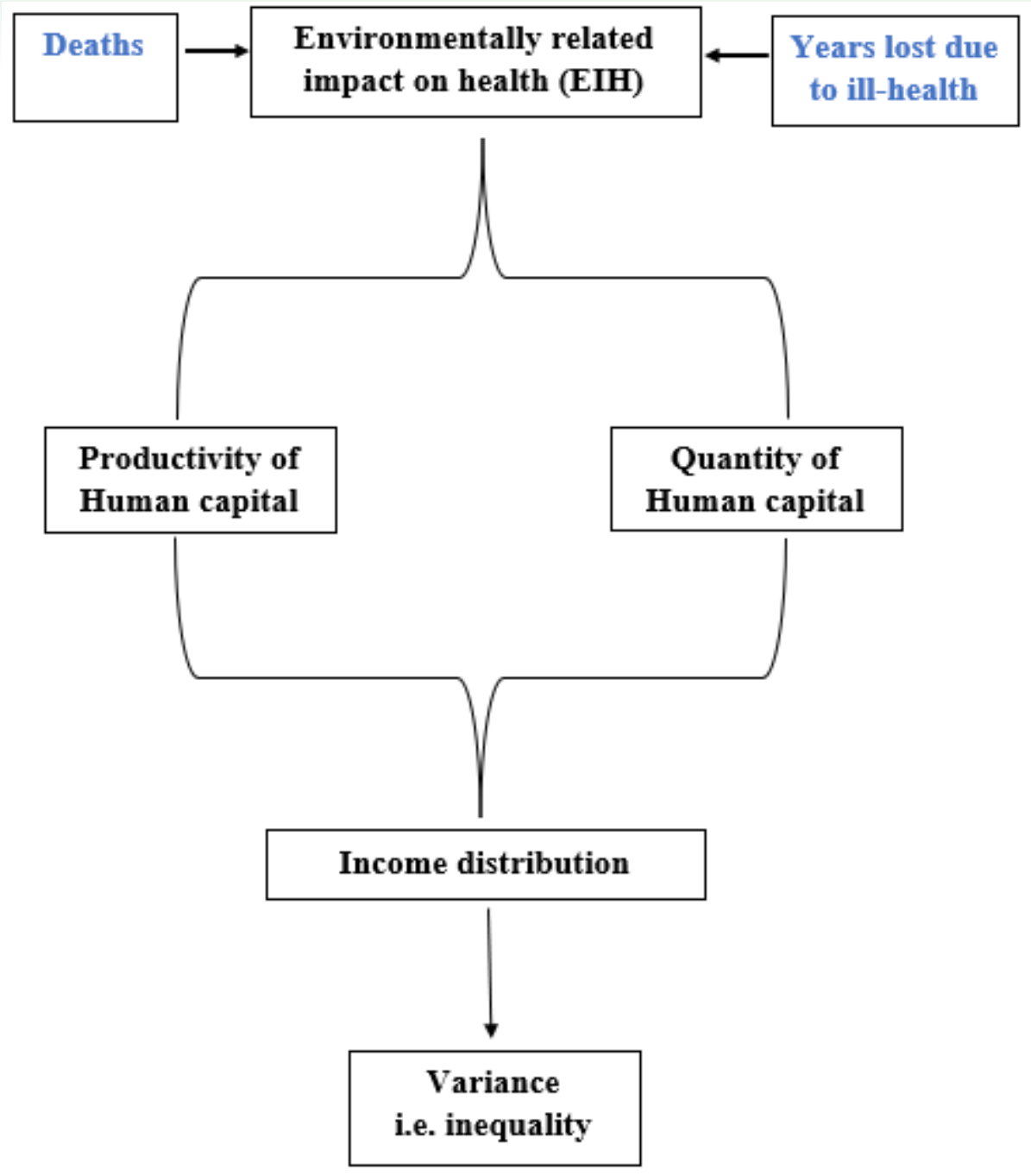
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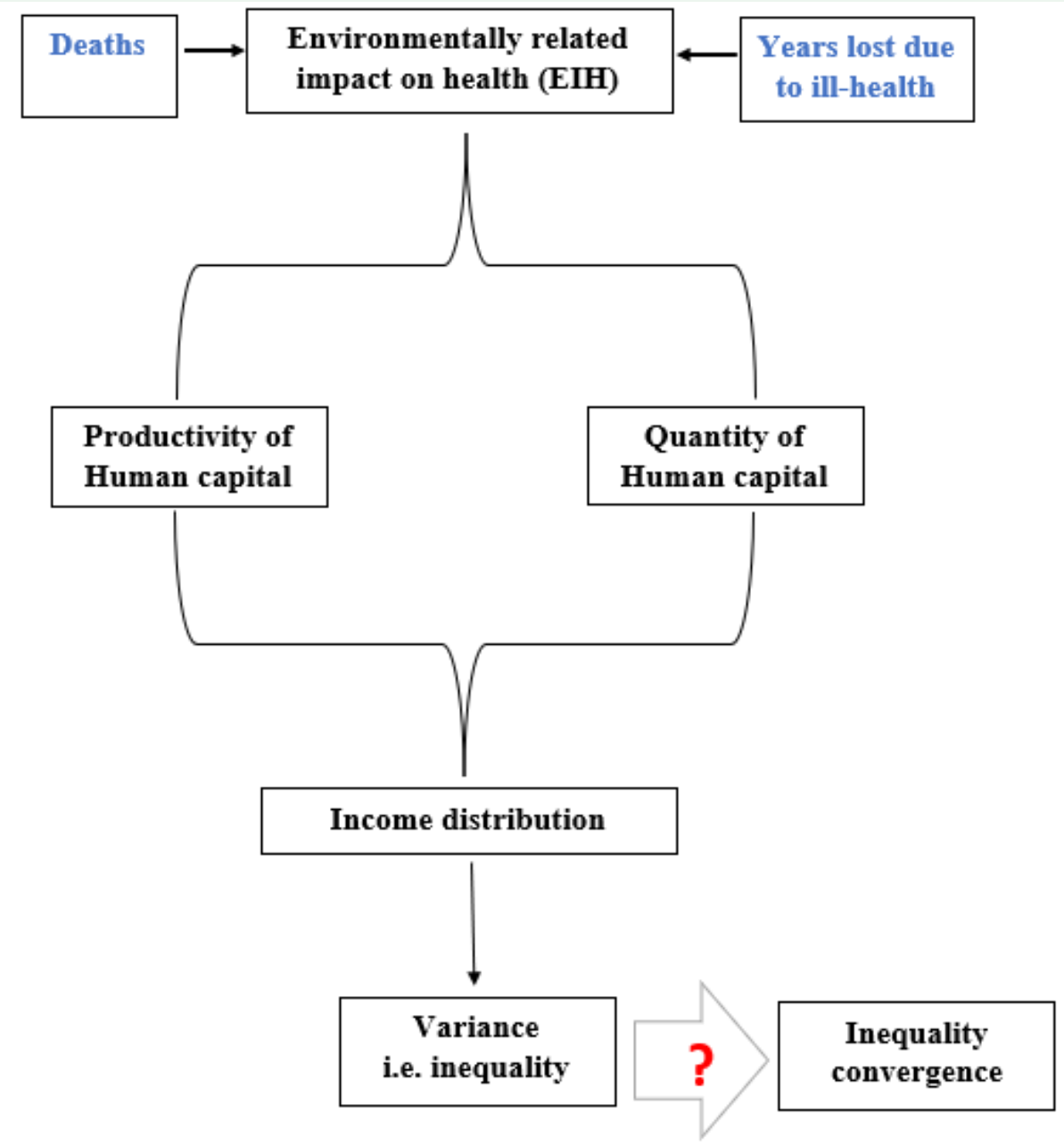
Variance i.e. inequality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Inequality convergence

