Accounting for Intergenerational Social Mobility in Low- and Middle-Income Countries

Evidence from the Poorest in Ethiopia, India, Peru and Vietnam

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Why do we look at ISI?

- Income inequality positively correlates with the degree of ISI ("Great Gatsby Curve")
  - Goal of reducing inequality (e.g. World bank 2016)

- 'Effectiveness' Arguments:

→ Inequality is bad for growth (Galor et al., 2009)

→ Tap full economic potential of society (Causa and Johansson, 2009)

- Normative Argument:

→ Enhancing equal opportunities for all children, irrespective of family background

Why low- and middle-income countries?

- Parental wealth is more likely to determine individual striving in an environment where provision of public goods and social protection is weak
- So far only little evidence on ISI in low- and middle-income countries
- NEW: ISI decomposition approach on data from low- and middle-income countries

→ Looking for specific pathways which can account for the degree of ISI in developing countries

Why pathways?

- Academic curiosity
- Policy design

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Literature on ISI

- Theoretical work by Becker & Tomes (1986): ISI increases with more strict credit constraints and certain parental preferences, hence many channels for ISI conceivable
- Cross-country studies: heterogeneous degree of ISI between countries (Corak, 2006; and Causa & Johansson, 2009, for developed economies; Bossuroy and Cogneau, 2013; and Lambert, Ravallion, and van de Walle, 2014, for developing countries)
- In developed economies, race, cognitive skills, schooling, health, and non-cognitive skills play the greatest role in the transmission of socioeconomic status between generations, again with differing weights in different (industrial) countries (Bowles & Gintis, 2002; Blanden et al., 2007; Blanden et al., 2014; Schad, 2015)

Research Questions

1. How large is the extent of ISI in the countries under study?
2. Which specific pathways can account for the ISI in these countries?
3. How does the importance of those pathways differ across across different subgroups and between countries?

Results

- There is a considerable degree of Intergenerational Social Immobility in the countries under study, having a poor compared to a middle class background decreases the chances of obtaining a secondary school degree by 20%.
- The main pathways of ISI besides lower cognitive skills (15%) are the need to pursue child labor (12%) and the greater number of siblings in poor households (8%).

Young Lives (YL) Dataset: Older Cohort

- Longitudinal survey investigating the causes and consequences of childhood poverty
- Four rounds (approx. every 3 years starting in 2002)
- Four countries: Ethiopia, India, Peru and Vietnam

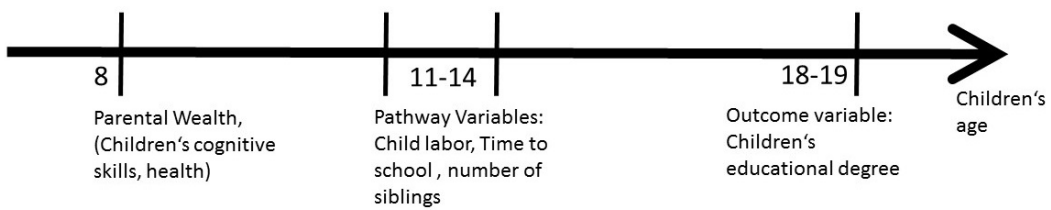
→ Capturing "the four major regions of the developing world, both low- and middle-income countries, and diverse socioeconomic and political systems"(Young Lives, 2011, p.1)

- 1000 observations in each country, but no iq-test for everybody therefore reduced sample in analysis
- Not representative: 'pro-poor' sampling through first choosing the 20 poorest sites within one country and then selecting randomly the children between 7 and 8 years of age

Analysis in Four Steps

Following decomposition by Bowles & Gintis (2002) (Mediation Analysis, Decomposition Approach, ...)

