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Education, Skill and Productivity: Further Evidence from Ghana

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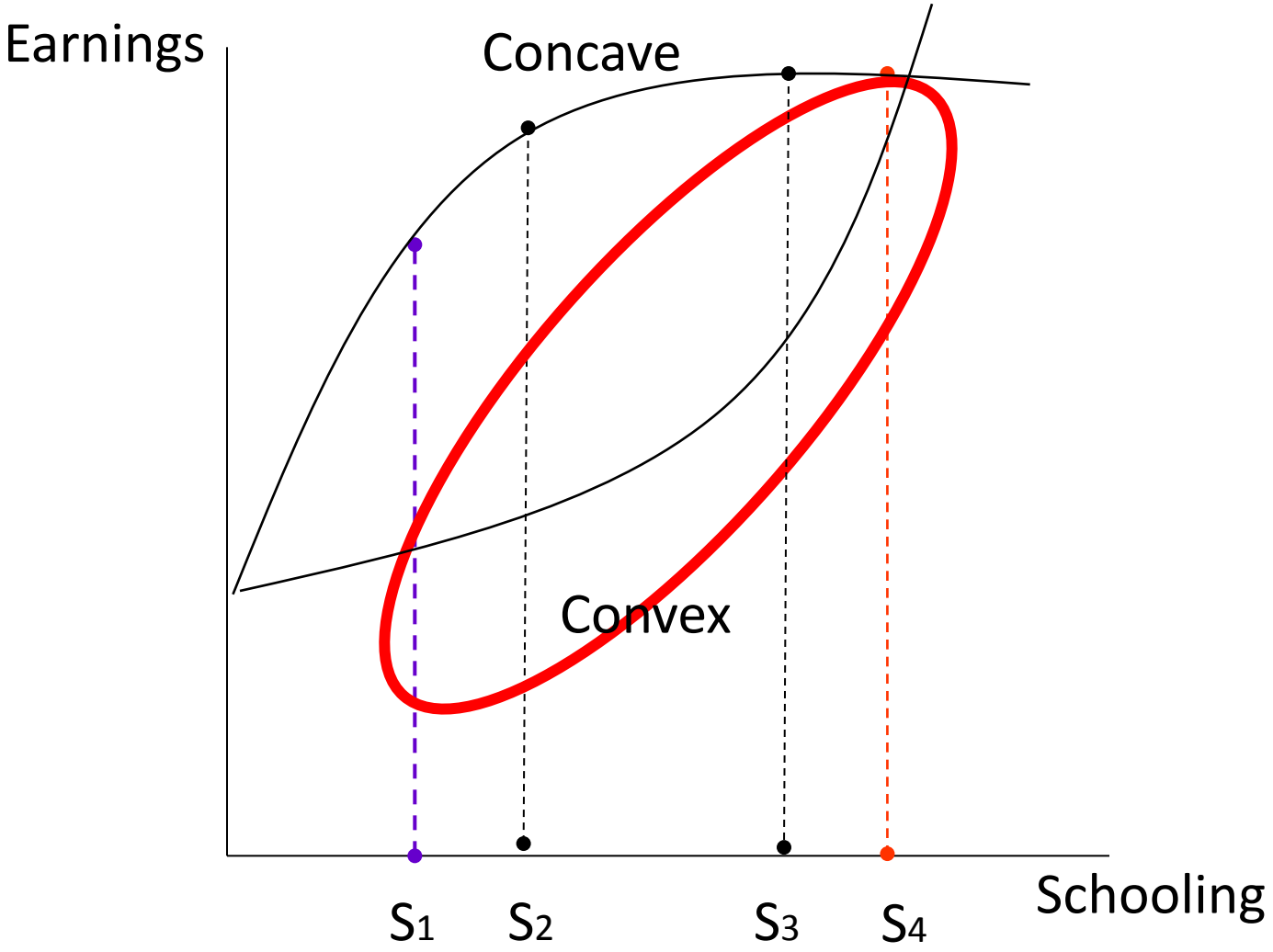
Background and outline

- This paper is part of the 3 country papers for Ghana on L2C
- Tests the education and earnings relationship and the education and firm productivity relationship for Ghana
  - Discusses literature briefly
  - Gives a brief context
  - Empirics
  - Results so far

Education and Earnings-brief literature

- Human capital is vital for firm productivity and is accumulated in two ways: experience and education: Seminal works by Becker (1962, 1964) and Mincer (1974)
- Empirical studies suggest that the relationship between education and earnings for most countries was concave
- Evidence, from developing countries however, shows concavity and convexity, in Africa
  - Falling Returns to education for some countries Moll (1996) South Africa Appleton *et.al.* (1999) Soderbom *et. al.* (2006Kenya's urban labour) Appleton *et.al.* (1999) for Kenya.
  - A rising returns to education for others; Appleton *et.al.* (1999) Uganda, Canagarajah and Thomas (1997) Ghana from 1987 to 1991. Sackey (2008) for Ghana within 1992-1999 and Soderbom *et. al.* (2006) for Tanzania

Earning Educations Changing Profile



- Convexity implies that skill shortages persist at higher educational levels.
- This justifies the call for more research into returns to higher education in Africa to ascertain new emerging trends (Diagne and Diene, 2011 and Ajakaiye and Kimenyi 2011).