What is Inequality convergence?

- A central tenet of the growth literature is the convergence hypothesis that per-capita income tends to grow more rapidly in poorer countries than in richer countries thereby converging in living standards (Bénabou, 1996).
- Income convergence also implies inequality convergence, in that countries with high initial inequality will experience greater reductions in inequality compared to countries starting with low inequality(Ravallion, 2003).

The hypothesis

- Countries with higher incidence of EIH will experience lower growth in mean income and less than a proportionate reduction in inequality overtime.
- Also EIH constrain the inequality-reducing impacts of economic growth, thus inhibiting the convergence of income inequality across countries

Research Questions

1. Does the effect of EIH on income distribution affect the speed of inequality convergence?
2. Does EIH directly impact inequality reduction?
3. Does EIH indirectly impact inequality by affecting the inequality-reducing impact of growth in per capita income?

Data

- UNU-WIDER, World Income Inequality Database (WIID) Companion dataset (wiidglobal). Version 31 May 2021.
- Global Burden of Disease (GBD) dataset, available on the Global Health Data Exchange (http://ghdx.healthdata.org/gbd-results-tool)

- **Inequality convergence**

$$\gamma(g_{it}) = \lambda_0 + \lambda_1 \ln(g_{it-\tau}) + \epsilon_{it} \tag{1}$$

- **Effect of EIH on inequality reduction and convergence in inequality**

$$\gamma(g_{it}) = \lambda_0 + \lambda_1 \ln(g_{it-\tau}) + \lambda_2 \ln(\sigma_{it-\tau}) + \epsilon_{it} \tag{2}$$

- **Including the income effect**

$$\gamma(g_{it}) = \lambda_0 + \lambda_1 \ln(g_{it-\tau}) + \lambda_2 \ln(\sigma_{it-\tau}) + (\beta_0 + \beta_1 \sigma_{it-\tau})\gamma(\mu_{it}) + \lambda_3 Z_{it} + \epsilon_{it} \tag{3}$$

- we expect $\lambda_1 < 0$ and $\lambda_2 > 0$
- where $\gamma(g_{it}) = \ln\left(\frac{g_{it}}{g_{it-\tau}}\right)/\tau$ is the annualized change in the log of Gini index
- and $\gamma(\mu_{it}) = \ln\left(\frac{\mu_{it}}{\mu_{it-\tau}}\right)/\tau$ is the annualized change in the log of mean income and thus represent the growth in per capita income.