1. Degree of ISI: Impact of parental wealth on children's outcome
2. Correlation between parental wealth and potential pathways
3. Effect of potential pathways on children's outcome
4. Decomposition of the degree of ISI into the different pathways (combining steps 2 and 3 given results of step 1)



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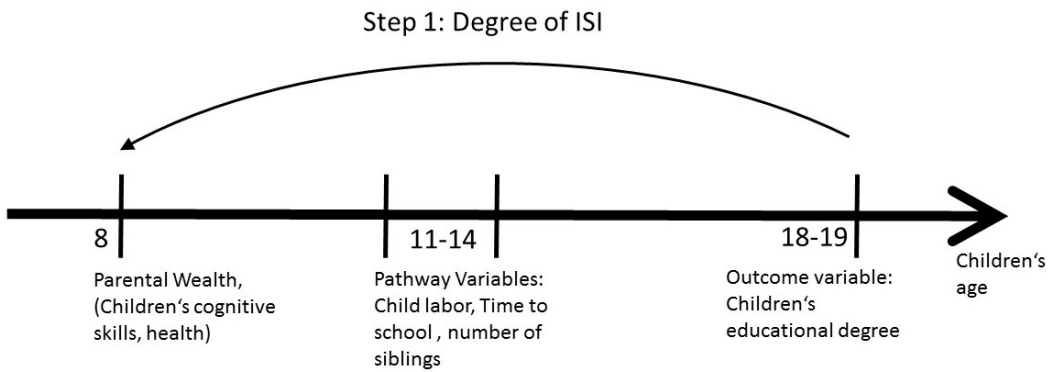

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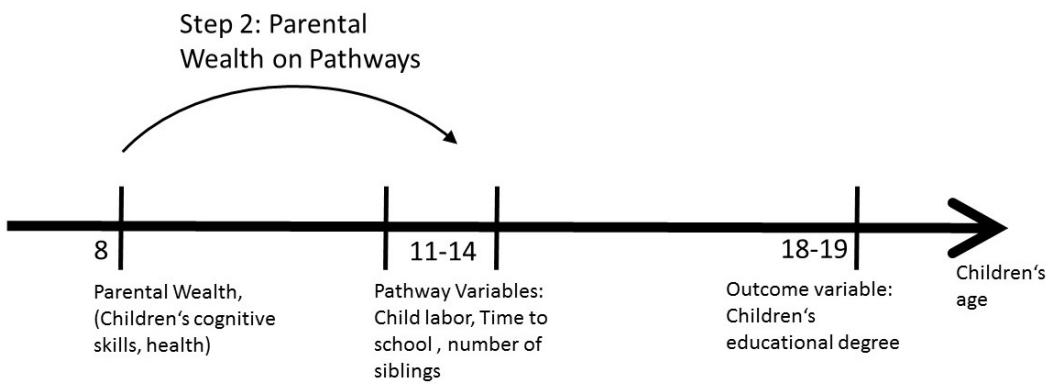

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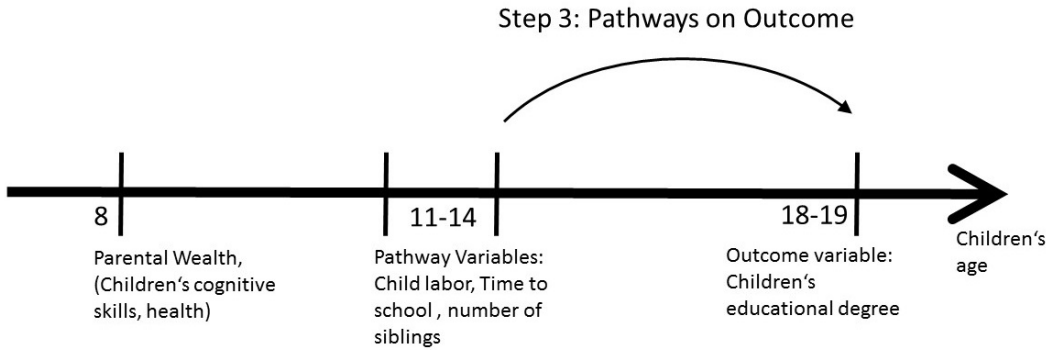

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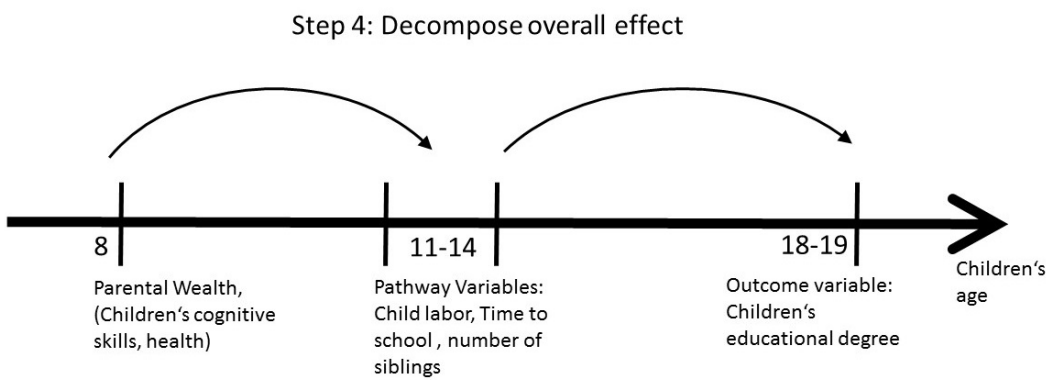

