

Global Universal Basic Skills: Current State and Implications for World Development

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Motivation

- Primary development goal: all youth around the world achieve at least basic skills
- Immense importance for inclusive world development
- Limited country coverage of previous work



This Paper

Our research goal

1. Provide the best estimates of the share of children not achieving basic skills in all countries of the world
2. Provide world estimate of the lost economic output due to missing the goal of global universal basic skills

Method

- New method for linking micro data across different international student achievement tests
- Projections with different reform scenarios

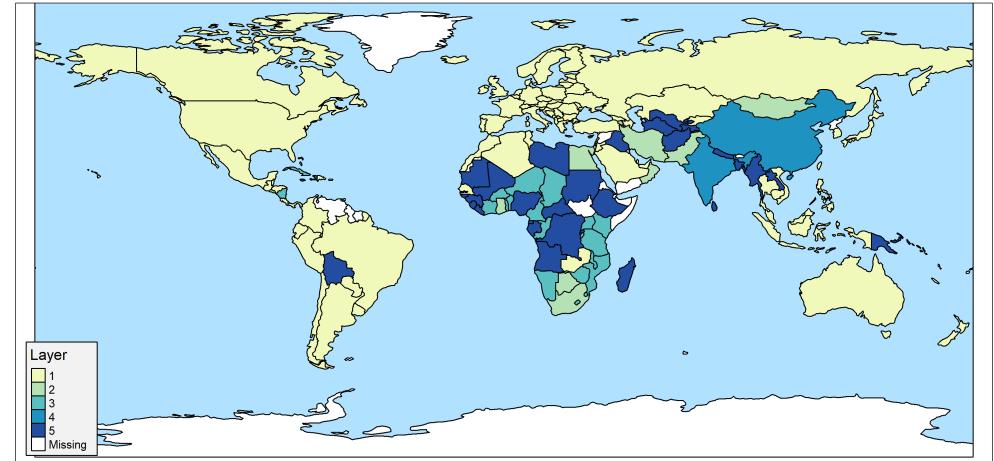
Results

- At least 2/3 of the world's youth do not obtain basic skills
- Achieving global universal basic skills would raise future world GDP by over 700 trillion dollars

1. Constructing a Global Data Base

Data

- **Layer 1: PISA participants**
 - PISA & PISA for Development
- **Layer 2: TIMSS participants**
- **Layer 3: Participation in regional tests**
 - PASEC (2014), SAQMEC IV (2012-2014), TERCE (2013), SERCE (2006)
- **Layer 4: Sub-territorial PISA**
 - China and India
- **Layer 5: No international participation**



Method

Universal Basic Skills

Fully achieving PISA Level 1 (420 points in math and 410 in science)

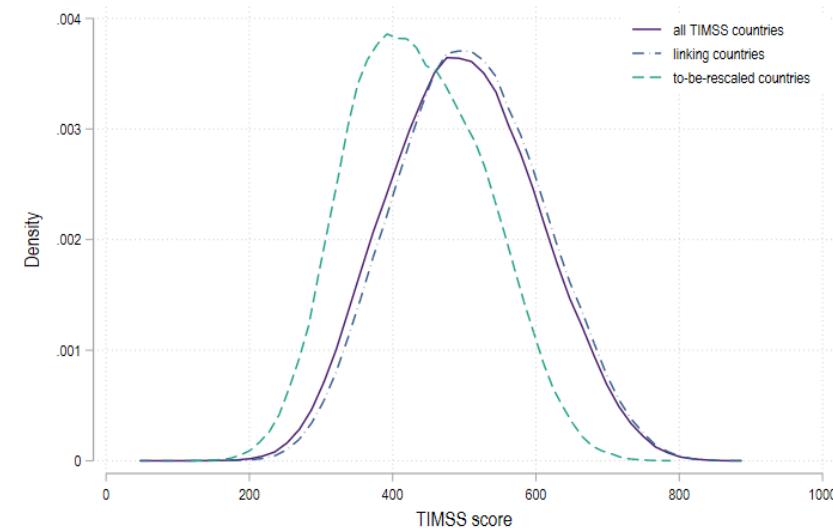
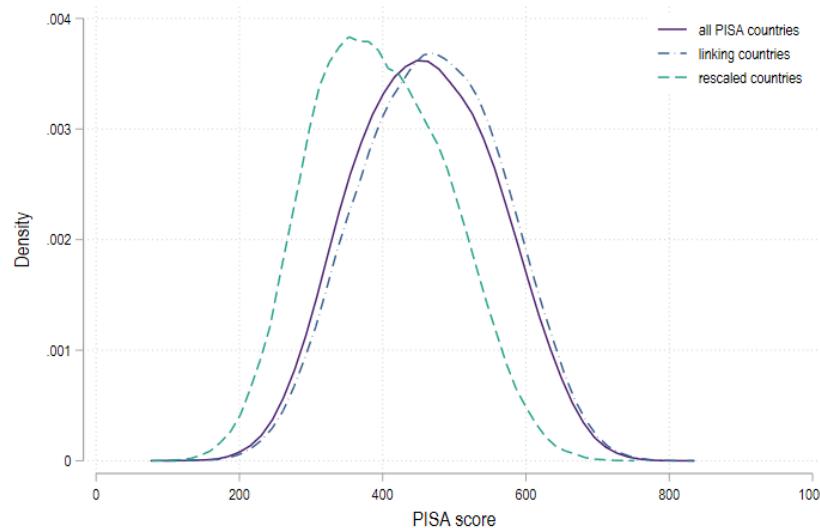
→ lowest of 6 performance levels in PISA