Table 1: Inequality reduction, incidence of EIH and income growth

Variables	Full sample				Low	Lower middle	Upper middle	High
	OLS			IVE	OLS (Eq.3)			
	Eq.1	Eq.2	Eq.3					
Constant	3.10†	3.04†	3.00†	2.09*	4.97†	-0.73	5.45†	3.47†
	[0.417]	[0.395]	[0.384]	[1.249]	[1.388]	[1.406]	[1.427]	[1.210]
Log of Gini index, initial year 1990, $\ln(g_{it-\tau})$	-0.84†	-1.06†	-1.1†	-4.58†	-1.66†	-1.25†	-1.22†	-0.82†
	[0.109]	[0.142]	[0.142]	[1.232]	[0.432]	[0.279]	[0.411]	[0.207]
Log incidence of EIH initial year 1990, $\ln(\sigma_{it-\tau})$		0.10†	0.10**	1.72†	0.15	0.57†	-0.12	-0.06
		[0.036]	[0.041]	[0.545]	[0.124]	[0.143]	[0.187]	[0.162]
Growth rate, $\gamma(\mu_{it})$			0.01	-	0.16†	0.21**	0.03	-0.11
			[0.024]		[0.048]	[0.082]	[0.044]	[0.113]
Growth rate interacted with incidence of EIH in 1990, $\gamma(\mu_{it})\sigma_{it-\tau}$			0.00	-	-0.0**	-0.00†	0.00	0.00
			[0.00]		[0.000]	[0.000]	[0.000]	[0.000]
Instruments				Yes				
Observations	178	178	178		28	45	49	56
R-squared	0.249	0.282	0.283		0.502	0.280	0.308	0.343

Note: Heteroskedasticity-consistent robust standard errors (White) in parentheses. † significant at the 1% level, ** significant at the 5% level, * significant at the 10% level.

Table 2: Number of years require by selected Lower middle-income countries to converge to benchmark average Gini index of High-income countries (35.34)

Country	Average Gini, 1990 – 2019	EIH Reduction, 1990 - 2019 (%)	Years (ignoring the effect of EIH)	Years (capturing the effect of EIH)
Nigeria	45.3	20.1	91.6	404.0
Senegal	56.3	40.8	120.4	146.8
Mauritania	53.6	45.8	123.7	153.0
Zimbabwe	64.3	23.5	125.1	89.0
Honduras	52.0	35.8	125.7	88.4
Kenya	58.5	17.4	126.2	111.4
Nicaragua	52.5	68.2	130.3	93.1
Tunisia	43.3	20.2	138.2	46.5
Zambia	63.4	41.1	140.2	165.7
Eswatini	64.9	26.6	141.3	115.7
Lesotho	64.2	29.3	141.9	142.0
Cape Verde	60.7	59.6	142.3	114.2
Comoros	63.1	57.2	143.3	172.9
Angola	60.8	60.9	145.1	262.2
Bhutan	52.1	65.0	150.6	159.9
Pakistan	46.5	14.2	152.5	293.2
Philippines	46.8	22.5	154.5	91.0
Cameroon	57.8	10.4	154.7	191.3
Congo	60.2	38.6	156.0	170.1
Nepal	50.0	62.9	161.4	398.2
Tanzania	53.4	41.3	167.0	301.6
Cote d'Ivoire	58.0	18.4	174.7	233.7
Ghana	55.7	50.4	179.9	274.6
Sri Lanka	47.1	15.5	184.4	66.7
Benin	55.2	9.9	185.9	427.9
Morocco	42.2	39.6	194.3	121.0
India	50.1	38.7	224.0	341.3
Vietnam	37.6	30.8	314.4	38.2

Conclusion

- Higher initial incidence of EIH simultaneously worsens the rate of inequality reduction. Thus, those countries that experience faster reduction in the level of EIH tend to converge in inequality more quickly than their counterparts, ceteris paribus.

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- Thus, estimates that exclude the incidence EIH may bias the speed of convergence downward.
- High inequality have co-existed with high growth rates in low and lower middle-income countries, since the 1990s.
- That is because higher rates of income growth, per se, does not promote inequality reduction within countries, instead higher growth rates exist side by side with high inequality, especially in developing countries.

Policy implications

- Countries cannot expect to reduce inequality while maintaining high levels of EIH especially in developing countries.
- If they choose inequality reduction as a priority, then they must implement policy instruments that will cut down the level of EIH and alleviate the conditions of the vulnerable population that are disproportionately impacted.
- For example, developing countries should:
  1. build infrastructure
  2. and improve access to clean water, proper sanitation and hygiene: which account for about 827,000 deaths each year (WHO 2020).
  3. promote less air polluting forms of fuel. Solid fuels or kerosene for heating, cooking and lighting account for about 3 billion adverse morbidity risks (WHO 2020).

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- Thus, the strategies for improving economic equality and welfare, which is the focus of my research, are very much tied to the successful implementation of the Sustainable Development Goals.

Thank you.