1st Step: Degree of ISI

- Indicator for Parents' Socioeconomic Status

⇒ Wealth Index 'Wi_i' (measured when child i is 8 years old)

  - Takes a value between 0 to 1
  - Based on indices for housing quality, consumer durables and access to services
  - 0.5 equals mean wealth of a country's society

- Indicator for Children's Socioeconomic Status

⇒ Educational Outcome 'Ed_i' (measured when child i is 19 years old)

  - Dichotomous Variable
  - 1= if child achieved at least an International Standard Classification of Education (ISCED) of 3
  - 0= if child achieved less

1st: Degree of ISI

$$Ed_i^C = \beta Wi_i^P + X_i'\zeta + \sum_{j=1}^{4} \alpha_j d_{j,i} + \xi_i \quad (1)$$

- Estimated β gives degree of ISI*
- Control vector X_i includes: sex of the child, father's age, father's age squared and birth rank observed in first observation period
- Country dummy $d_{j,i}$ for each country j

*All estimations are undertaken via OLS since the decomposition requires linear estimation. However, AME of Probit models are only marginally different to coefficients of OLS.

1st Step: Degree of ISI

Dependent Variable	Children's Education
Parental Wealth	0.392***
	(0.0476)
Controls	
Female	0.0177
	(0.0199)
Father's Age	0.00618
	(0.0117)
Father's Age^2	-0.0000610
	(0.000141)
Birth Order *(Base: First Child)*	
Second Child	-0.0180
	(0.0248)
Third Child	-0.0718**
	(0.0318)
Fourth Child	-0.0966**
	(0.0446)
Fifth Child	-0.000414
	(0.0510)
Sixth Child or more	-0.125**
	(0.0502)
Country Dummies	
ET	0.237
	(0.232)
IN	0.560**
	(0.231)
PE	0.503**
	(0.229)
VN	0.355
	(0.233)
Observations	1544
Adjusted R^2	0.804

Robust standard errors are reported in parantheses (p<0.1, ** p<0.05, *** p<0.01).*

Potential Pathways in DCs I

Requirement for being a pathway of ISI:
Correlation with parental socioeconomic status and causal relation with children's socioeconomic status (Bowles & Gintis, 2002, p.9)

- Child i's time spend in labor 'Cl_i'
  - Poor parents send children in child labor and due to less time spend in school, children receive a lower schooling certificate
  - → Average of hours spend doing household chores, caring for family members, working in family business, and doing a paid activity on a typical day when children are 11 years old.
- Child i's health 'He_i'
  - Poorer family background correlates with a lower health status (Woodhead et al. 2014)
  - Childhood health affects educational achievement (Case et al., 2005)
  - → Height for age z-score at the age of 8

Potential Pathways in DCs II

- Child i's time to school 'Ts_i'
  - A longer distance to school reduces school attendance
  - Distance to school correlates highly with travel time to school, but travel time can more clearly be linked to parental wealth

  → Travel time to school in minutes when children are 11 years old.

- Number of children living in child i's household '$Nc1_i$' to '$Nc3_i$'
  - Especially wealthy parents invest all resources in the quality instead of the quantity of their offsprings such that they reach at least the same socioeconomic status (Goodman et al., 2012)
  - A higher number of children negatively affects educational outcome of each child (Black et al., 2005)

  → Number of additional children who are 12 years old or younger living in child i's household when child i is 11 years old.

