

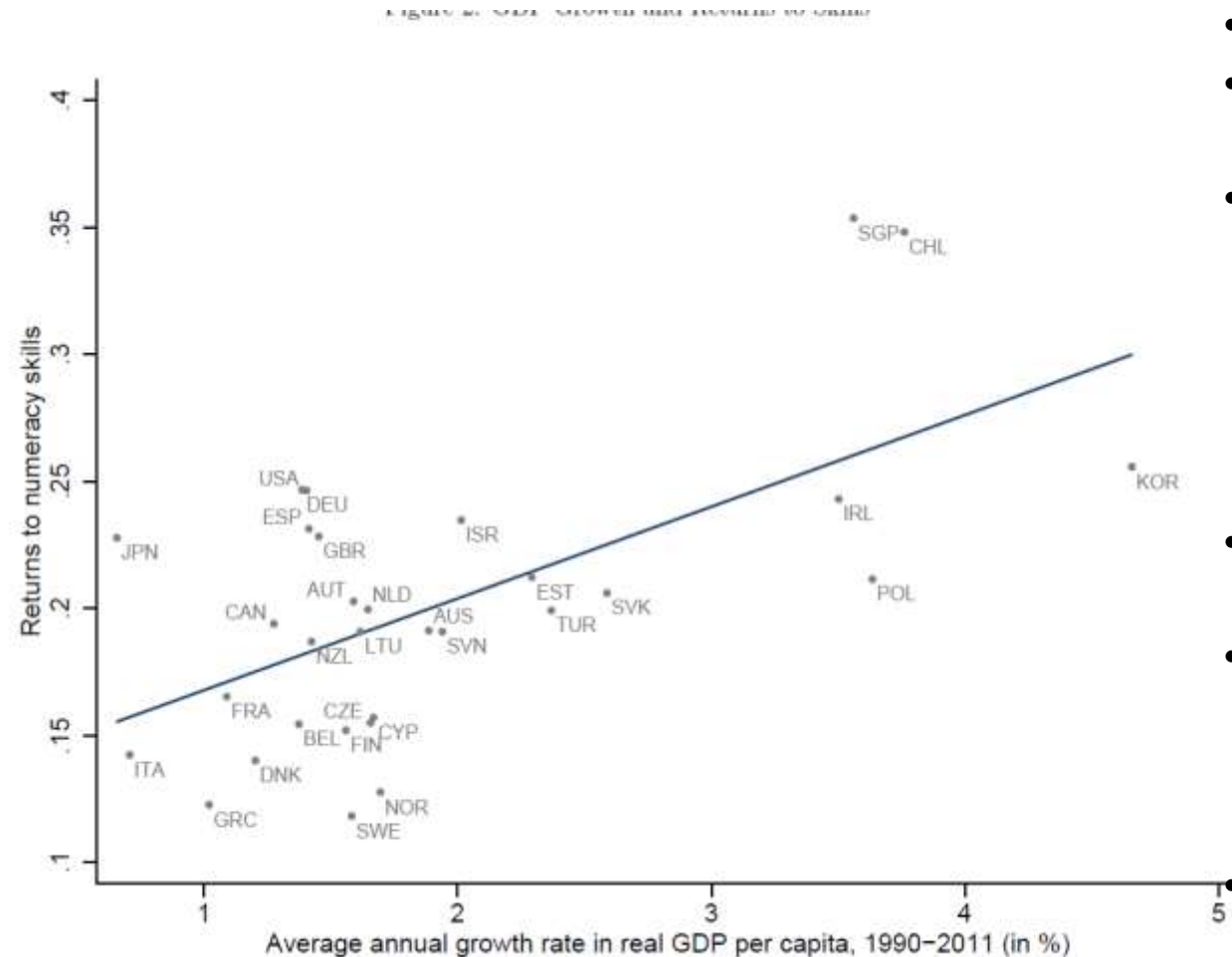
# Who are the skill workers in small firms in Developing Countries? Evidence from Bangladesh

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# Motivation



- Human capital → Economic growth
- Human capital captured by years of schooling
- Impact of one more year of schooling on income differs significantly across countries → learning outcomes

→ Cognitive skills

- Literacy and numeracy skills
- Schooling variables become insignificant when measures of cognitive skills are used in models (Hanushek, 2008)

**High returns to cognitive skills!**

Source: Hanushek et al. (2016)

# Measurement of cognitive skill in developing countries

- Cognitive skill : “Ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by thoughtful engagement.”
  - ➔ Literacy, numeracy, and the ability to solve abstract problems are used to capture cognitive skills.
  - ➔ Not a very good proxy for “skill” for the workers with little education in developing countries
  - ➔ Literature on skills (returns to skill, skill production function, etc.) is thin for developing countries

# Job-relevant skills

- Task-related and build on a combination of cognitive and socio-emotional skills.
- The World Bank survey (STEP) asks workers about their use of such skills on the job (computer use, repair and maintenance of electronic equipment, operation of heavy machinery, client contact, solving and learning, and supervision).
- 0-3 scale: 0 = not use, 1 for low, 2 for medium, and 3 for high use.
- Self reported measure of skills → Suffer from reporting bias (upward)
- Hard to measure job relevant skills!