New Method for Linking Scores Across the Different International Tests

We convert any individual TIMSS score, t_i , into the corresponding PISA score, p_i , by:

$$p_i = \frac{(t_i - m_{TIMSS}^C)}{s_{TIMSS}^C} s_{PISA}^C + m_{PISA}^C$$

We use the subset of countries, C , that takes the PISA test and TIMSS (or one of the different regional tests) and estimate means and standard deviations of the common countries for the two distributions.



China and India

- Sub-territorial PISA participation
- **India:** Educational Initiative: Tamil Nadu scores 0.02 sd below the national mean → **shift the PISA distribution for Tamil Nadu to estimate the national distribution**
- **China:** Use the 2014 wave of the China Family Panel Studies (CFPS) to **re-center PISA scores**

Imputation of Achievement

We predict the proportion of students below basic skills in country j as:

$$\rho^j = \alpha_0 + \alpha_1 E_j^N + \alpha_2 GDP_j + v_j + \mu_j + \varepsilon_j$$

where E_j^N is net enrollment in secondary school, GDP_j is gross domestic product per capita, and v and μ are indicators for world regions and income groups, and ϵ is an error term. $R^2 = 0.835$

Skill Level of Children who are not in School

36 % of the 15-year-olds are not in school → how many of them are below basic skills?

- PISA-D out-of-school assessment 2018-2020
- PIAAC Data: Dropouts from upper secondary school

→ We assume out-of-school kids to be on the 25th percentile of each country on average and add multiple sensitivity checks

Achievement of Basic Skills

	Currently enrolled students			Enrollment	Estimated share of children below basic skills
	Share below basic skills (1)	Mean achievement (2)	Achievement at 25 th percentile (3)		
World	0.623	386.7	330.4	0.641	0.662
By income group					
Low-income countries	0.907	289.3	240.2	0.305	0.960
Lower-middle-income countries	0.824	335.0	280.6	0.561	0.867
Upper-middle-income countries	0.342	468.4	408.5	0.800	0.377
High-income countries	0.231	488.9	426.4	0.930	0.247
By region					
Sub-Saharan Africa	0.895	303.3	253.9	0.338	0.944
South Asia	0.866	322.7	265.7	0.598	0.904
Middle East & North Africa	0.656	380.8	320.7	0.799	0.696
Latin America & Caribbean	0.623	394.3	339.9	0.791	0.662
Europe & Central Asia	0.285	469.6	411.3	0.898	0.309
East Asia & Pacific	0.255	494.6	434.7	0.767	0.291
North America	0.212	492.5	427.9	0.931	0.228

2. The Economic Gains from Global Universal Basic Skills

Three Reform Scenarios

Scenario I

All children who are currently in school reach at least basic skills.

Scenario II

The average achievement of out-of-school children is lifted to the average achievement of in-school children in the respective country.

Scenario III

Full participation in secondary school with every student attaining at least the basic skill level.

Four Phases of Reform

Phase 1 (2020-2035)

Each cohort of new, higher achieving students is only a fraction of the total labour force

Phase 2 (2036-2060)

Reform fully enacted but workers with lower level of skills in working force

Phase 3 (2061-2075)

Labor market cohorts which only partially profited from reform are replaced with new cohorts

Phase 4 (after 2075)

Whole workforce has gone through reform

[Show details](#)

Economic effects of this upskilling of the labor force

GDP growth:

$$g_\tau = \gamma \bar{A}_\tau$$

where γ is the estimated impact of aggregated skills on growth rates and \bar{A}_τ are the skills of the workforce

GDP for the reform simulation over the period S:

$$GDP_\tau = (1 + g_\tau) GDP_{reform}^{t-1}$$

Level of GDP without the reform grows at a constant rate of potential GDP, i.e., $g_\tau = p$