Potential Pathways in DCs III

- Child i's inheritance of cognitive skills 'Cs_i'
  - "Similarity in parents' and offsprings' scores on cognitive tests" (Bowles and Gintis, 2002)
  - Higher cognitive ability contributes to a higher educational outcome

  $\rightarrow$ Fluid intelligence measure: Score of Raven's Colored Progressive Matrices (CPM) ranging from 0 to 36 when child is 8 years old

2nd Step: Parental Wealth → Pathways

$$PW_i^C = \lambda_{PW} Wi_i^P + X_i'\zeta_{PW} + \sum_{j=1}^{4} \alpha_{PW,j} d_{i,j} + e_{PW,i} \qquad (2)$$

- Estimation of equation (2) for each Pathway (PW_i^C)
  - Child labor
  - Childhood Health
  - Time to school
  - Number of children in household
  - Cognitive skills

2nd Step: Parental Wealth → Pathways

Dependent Variable	Child Labor	Health	Time to School	At Least 1 add. Child	At Least 2 add. Children	At Least 3 add. Children	Cognitive Skills
Parental Wealth	-0.406***	1.071***	-8.807***	-0.0995*	-0.312***	-0.184***	8.205***
	(0.0412)	(0.130)	(2.046)	(0.774)	(0.0531)	(0.0363)	(2.500)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1544	1544	1544	1544	1544	1544	1544
Adjusted R^2	0.613	0.684	0.577	0.719	0.333	0.130	0.926

Robust standard errors are reported in parentheses (p<0.1, ** p<0.05, *** p<0.01).*

3rd Step: Pathways → Children's Education

$$\begin{aligned} Ed_i^C = &\rho_{Cl} Cl_i^C + \rho_{He} He_i^C + \rho_{Ts} Ts_i^C + \rho_{Nc1} Nc1_i^C + \rho_{Nc2} Nc2_i^C \\ &+ \rho_{Nc3} Nc3_i^C + \rho_{Cs} Cs_i^C + \gamma_{Wi} Wi_i^P + X_i'\tau + \sum_j \omega_j d_{j,i} + v_i \end{aligned} \tag{3}$$

- ρ_{PW} coefficients give effect of pathway on children's education
- γ_{Wi} gives the direct effect of parental wealth on children's education (which cannot be explained by the included pathways)

3rd Step: Pathways → Children's Education

	Children's Education
Parental Wealth	0.232***
	(0.0526)
Pathways	
Child Labor	-0.119***
	(0.0337)
Health	0.0110
	(0.00975)
Time to School	-0.00126*
	(0.000711)
At Least 1 add. Child	-0.0131
	(0.0242)
At Least 2 add. Children	-0.0131
	(0.0288)
At Least 3 add. Children	-0.133***
	(0.0442)
Cognitive Skills	0.00720***
	(0.00169)
Controls	Yes
Country Dummies	Yes
Observations	1544
Adjusted R^2	0.811

Robust standard errors are reported in parantheses (p<0.1, ** p<0.05, *** p<0.01).*

4^{th} Step: Decomposition

- In the decomposition, we are interested in the contribution of each pathway to the overall degree of ISI
- Intuitively: Multiply estimated coefficients from steps 2 and 3, bootstrap standard errors

4th Step: Decomposition

	(1) Part of total β	(2) Percent of total β
Child Labor	0.0483***	0.123***
	(0.0143)	(0.0394)
Health	0.0118	0.0300
	(0.0116)	(0.0313)
Time to School	0.0111*	0.0284*
	(0.00637)	(0.0170)
Number of Children	0.0300***	0.0764***
	(0.0107)	(0.0292)
Cognitive Skills	0.0591***	0.151***
	(0.0149)	(0.0419)
Explained component of β	0.160***	0.409***
	(0.0267)	(0.0844)
Unexplained component of β	0.232***	0.591***
	(0.0525)	(0.0844)
Total β	0.392***	
	(0.0479)	

Bootstrapped standard errors are reported in parentheses ($p<0.1$, ** $p<0.05$, *** $p<0.01$). This table shows the results from decomposing the estimated β coefficient.*