# Survey of Adult Skills (PIAAC)

- Programme for the International Assessment of Adult Competencies (PIAAC)
- PIAAC assesses three domains of cognitive skill: Literacy (including reading components), Numeracy, **Problem solving in technology-rich environments**
- ➔ **Hard to measure skills in low tech environment!**

Table 1: Returns to Skills in Second-Round PIAAC Countries

	Pooled	Chile	Greece	Indonesia <sup>a</sup>	Israel	Lithuania	New Zealand	Singapore	Slovenia	Turkey
Numeracy	.200*** (.003)	.380*** (.026)	.107*** (.021)	.249*** (.028)	.281*** (.016)	.165*** (.016)	.189*** (.011)	.455*** (.013)	.191*** (.011)	.202*** (.027)
Experience	.028*** (.001)	.019 (.012)	.026** (.010)	.045*** (.011)	.034*** (.007)	.015 (.012)	.023*** (.007)	.049*** (.007)	.009 (.007)	.075*** (.010)
Experience <sup>2</sup>	-.052*** (.003)	-.027 (.032)	-.046* (.025)	-.089*** (.029)	-.055*** (.017)	-.033 (.027)	-.042*** (.014)	-.110*** (.017)	-.024 (.016)	-.173*** (.028)
Female	-.145*** (.005)	-.116** (.051)	-.055 (.039)	-.261*** (.063)	-.082** (.032)	-.217*** (.035)	-.116*** (.023)	-.158*** (.028)	-.071*** (.021)	-.009 (.068)
R <sup>2</sup>	.218	.365	.099	.171	.277	.158	.265	.480	.215	.208
Observations	45064	903	623	806	908	1260	1204	1507	1306	674

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

*Notes:* Least squares regressions weighted by sampling weights. Dependent variable: log gross hourly wage. Sample: full-time employees aged 35-54. Pooled specification includes all 32 PIAAC countries; includes country fixed effects and gives same weight to each country. Numeracy score standardized to std. dev. 1 within each country. Experience<sup>2</sup> divided by 1000. R<sup>2</sup> refers to within-country R<sup>2</sup>. Robust standard errors in parentheses. <sup>a</sup>Jakarta only. *Data source:* PIAAC 2016.

Source: Hanushek, 2016

# Our indirect measure of skill: Managers'/owners' perception

In small firms, managers or the owners who run the factories know best!

→ observe the “unobserved” ability which is unknown to researchers

- Managers/owners select us the workers with variations in proficiency (skill) level within a occupation
- Managers/owners were asked to scale the level of proficiency scale on 1-10 scale (higher value implies more proficient)
- Converted 1-10 scale to z-score with mean= 0 and std. dev. =1
- Better capture the relative proficiency of the workers?

# Data

- Labor Market Study under Skills for Employment Investment Programme (SEIP)
- Light Engineering: Capital machinery, construction equipment, spare parts for automobiles/factories/agro-processing, body for bus/car/van
- Electronics: Light, fan, battery, generators, electric meters
  
- Firm linked workers survey
- Firms: 190 ; Workers: 2398 [Workers per firm: 12.6]
- How firms were selected: Randomly picked from 4 regions:
  - Dhaka, Gazipur, Narayanganj
  - Chittagong
  - Bogura, Natore
  - Jessore, Khulna, Jhenaidah

## Summary statistics (Firm survey)

Annual revenue per firm: Taka 1.98 Crore  
(electronics is larger than LE)

Number of employees per firm: 41

Share of female workers: 3%

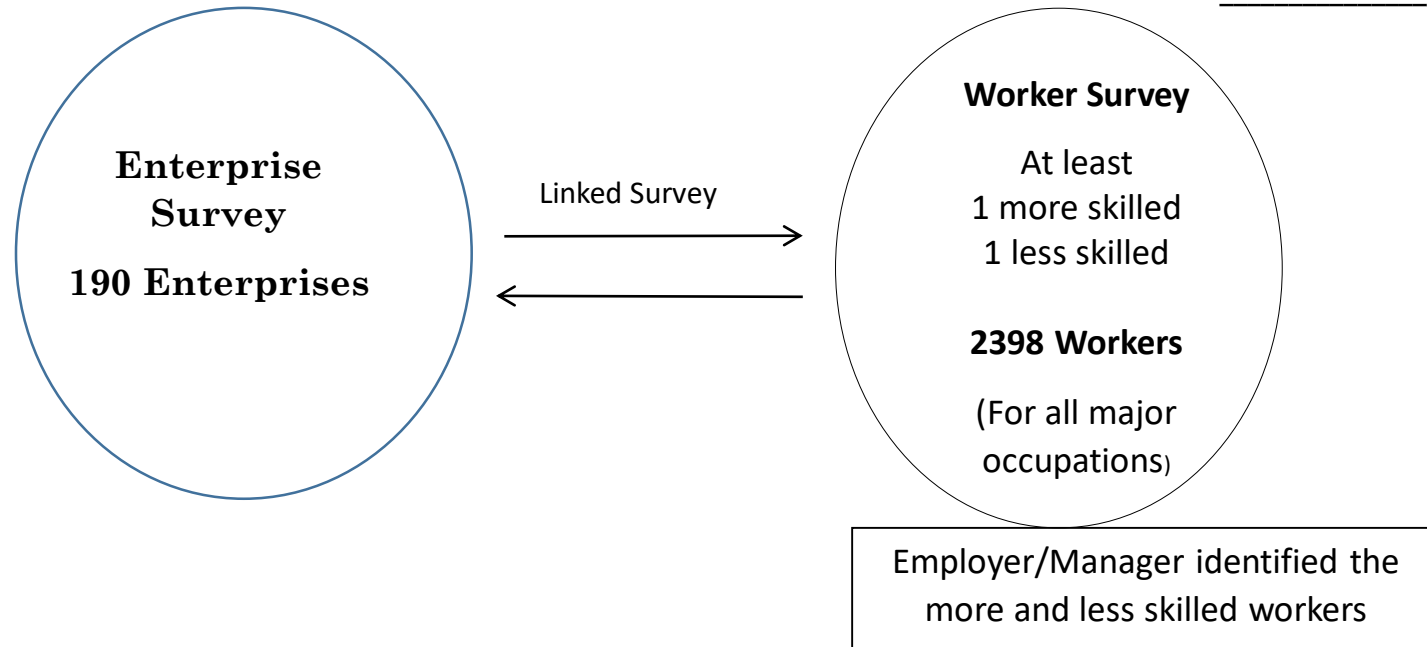
Capital-labor ratio: Taka 23 lacs  
(electronics is more capital intensive)