The total value V of the reform

$$V = \sum_{\tau=1}^S (GDP_\tau^{reform} - GDP_\tau^{no reform}) * (1 + d)^{-\tau}$$

Parameters

Projection Results

	Scenario I: Current students achieve at least basic skills		Scenario II: Full participation at current level		Scenario III: All children achieve at least basic skills	
	Value of reform (bn In % of current USD)		Value of reform (bn In % of current USD)		Value of reform (bn In % of current USD)	
	(1)	(2)	(3)	(4)	(5)	(6)
World	355,674	264%	173,110	128%	706,011	524%
By income group						
Low-income countries	6,544	550%	5,482	461%	40,900	3437%
Lower-middle-income countries	142,711	717%	55,811	280%	378,790	1904%
Upper-middle-income countries	104,356	213%	74,793	152%	163,163	332%
High-income countries	102,063	160%	37,024	58%	123,158	193%
By region						
Sub-Saharan Africa	28,637	648%	17,929	405%	123,737	2798%
South Asia	98,518	826%	33,505	281%	257,662	2160%
Middle East & North Africa	47,718	634%	8,672	115%	66,691	886%
Latin America & Caribbean	49,702	491%	13,432	133%	75,786	749%
Europe & Central Asia	53,070	157%	22,793	68%	66,461	197%
East Asia & Pacific	43,852	102%	63,315	147%	74,535	173%
North America	34,177	147%	13,464	58%	41,139	177%

Notes: Discounted value of future increases in GDP until 2100 due to the reform scenario, expressed in billion USD and as a percentage of current GDP. Basic skills: Achieving at least at the equivalent of PISA Level 1. See section 5.1 for details on the reform scenarios and section 5.2 for details on the simulation model. Country groups follow World Bank classification.

Sensitivity

- Alternative parameter choices of the simulation model [show](#)
- Skill level of children who are not in school [show](#)
- Achievement estimates of the children who are currently in school [show](#)
- Varying uncertainty by layer [show](#)
- Lower and upper bound for China and India [show](#)

Conclusion

Share of children not achieving basic skills

- At least 2/3 of the world's youth do not obtain basic skills.
- In high-income countries, 25 % of children lack basic skills.
- Skill deficits reach 94 % in Sub-Saharan Africa and 90 % in South Asia but also hit 70 % in Middle East and North Africa and 66 % in Latin America.

Immense consequences for global economic development

- The world would gain over 700 trillion US dollars in added GDP over the remaining century if it were to reach global universal basic skills

Need for an internationally standardized test

- Our analysis provides a first global picture of the distribution of skills around the world, but it comes with uncertainty.
- Half of the world's youth live in the 35 countries that fail to participate in international tests.
- It would be a great service to world development if an international development organization were to institute a regular, internationally standardized test of representative samples of students in all countries of the global South.



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Four Phases of Reform

Phase 1 (2020-2035)

Each cohort of new, higher achieving students is only a fraction of the total labour force

$$\Delta^t = g * \Delta TS * \frac{1}{40} * \frac{t - 2020}{15} + \Delta^{t-1}$$

with

- Δ^t = additional growth in GDP per capita due to reform in year t
- g = 1.98% of additional average annual growth for a one standard deviation increase in test scores
- ΔTS = increase in average test score due to reform
- 40 years working life
- 15 years reform duration

Phase 2 (2036-2060)

Reform fully enacted but workers with lower level of skills in working force

$$\Delta^t = g * \Delta TS * \frac{1}{40} + \Delta^{t-1}$$

Phase 3 (2061-2075)

Labor market cohorts which only partially profited from reform are replaced with new cohorts

$$\Delta^t = g * \Delta TS * \frac{1}{40} - (\Delta^{t-40} - \Delta^{t-41}) + \Delta^{t-1}$$

Phase 4 (after 2075)

Whole workforce has gone through reform

$$\Delta^t = g * \Delta TS$$

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Parameter	Definition	Baseline value
R	Reform period (years)	15
W	Length of work life	40
S	Simulation period (years)	80
d	Discount rate	0.03
p	Status quo growth rate	0.015
γ	growth coefficient	0.0198
A^*	math basic skills (Level 1)	420
	science basic skills (Level 1)	410

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Sensitivity of simulation results: Alternative parameter choices