Decomposition by Gender and Family Background

Subsamples	Female Children	Male Children	Lower Family Background	Higher Family Background
Explained parts of total β				
Child Labor	0.0383*	0.0440**	0.0343*	0.0694**
	(0.0202)	(0.0201)	(0.0207)	(0.0333)
Health	-0.00295	0.0167	-0.0000619	0.0107
	(0.0183)	(0.0132)	(0.00699)	(0.0191)
Time to School	0.00742	0.0125	0.00344	0.0209
	(0.00776)	(0.0103)	(0.00966)	(0.0174)
Number of Children	0.0240	0.0347**	0.0771**	-0.00560
	(0.0163)	(0.0166)	(0.0340)	(0.0140)
Cognitive Skills	0.0672***	0.0500**	0.0367*	0.0526**
	(0.0219)	(0.0200)	(0.0223)	(0.0263)
Explained component of β	0.134***	0.158***	0.151***	0.148***
	(0.0358)	(0.0361)	(0.0507)	(0.0508)
Unexplained component of β	0.277***	0.222***	0.220	0.392***
	(0.0735)	(0.0766)	(0.159)	(0.116)
Total β	0.411***	0.380***	0.372**	0.540***
	(0.0668)	(0.0682)	(0.155)	(0.105)
Observations	756	788	774	770

Bootstrapped standard errors are reported in parentheses ($p<0.1$, ** $p<0.05$, *** $p<0.01$). This table shows the results from decomposing the estimated β coefficient for female and male children, and rich and poor families separately.*

Decomposition by Country

Subsamples Explained parts of total β	Ethiopia	India	Peru	Vietnam
Child Labor	0.195	0.0338**	0.0226	0.0166
	(0.126)	(0.0159)	(0.0281)	(0.0385)
Health	-0.000136	0.0121	-0.00595	0.0301
	(0.0449)	(0.0122)	(0.0276)	(0.0434)
Time to School	-0.00617	0.00753	0.0176	0.0867
	(0.0503)	(0.00907)	(0.0128)	(0.0618)
Number of Children	0.0383	0.00241	0.0909***	0.0301
	(0.0896)	(0.00968)	(0.0331)	(0.0449)
Cognitive Skills	0.0387	0.0322**	0.111***	0.0582
	(0.0816)	(0.0141)	(0.0357)	(0.0596)
Explained component of β	0.266	0.0880***	0.236***	0.222**
	(0.194)	(0.0264)	(0.0630)	(0.0958)
Unexplained component of β	0.306	0.191***	0.193**	0.615***
	(0.364)	(0.0705)	(0.0880)	(0.207)
Total β	0.572*	0.279***	0.429***	0.836***
	(0.334)	(0.0628)	(0.0798)	(0.182)
Observations	130	774	469	171

Bootstrapped standard errors are reported in parentheses.
($p<0.1$, ** $p<0.05$, *** $p<0.01$)*
This table shows the results from decomposing the estimated β coefficient for each country separately.

Robustness Checks

Results are robust to:

- Consumption instead of wealth index as a proxy for parental wealth*
- ISCED level instead of dichotomous variable (reduced sample)*
- Different childhood health measures such as weight-for-age

*Except of signficance of time to school pathway in pooled decomposition.

Conclusion

- Considerable amount of ISI in low- and middle-income countries: Having very poor parents instead of parents with an average wealth reduces the probability to receive the highest secondary school leaving certificate by 20 %.
- 40 % of the ISI can be explained by the included pathways
  - Child labor, number of children, (time to school) & inheritance of cognitive skills significant pathways
- Next Step: Compare degree of ISI to that in developed countries

Thank you for your attention!

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Appendix

1. Descriptive Statistics
   - Socioeconomic Status & Pathways
   - Controls
2. Illustration: The Decomposition of ISI
3. Shortcomings of Decomposition
4. Coding Children's Educational Outcome
   - Ethiopia
   - India
   - Peru
   - Vietnam

1st Step: Degree of ISI

Descriptive Statistics: Socioeconomic Status & Pathways

	N	Mean	SD	Min.	Max.	Observation Round
Parental Wealth	1544	0.4435	0.2071	0.0079	0.9722	1
Children's Education *(None)*						
Secondary School Leaving Certificate	1544	0.7811	0.4136	0	1	4
Pathways						
Child Labor	1544	0.4044	0.377	0	2.5	2
Childhood Health	1544	-1.453	1.0489	-10.02	2.18	1
Time to School in Min.	1544	16.3517	14.4393	0	180	2
Number of Children *(No add. child)*						
At Least One Additional Child	1544	0.6671	0.4714	0	1	2
At Least Two Additional Children	1544	0.2668	0.4425	0	1	2
At Least Three Additional Children	1544	0.0907	0.2872	0	1	2
Cognitive Skills	1544	21.2455	6.592	0	36	1

For categorical variables, the base category is displayed in parentheses.