# How workers were selected

Occupational Category	Freq.	Percent	Cum.
Managers	86	3.59	3.59
Professionals	20	0.83	4.42
Technicians and associate professionals	358	14.93	19.35
Service and sales workers	20	0.83	20.18
Craft workers & plant operators	1,914	79.82	100.00
<b>Total</b>	<b>2,398</b>	<b>100.00</b>	



# Skill premium

- *Monthly salary  $ij = \beta_0 + \beta_1 \text{ skill measure} + \beta_2 \text{ education} + \beta_3 \text{ training} + \beta_4 \text{ experience} + \beta_5 \text{ demographics} + \beta_6 \text{ Occupation categories} + \beta_7 \text{ physical labor} + \beta_8 \text{ health} + \theta_j + u_{ij}$*
- No well defined organogram, wide variations within occupation categories
- Physical labor: 1-10 scale



## Summary stats of the workers (regression sample)

Variable	Obs	Mean	Std. Dev.
Monthly salary (Taka)	2331	<b>13003.935</b>	6239.149
Skill measure (z-score)	2331	-.045	.997
Gender (male)	2331	.949	.221
Age (years)	2331	32.327	10.545
Chronic diseases (dummy)	2331	.06	.238
Extent of physical labor (1-10 scale)	2331	6.176	1.332
Parents' education (years)	2331	3.091	3.245
<b>Worker's years of education</b>	<b>2331</b>	<b>6.604</b>	<b>3.501</b>
<b>Vocational training (dummy)</b>	<b>2331</b>	<b>.07</b>	<b>.256</b>
<b>Experience (# of months)</b>	<b>2331</b>	<b>157.397</b>	<b>110.415</b>
Occupational categories			
Managers	2331	.036	.187
Professionals	2331	.009	.092
Technicians and Associate Professionals	2331	.153	.36
Service and sales	2331	.009	.092
Craft and plant workers	2331	.794	.405
Personal relationship with workers (z-score)	2331	-.02	1.025
PSC or class 5 passed	1170	.731	.444
JSC or class 8 passed	1170	.482	.5
SSC passed	1170	.256	.437
Experience in all past jobs (months)	1170	62.305	81.131
Experience in current jobs (months)	1850	88.075	75.337
No. of promotions in the current job	1850	.634	.64
Vocational training (days)	1170	9.226	39.337

Table: Skill Premium (Dependent variable: Monthly salary)

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
<b>Skill measure (z-score)</b>	<b>2,350.496***</b> <b>(127.334)</b>	<b>2,277.953***</b> <b>(131.373)</b>	<b>1,587.081***</b> <b>(128.373)</b>
Gender (male)		499.463 (605.501)	393.241 (597.986)
Age (years)		33.012*** (11.380)	-40.415*** (12.027)
Chronic diseases (dummy)		445.359 (622.886)	-333.760 (600.791)
Extent of physical labor	-607.330*** (177.075)	-617.934*** (179.479)	-554.874*** (175.715)
Parents' education (years)			109.498*** (41.426)
Years of education			<b>75.958**</b> (34.369)
Vocational training (dummy)			291.530 (418.059)
Experience (# of months)			<b>19.850***</b>
Observations	2,395	2,331	2,331
R-squared	0.359	0.363	0.450
Number of firms	190	190	190

Significant skill premium!

All models are controlled for and firm FEs and occupational categories

# Skill production function

- *Skill measure*  $_{ij} = \beta_0 + \beta_1 \text{ education} + \beta_2 \text{ training} + \beta_3 \text{ experience} + \beta_4 \text{ demographics} + \beta_5 \text{ Occupation categories} + \beta_6 \text{ physical labor} + \beta_7 \text{ health} + \beta_8 \text{ relationship with manager} + \theta_j + u_{ij}$
- Role of education, training and experiences (learning by doing)
- Relationship with manager: 1-10 scale, higher value implies better relationship
- Managers can give higher scores to workers who are in their good book but not necessarily high skilled