	Reform duration		Working life		Growth coefficient		Discount rate	
	20 years	10 years	45 years	35 years	0.0176	0.0220	4%	2%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
World	630,666	789,945	636,917	783,275	616,522	818,144	401,712	1275,886
By income group								
Low-income countries	36,013	46,414	36,326	46,082	34,751	48,943	22,886	75,053
Lower-middle-income countries	335,876	426,933	338,981	423,625	326,156	446,331	213,663	690,030
Upper-middle-income countries	147,130	180,826	148,704	179,144	145,038	184,930	93,834	291,917
High-income countries	111,647	135,772	112,906	134,424	110,577	137,940	71,329	218,886
By region								
Sub-Saharan Africa	109,432	139,802	110,417	138,758	106,015	146,569	69,559	22,6105
South Asia	227,982	291,046	230,056	288,834	220,958	305,157	145,020	47,0329
Middle East & North Africa	60,031	74,038	60,658	73,364	59,082	75,882	38,263	119,584
Latin America & Caribbean	68,303	84,030	69,032	83,254	67,303	85,988	43,552	135,684
Europe & Central Asia	60,283	73,228	60,965	72,498	59,734	74,346	38,516	118,034
East Asia & Pacific	67,284	82,515	68,012	81,738	66,389	84,278	42,927	133,172
North America	37,351	45,286	37,777	44,829	37,041	45,924	23,875	72,978

Notes: Scenario III: All children achieve at least basic skills (equivalent to PISA Level 1). Discounted value of future increases in GDP until 2100 due to the reform scenario, expressed in billion USD. See section 5.1 for details on the reform scenarios and section 5.2 for details on the simulation model. Country groups follow World Bank classification.

Sensitivity of simulation results: Measurement error in skill estimates

	Out-of-school children		In-school children		All children		Uncertainty increasing with layer	
	35 th perc.	15 th perc.	- 10%	+ 10%	- 10%	+ 10%	Lower bound	Upper bound
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
World	638,845	798,937	655,351	758,215	612,894	806,481	582,443	852,262
By income group								
Low-income countries	35,479	48,843	39,267	42,586	34,507	48,087	27,587	58,330
Lower-middle-income countries	337,839	433,025	353,536	405,106	324,045	439,230	289,236	486,265
Upper-middle-income countries	149,440	182,606	150,373	176,257	144,287	182,714	149,269	177,649
High-income countries	116,087	134,463	112,175	134,266	110,055	136,450	116,351	130,018
By region								
Sub-Saharan Africa	108,872	144,174	117,834	129,843	105,308	144,161	89,987	166,106
South Asia	229,564	294,753	239,515	276,643	219,492	300,143	192,233	336,348
Middle East & North Africa	626,81	72,019	60,723	72,840	58,768	74,943	59,573	74,215
Latin America & Caribbean	70,545	82,542	69,664	82,060	66,954	84,949	70,694	81,049
Europe & Central Asia	61,999	73,756	60,801	72,172	59,453	73,551	62,431	70,548
East Asia & Pacific	66,586	86,540	69,249	79,921	66,050	83,291	68,526	80,710
North America	38,598	45,153	37,565	44,736	36,869	45,443	38,999	43,286

Notes: Scenario III: All children achieve at least basic skills (equivalent to PISA Level 1). Discounted value of future increases in GDP until 2100 due to the reform scenario, expressed in billion USD. Uncertainty increasing with layer: achievement increase - / + 5% for Layer 1, 10% for Layer 2, 15% for Layer 3, 20% for Layer 4, and 25% for Layer 5. See section 5.1 for details on the reform scenarios and section 5.2 for details on the simulation model. Country groups follow World Bank classification.

China and India

China

- Beijing, Shanghai, Jiangsu and Zhejiang participated in **PISA 2018**
→ **not representative**
- **Baseline:** Use 2014 wave of the China Family Panel Studies (CFPS) to re-center PISA scores
- **Upper bound:** PISA 2018 results
- **Lower bound:** PISA 2018 results for urban population, all rural children below basic skills

India

- Himachal Pradesh and Tamil Nadu participated in the PISA 2009
- **Baseline:** Educational Initiative: Tamil Nadu scores 0.02 sd below the national mean → **shift the PISA distribution for Tamil Nadu to estimate the national distribution**
- **Upper bound:** unadjusted score for Tamil Nadu
- **Lower bound:** unadjusted score for Himachal Pradesh

Sensitivity of simulation results: Lower and upper bound for China and India

	Lower bound China (1)	Upper bound China (2)	Lower bound In- dia (3)	Upper bound In- dia (4)	Both lower bound (5)	Both upper bound (6)
China	0.671	0.060	0.060	0.060	0.671	0.060
India	0.899	0.899	0.924	0.895	0.924	0.895
World	0.741	0.662	0.666	0.661	0.746	0.661
By income group						
Lower-middle-income countries	0.867	0.867	0.877	0.865	0.877	0.865
Upper-middle-income countries	0.635	0.377	0.377	0.377	0.635	0.377
By region						
South Asia	0.904	0.904	0.922	0.902	0.922	0.902
East Asia & Pacific	0.625	0.291	0.291	0.291	0.625	0.291

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