Potential Pathways in DCs: Descriptive Statistics

Descriptive Statistics: Controls

	N	Mean	SD	Min.	Max.	Observation Round
Sex *(Male)*						
Female	1544	0.4896	0.5001	0	1	1
Father's Age	1544	37.5531	7.3364	24	80	1
Father's Age ^{2}	1544	1464.023	617.2858	576	6400	1
Birth Order *(First Child)*						
Second Child	1544	0.2992	0.4581	0	1	1
Third Child	1544	0.1723	0.3777	0	1	1
Fourth Child	1544	0.08614	0.2807	0	1	1
Fifth Child	1544	0.0622	0.2416	0	1	1
Sixth child or more	1544	0.0855	0.2797	0	1	1

For categorical variables, the base category is displayed in parentheses.

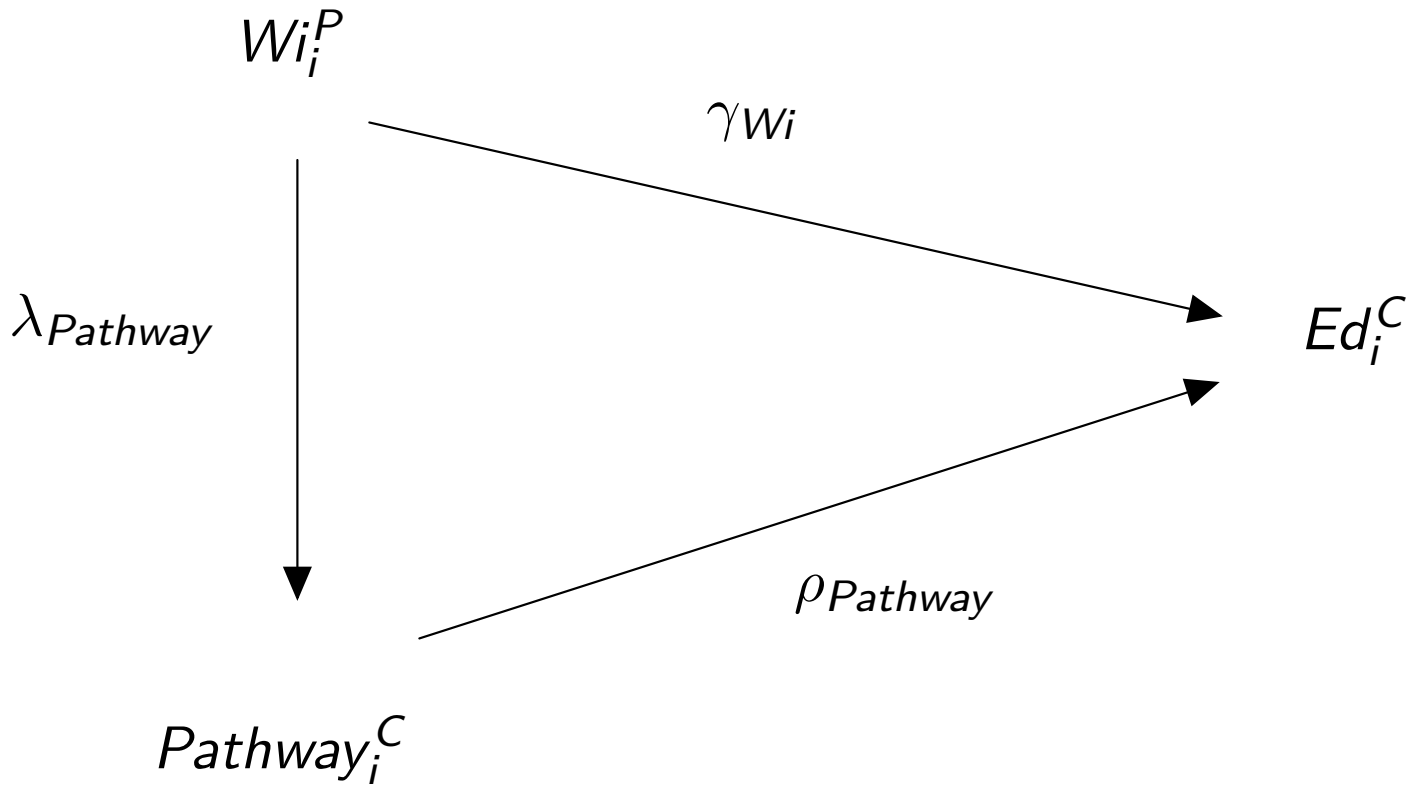

Figure: The Decomposition of ISI on the basis of Schad (2015)