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
Years of education		-0.002			0.006
		(0.006)			(0.006)
Vocational training (dummy)			<b>0.129*</b>		<b>0.130*</b>
			(0.076)		(0.071)
Months of experiences				<b>0.003***</b>	<b>0.003***</b>
				(0.000)	(0.000)
Personal relationship with manager (z-score)	<b>0.377***</b>	<b>0.378***</b>	<b>0.375***</b>	<b>0.324***</b>	<b>0.320***</b>
	(0.038)	(0.038)	(0.037)	(0.034)	(0.033)
Gender (male)	-0.019	-0.016	-0.020	-0.018	-0.027
	(0.110)	(0.112)	(0.110)	(0.091)	(0.092)
Age (years)	<b>0.011***</b>	<b>0.011***</b>	<b>0.011***</b>	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Parents' education	-0.006	-0.006	-0.007	0.007	0.006
	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)
Extent of physical labor	<b>-0.068***</b>	<b>-0.068***</b>	<b>-0.069***</b>	<b>-0.054**</b>	<b>-0.053**</b>
	(0.025)	(0.025)	(0.025)	(0.023)	(0.023)
Chronic diseases (dummy)	<b>0.262***</b>	<b>0.262***</b>	<b>0.261***</b>	0.096	0.094
	(0.075)	(0.075)	(0.075)	(0.067)	(0.068)
Control for occupational categories	Yes	Yes	Yes	Yes	Yes
Observations	2,331	2,331	2,331	2,331	2,331
R-squared	0.173	0.173	0.174	0.268	0.270
Number of firms	190	190	190	190	190

Table: Skill Production Function (Dependent variable: Measure of skill (z-score))

- Experience is the key determinant
- Vocational training matters
- Years of education has no role

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
VARIABLES	Electronics	Light Engineering	Larger firms (output)	Smaller firms (output)	Larger firms (employment)	Smaller firms (employment)	Blue collar jobs	Non-blue collar jobs	Table: Impact heterogeneity (Dependent variable: Skill measures (z-score))
Years of education	0.012 (0.010)	-0.002 (0.009)	0.002 (0.008)	0.013 (0.011)	0.005 (0.007)	0.010 (0.011)	0.011 (0.008)	-0.010 (0.010)	
Vocational training (dummy)	<b>0.221**</b> (0.091)	0.038 (0.083)	0.048 (0.079)	<b>0.184*</b> (0.108)	0.064 (0.075)	<b>0.213*</b> (0.121)	0.109 (0.095)	<b>0.235*</b> (0.139)	
<b>Experiences (months)</b>	<b>0.003***</b> (0.000)	<b>0.003***</b> (0.000)	<b>0.003***</b> (0.000)	<b>0.004***</b> (0.000)	<b>0.003***</b> (0.000)	<b>0.004***</b> (0.000)	<b>0.004***</b> (0.000)	<b>0.003***</b> (0.000)	
Relationship with workers (z-score)	0.442*** (0.048)	0.199*** (0.040)	0.261*** (0.043)	0.412*** (0.053)	0.328*** (0.044)	0.320*** (0.050)	0.360*** (0.035)	0.204*** (0.071)	Blue collar jobs: Craft workers and plant operators
Gender (male)	0.516*** (0.115)	-0.219** (0.103)	-0.101 (0.100)	0.204 (0.222)	0.004 (0.111)	-0.082 (0.161)	-0.020 (0.104)	-0.130 (0.151)	
Age (years)	-0.002 (0.004)	-0.004 (0.003)	-0.002 (0.003)	-0.008* (0.004)	-0.002 (0.003)	-0.005 (0.003)	-0.005* (0.003)	0.001 (0.004)	
Parental education	-0.001 (0.009)	0.011 (0.009)	0.013 (0.009)	-0.005 (0.010)	0.005 (0.008)	0.004 (0.011)	0.004 (0.008)	0.007 (0.012)	Vocational training matters more in smaller firms and for non-blue collar jobs
Extent of physical labor	-0.028 (0.026)	-0.125** (0.047)	-0.034 (0.031)	-0.057* (0.033)	-0.024 (0.031)	-0.079** (0.034)	-0.044 (0.030)	-0.108** (0.051)	
Chronic diseases	0.108 (0.077)	0.068 (0.140)	0.085 (0.112)	0.112 (0.091)	0.101 (0.093)	0.067 (0.104)	0.066 (0.081)	0.320** (0.136)	
Control for occupational categories	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Observations	1,405	926	1,170	1,147	1,182	1,100	1,850	481	
R-squared	0.328	0.225	0.242	0.309	0.290	0.263	0.262	0.193	
Number of firms	117	73	92	98	90	98	189	142	

VARIABLES	PSC		JSC		SSC	
	larger firms	smaller firms	larger firms	smaller firms	larger firms	smaller firms
PSC or class 5 passed	0.040 (0.066)	0.076 (0.064)				
JSC or class 8 passed			<b>0.144**</b> (0.061)	0.059 (0.077)		
SSC passed					<b>0.185***</b> (0.067)	<b>0.132*</b> (0.073)
Vocational training (dummy)	0.050 (0.079)	0.184* (0.107)	0.044 (0.079)	0.187* (0.108)	0.040 (0.080)	0.184* (0.111)
Experiences (months)	0.003*** (0.000)	0.004*** (0.000)	0.003*** (0.000)	0.004*** (0.000)	0.003*** (0.000)	0.004*** (0.000)
Relationship with workers (z-score)	0.260*** (0.043)	0.415*** (0.053)	0.256*** (0.043)	0.415*** (0.053)	0.263*** (0.042)	0.413*** (0.052)
Gender (male)	-0.098 (0.099)	0.215 (0.222)	-0.110 (0.102)	0.216 (0.224)	-0.094 (0.098)	0.217 (0.224)
Age (years)	-0.002 (0.003)	-0.008* (0.004)	-0.002 (0.003)	-0.008* (0.004)	-0.002 (0.003)	-0.008* (0.004)
Extent of physical labor	-0.034 (0.031)	-0.060* (0.033)	-0.030 (0.031)	-0.059* (0.033)	-0.026 (0.031)	-0.055* (0.033)
Chronic diseases	0.085 (0.112)	0.120 (0.090)	0.076 (0.112)	0.114 (0.090)	0.073 (0.113)	0.110 (0.090)
Observations	1,170	1,147	1,170	1,147	1,170	1,147
R-squared	0.243	0.309	0.247	0.309	0.247	0.310
Number of firms	92	98	92	98	92	98

## Robustness checks with alternate education vars.

Table: Impact heterogeneity by education and firm size (Dependent variable: Skill measures (z-score))

Education matters mostly if the workers are SSC passed

Impact is more pronounced for larger firms



	(1)	(2)	(3)	(4)	(5)	(6)
	PSC	PSC	JSC	JSC	SSC	SSC
VARIABLES	Blue collar jobs	Non-blue collar jobs	Blue collar jobs	Non-blue collar jobs	Blue collar jobs	Non-blue collar jobs
PSC or class 5 passed	0.039	0.233*				
	(0.048)	(0.133)				
JSC or class 8 passed			<b>0.113**</b>	0.025		
			(0.052)	(0.118)		
SSC passed					<b>0.160**</b>	<b>0.233**</b>
					(0.062)	(0.109)
Vocational training (dummy)	0.112	0.212	0.105	0.223	0.106	0.196
	(0.096)	(0.139)	(0.096)	(0.142)	(0.096)	(0.140)
Experiences (months)	0.004***	0.003***	0.004***	0.003***	0.004***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relationship with workers (z-score)	0.361***	0.203***	0.357***	0.201***	0.361***	0.205***
	(0.035)	(0.071)	(0.035)	(0.072)	(0.034)	(0.071)
Gender (male)	-0.006	-0.156	-0.016	-0.142	-0.005	-0.121
	(0.103)	(0.147)	(0.104)	(0.151)	(0.101)	(0.160)
Age (years)	-0.006*	0.001	-0.006**	0.001	-0.006**	0.000
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
Parental education	0.006	0.002	0.002	0.005	0.003	-0.001
	(0.008)	(0.012)	(0.008)	(0.013)	(0.008)	(0.013)
Extent of physical labor	-0.046	-0.110**	-0.042	-0.105**	-0.039	-0.092*
	(0.030)	(0.051)	(0.030)	(0.051)	(0.030)	(0.050)
Chronic diseases	0.067	0.323**	0.057	0.316**	0.055	0.325**
	(0.081)	(0.133)	(0.081)	(0.137)	(0.081)	(0.128)
Observations	1,850	481	1,850	481	1,850	481
R-squared	0.261	0.197	0.263	0.192	0.263	0.202
Number of firms	189	142	189	142	189	142

Table: Impact heterogeneity by education and occupational categories

(Dependent variable: Skill measures (z-score))

SSC !

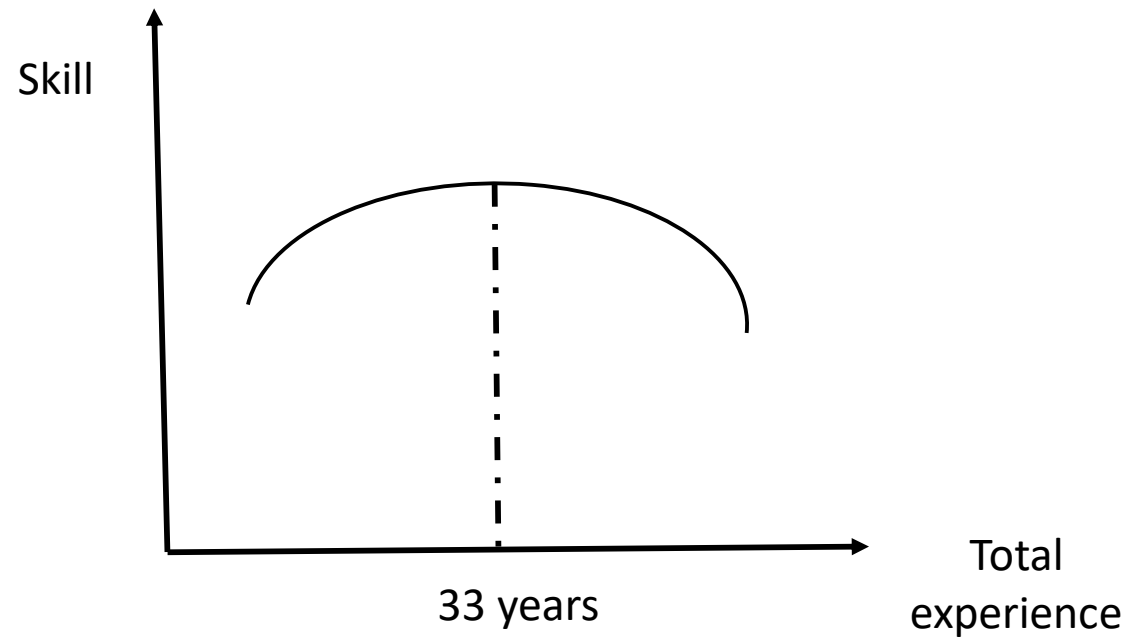
## Robustness checks with alternate experience vars.