4^{th} Step: Decomposition

Calculating pathway coefficients and pathway fractions: Insert equation (2) for each pathway into equation (3) remembering equation (1) yields:

$$\begin{aligned}\beta =& \rho_{Cl}\lambda_{Cl} + \rho_{He}\lambda_{He} + \rho_{Nc1}\lambda_{Nc1} + \rho_{Nc2}\lambda_{Nc2} \\ &+ \rho_{Nc3}\lambda_{Nc3} + \rho_{Ts}\lambda_{Ts} + \rho_{Cs}\lambda_{Cs} + \gamma_{Wi}\end{aligned} \tag{4}$$

- Pathway coefficient of child labor $= \rho_{Cl} \times \lambda_{Cl}$
- Pathway fraction of child labor $= \frac{\rho_{Cl}\lambda_{Cl}}{\beta}$

$\rightarrow$ Standard errors for coefficients and fractions are simulated per bootstrap with 1000 replications

Shortcomings of Decomposition

- Assumption of uncorrelated error terms: Hirvonen (2010) unlikely to be the case since all influenced by 'luck'
  - → However:
  - Bias decreases with number of introduced pathways (Hirvonen(2010))
  - Comparison between two countries/groups concerning the importance of different pathways still valid when assuming the correlation of error terms works in the same way
- All estimations are undertaken via OLS method since only linear estimation allows for decomposition
  - → However, AMEs of probit estimation only differ marginally

Coding Children's Educational Outcome - Ethiopia

Dependent Variable	Child's Highest Grade/Degree Completed	Corresponding ISCED Level
0	None	0
	Others	0
	Religious education	0
	Primary (Grade 1-6)	1
	Grade 8 Completion Certificate (Grade 7-8)	2
	Ethiopian General Secondary Education (Grade 9-11)	2
	Adult literacy program	n.a.
1	Ethiopian Higher Education Entrance Certificate (Grade 12)	3
	Post-secondary, vocational	3
	University	6, 7 or 8

Coding Children's Educational Outcome - India

Dependent Variable	Child's Highest Grade/Degree Completed	Corresponding ISCED Level
0	None	0
	Religious Education	0
	Primary certificate	1
	Upper primary certificate	2
	Adult literacy program	n.a.
1	Matriculation certificate (Grade 10-11)	3
	Senior secondary school leaving certificate (Grade 12)	3
	Senior secondary school leaving certificate, vocational	3
	Degree	6
	Post-graduate degree	7 or 8

Coding Children's Educational Outcome - Peru

Dependent Variable	Child's Highest Grade/Degree Completed	Corresponding ISCED Level
0	None	0
	Some sort of preschool	0
	Primary education certificate (Grade 1-6)	1
	Lower secondary certificate (Grade 7-10)	2
	CETPRO (incomplete)	2
	CETPRO (complete)	2
	Adult literacy program	n.a.
1	Upper secondary certificate (Grade 11)	3
	Technical pedagogical institute (incomplete)	6
	Technical pedagogical institute (complete)	6
	University (incomplete)	6
	University (complete)	6
	Masters or doctoral at university	7 or 8

Note: Information on Centros de Educacion Tecnico-Productiva (CETPRO) in Peru taken from Clark (2015).

Coding Children's Educational Outcome - Vietnam

Dependent Variable	Child's Highest Grade/Degree Completed	Corresponding ISCED Level
0	None	0
	Religious education	0
	Primary education completion certificate	1
	Lower secundary completion certificate	2
	Adult literacy program	n.a.
1	Upper secondary education graduation diploma	3
	Elementary vocational education completion certificate	3
	Intermediate vocational training completion diploma	3
	Professional technical secondary education diploma	4
	Professional vocational secondary education diploma	4
	College degree	5
	Collegiate vocational training completion diploma	5
	Bachelor's degree	6
	Master's or doctoral degree	7 or 8