Table: Impact heterogeneity by experience and firm size

(Dependent variable: Skill measures (z-score))

	Past experience	Past experience	Current experience	Current experience	# of promotions in current job	# of promotions in current job
VARIABLES	larger firms	smaller firms	larger firms	smaller firms	larger firms	smaller firms
Experience in all past jobs (months)	<b>0.003***</b>	<b>0.002***</b>				
Experience in current job (months)			<b>0.003***</b>	<b>0.002***</b>		
			(0.001)	(0.000)		
No. of promotions in the current job					<b>0.119***</b>	<b>0.076**</b>
					(0.040)	(0.037)
Education (years)	-0.000	0.003	-0.001	0.005	-0.003	0.001
	(0.008)	(0.011)	(0.008)	(0.011)	(0.008)	(0.011)
Vocational training (dummy)	0.050	0.161	0.052	0.184	0.048	0.180
	(0.084)	(0.112)	(0.083)	(0.115)	(0.085)	(0.114)
Relationship with workers (z-score)	<b>0.272***</b>	<b>0.471***</b>	<b>0.287***</b>	<b>0.479***</b>	<b>0.294***</b>	<b>0.500***</b>
	(0.045)	(0.056)	(0.044)	(0.058)	(0.046)	(0.060)
Gender (male)	-0.079	0.281	-0.139	0.337	-0.119	0.344
	(0.103)	(0.260)	(0.119)	(0.266)	(0.119)	(0.278)
Age (years)	0.002	0.009*	0.002	0.010**	0.005*	0.017***
	(0.003)	(0.005)	(0.003)	(0.004)	(0.003)	(0.004)
Extent of physical labor	-0.032	-0.060*	-0.050	-0.073**	-0.050	-0.068*
	(0.032)	(0.034)	(0.035)	(0.034)	(0.036)	(0.034)
Chronic diseases	0.102	0.201**	0.244*	0.141	0.255*	0.203**
	(0.126)	(0.096)	(0.126)	(0.090)	(0.134)	(0.092)
Observations	1,170	1,147	1,170	1,147	1,170	1,147
R-squared	0.197	0.259	0.172	0.257	0.146	0.239
Number of firms	92	98	92	98	92	98

	(1)	(2)	(3)
VARIABLES	Model 1	Model 2	Model 3
Experience	0.008*** (0.001)		
Experience square	<b>-0.0001***</b> (0.000)		
Past experience		0.005*** (0.001)	
Past experience square		<b>-0.000***</b> (0.000)	
Current experience			0.006*** (0.001)
Current experience square			<b>-0.000***</b> (0.000)
Other controls	Yes	Yes	Yes
Observations	2,331	2,331	2,331
R-squared	0.296	0.225	0.216
Number of firm	190	190	190



**Table : Nonlinearity in experiences**  
(Dependent variable: Skill measures (z-score))

	(1)	(2)	(3)	(4)
	length of training	length of training	length of training	length of training
VARIABLES	Larger firms	Smaller firms	Blue collar job	Non-blue collar jobs
Vocational training (days)	0.000	<b>0.001*</b>	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Education (years)	0.002	0.013	0.012	-0.009
	(0.008)	(0.011)	(0.008)	(0.010)
Experiences (months)	0.003***	0.004***	0.004***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Relationship with workers (z-score)	0.261***	0.414***	0.361***	0.207***
	(0.043)	(0.054)	(0.035)	(0.072)
Gender (male)	-0.101	0.205	-0.019	-0.126
	(0.100)	(0.223)	(0.105)	(0.152)
Age (years)	-0.002	-0.008*	-0.005*	0.001
	(0.003)	(0.004)	(0.003)	(0.004)
Parental education	0.012	-0.005	0.004	0.006
	(0.009)	(0.010)	(0.008)	(0.012)
Extent of physical labor	-0.034	-0.055	-0.042	-0.106**
	(0.031)	(0.033)	(0.030)	(0.052)
Chronic diseases	0.085	0.106	0.063	0.333**
	(0.111)	(0.090)	(0.082)	(0.134)
Observations	1,170	1,147	1,850	481
R-squared	0.242	0.309	0.262	0.188
Number of firms	92	98	189	142

## Robustness checks with alternate training vars.

Table: Impact heterogeneity of training by firm size and occupational categories

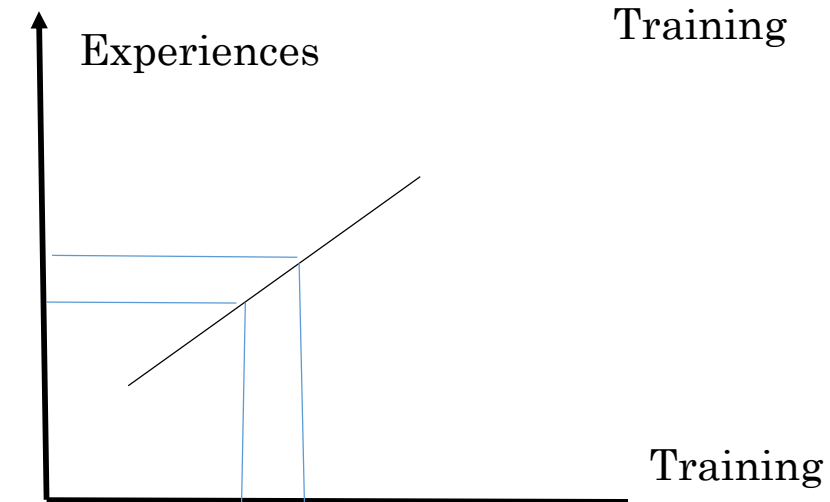
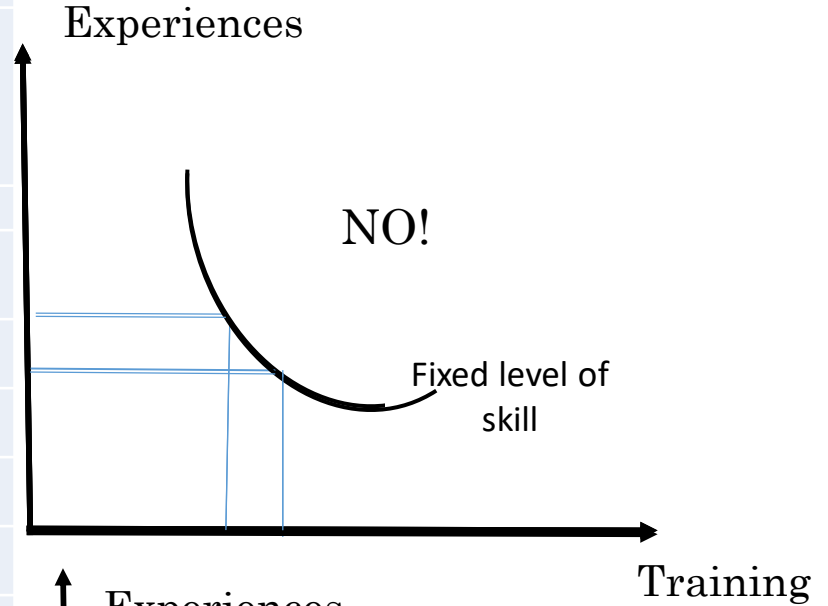
(Dependent variable: Skill measures (z-score))

Smaller firms!

# Can training substitute experiences?

Table: Substitutability between exp. and training  
(Dependent variable: months of experiences)

VARIABLES	(1) Total exp.	(2) Total exp. Large firms	(3) Total exp. Small firms	(4) Total exp. Blue collar	(5) Total exp. Non-blue collar	(6) Past exp. Non-blue collar	(7) Current exp. Non-blue collar
Vocational training	6.631 (7.825)	2.316 (12.027)	11.372 (8.934)	-6.276 (8.559)	<b>43.019**</b> (19.358)	2.580 (15.114)	<b>40.439***</b> (14.839)
Skill measure	<b>35.732***</b> (2.226)	<b>37.279***</b> (3.181)	<b>28.887***</b> (3.333)	<b>33.146***</b> (2.253)	<b>41.236***</b> (5.799)	<b>21.892***</b> (4.804)	<b>19.344***</b> (4.585)
Gender	-1.587 (9.855)	-1.270 (10.423)	23.697 (26.298)	-2.452 (10.020)	-13.951 (36.502)	-39.849 (30.479)	<b>25.898**</b> (10.916)
Age	<b>4.156***</b> (0.377)	<b>2.345***</b> (0.479)	<b>6.605***</b> (0.463)	<b>4.587***</b> (0.364)	<b>1.664**</b> (0.764)	0.839 (0.531)	0.825 (0.529)
Occupational categories	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,331	1,170	1,147	1,850	481	481	481
R-squared	0.348	0.240	0.554	0.385	0.160	0.094	0.096
Number of firms	190	92	98	189	142	142	142

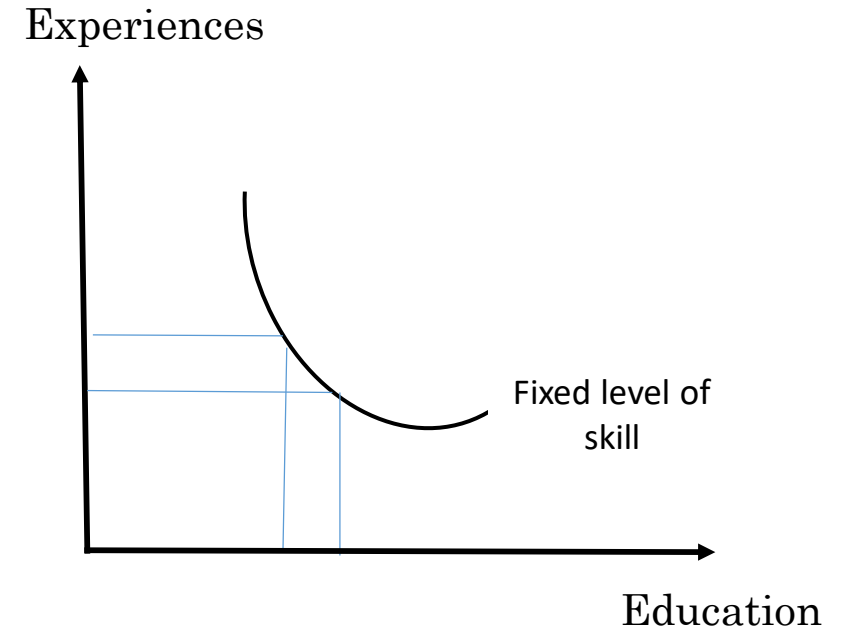


# Can education substitute training?

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Years of education	<b>-3.106***</b> (0.669)			
PSC/class 5 passed		<b>-18.646***</b> (4.012)		
JSC/class 8 passed			<b>-24.334***</b> (4.196)	
SSC passed				<b>-49.696***</b> (6.174)
Skill measure	35.712*** (2.221)	35.815*** (2.211)	36.010*** (2.240)	35.704*** (2.171)
Female	2.576 (9.808)	-1.464 (9.978)	0.435 (9.789)	-1.917 (9.816)
Age	4.066*** (0.370)	4.091*** (0.375)	4.151*** (0.376)	4.087*** (0.372)
Extent of physical labor	-2.010 (2.311)	-1.436 (2.300)	-2.066 (2.297)	-3.783* (2.256)
Constant	81.652*** (27.546)	66.547** (27.327)	70.212*** (26.834)	104.602*** (28.033)
Occupational categories	Yes	Yes	Yes	Yes
Observations	2,331	2,331	2,331	2,331
R-squared	0.356	0.354	0.358	0.375
Number of firms	190	190	190	190

Table: Substitutability between education and experiences  
(Dependent variable: Months of experience)

**Significant substitutability!**



# Soft skills (Socio-emotional skills)

## Do the managers care about soft skills?

Table: Dependent variable:  
skill measure (z-score)

VARIABLES	(1) Full sample	(2) Full sample	(3) Larger firms	(4) Smaller firms	(5) Blue collar jobs	(6) Non-blue collar jobs
Extroversion	-0.024 (0.024)	-0.011 (0.019)	-0.010 (0.019)	-0.040 (0.042)	-0.001 (0.024)	-0.045 (0.038)
Agreeableness	0.038 (0.024)	0.004 (0.020)	0.013 (0.022)	-0.031 (0.045)	-0.018 (0.022)	0.054 (0.042)
Conscientiousness	<b>0.085***</b> (0.027)	<b>0.078***</b> (0.024)	<b>0.086***</b> (0.026)	0.061 (0.085)	<b>0.075**</b> (0.029)	0.020 (0.044)
Neuroticism	0.039 (0.025)	0.032 (0.022)	0.026 (0.024)	0.073 (0.042)	0.016 (0.021)	0.075 (0.050)
Open to experience	<b>0.115***</b> (0.042)	<b>0.079**</b> (0.039)	0.060 (0.036)	0.172 (0.136)	0.072 (0.050)	<b>0.108*</b> (0.056)
Other controls	No	Yes	Yes	Yes	Yes	Yes
Constant	-2.392*** (0.514)	-1.288** (0.571)	-1.800*** (0.566)	0.624 (1.790)	-1.378* (0.727)	-0.358 (1.097)
Observations	933	926	740	172	664	262
R-squared	0.049	0.246	0.235	0.371	0.222	0.265
Number of firms	73	73	59	14	72	55

**Extroversion:** High scorers tend to be very social while low scorers prefer to work on their projects alone.

**Agreeableness:** Individuals adjust their behavior to suit others. High scorers are typically polite and like people.

**Conscientiousness:** Honest and hardworking. High scorers tend to follow rules.

**Neuroticism:** Very emotional. High scorers tend to have high emotional reactions to stress

**Openness to Experience:** Seeking new experiences and intellectual pursuits.

# Summary of results

- There is significant skill premium controlling for firm, occupation and physical labor
- Validates that managers'/owners' perceptions about skills of the workers are good measures of workers' proficiency
- Experience is most significant predictor of skill level
- Non-linearity of impact → impact is positive up to 33 years of exp.
- Education matters mostly if the workers are at least SSC passed
- Vocational training also matters but impact varies with size of firms, occupational categories, education level of the workers.
- Vocational training matters more for non-blue collar jobs in smaller firms
- There are strong indications that there is substitutability between education and experiences, but not between training and experiences
- To achieve same level of skills, one more year of education can substitute 3 months of experiences! Degree of substitutability is higher for higher level of education
- Managers also care about soft skills: Conscientiousness and Open to experiences.



# Conclusion (Policy implications)

- Education below SSC does not have impact → level of “learning” is very low (NSA, 2017)
  - Improvement of quality of primary and secondary education
  - Vocational training does not have impact for blue color jobs (floor workers), only has impact for non-blue color.
- Share of workers with vocational training is very low: 7%  
[LFS 2016-17: Share of workers who received any training in last 12 months: 3.65%]
  - Experiences (learning by doing) is the prime determinant of skill
    - This is not a policy variable!
    - Only education can make up for years of experiences!
- Formal education is the key! We are focusing too much on short term solutions (short training )!