Education and Productivity-literature and issues

- Skilled employees are a means to enhance firm productivity (Bassi and McMurrer 2004, Kuruvilla and Erickson, 2002).
- Welch 1970, Ram 1980 and Corvers 1997 all show that education is important for productivity.
- Corvers discusses the four effects of human capital on labour productivity.
  - The worker effect {the positive MPL as a result of education }
  - The allocative effect {ability of educated workers to more efficiently allocate input factors of production to the production process}
  - The diffusion effect and
  - research effect {educated workers are better at implementing new ideas.} Bartel and Lichtenberg, (1987),

- However, just as education and earnings literature; empirics here as well is not too clear Pack and Paxson (1999) Gottesman and Morrey (2006) Bhogat et al (2010).
- Two particularly interesting (albeit old but recurring) but puzzling questions posed by the literature and observations in developing countries are the following:
  1. Does higher education have higher returns in developing countries?
  2. To what extent does the educational level of the firm manager and workers influence the performance of the firm?"
- This paper seeks to find answers to the two questions for Ghana.

Context Ghana: Brief Overview

- In Ghana, the importance of education to economic growth and development has been recognized since independence (1957).
- The Seven-Year Development Plan for Ghana (1963/64-1969/70), in particular, identified human capital formation as a critical factor in the growth and development.
- By 1990s policies (e.g. FCUBE) were geared towards MDG, Gross enrolment increased to 94% in primary school and 77% in junior secondary schools by 2006.
- According to Killick (2010), *'comparative enrolment ratios in primary and secondary education for thirteen West African states, relating to the late fifties, showed Ghana's primary school rates to be double those of the next highest-ranking country…..'*
- However Ghana has not enjoyed commensurate skills development levels.
- Could this have been the reason why Ghana has since struggled to industrialize?
- Clearly there is need for further empirical studies in the earnings education literature.

Econometric Framework

- The empirical framework adopted is two-fold:
- First to re-examine the effect of education on earnings in Ghana, we estimate the basic Mincerian equation of returns to education using data from the most recent Ghana household survey (GLSS V). We augment the basic model with locational dummies and also estimate the model over occupational sub-samples for robustness.
- Second to test the effect of education of the firm manager and workers on firm performance we adopt and estimate a modified version of the production function framework by Corvers (1997). We use the World Bank Enterprise Survey data. It is a cross sectional data on 313 Ghanaian manufacturing firms collected in 2007

$$\ln w = \alpha + \beta_0 E + \beta_1 A + u$$

$\ln w =$ log real monthly wage

$E =$ educational attainment; this is decomposed into 4 groups;

- none persons who have not completed primary school,
- Primary school completion,
- Junior secondary indicates persons who have completed three (3) additional post primary years
- Secondary includes those who have completed secondary school or higher (includes all tertiary education).

$A =$ a vector of other explanatory variables including, experience, gender, unskilled workers, and locational dummies.

Education and firm productivity

- Estimate a modified Covers
- Covers (1997) accounted for worker effect, allocative effect, diffusion effect and research effect
- In this paper we restrict the estimation to worker and allocative effects
- Extended to cover sector and firm ownership

$$ln\frac{Y_i}{Li} = lnA + aln\left(\frac{K_i}{L_i}\right) + (\propto + \beta - 1)lnL_i + \emptyset_1\ lnL_{manedu,i} + \emptyset\ L_{training,i} + \emptyset_3\ lnL_{aveeduc,i} + \beta\emptyset_4\ L_{skillshare,i} + \beta\emptyset_5\ L_{sector,i} + \beta\emptyset_6\ L_{firmown,i} + v_i$$

Education & Earnings Summary Stats

Education and earnings across regions			
Region	Real mean monthly wage (old cedi)	Real mean monthly wage (USD)	Years of schooling
Western	205997	76.0	8.843
Central	217773.9	80.4	8.29
Gt. Accra	432671.1	159.7	11.15
Volta	124953.4	46.1	8.05
Eastern	204169.7	75.3	8.69
Ashanti	232199.5	85.7	9.17
Brong Ahafo	214841	79.3	8.85
Northern	226354.6	83.5	8.37
Upper East	102838.2	37.9	7.83
Upper West	140843.5	52.0	10.91
National	238799.9	88.1	9.23

- Average schooling age in Ghana is 9 years; JSS.
- About 70% of Ghanaians with education only have up to JSS, 24% up to SSS or higher.
- Policy has concentrated more on the basic education

Education & Earnings Mean Difference Test

Mean difference between earnings across educational levels		
	Mean log difference	T stat
None-primary	-0.0286	-0.33
None-junior secondary	-0.4715	-5.76
None-secondary or higher	-1.2126	-14.11
Primary-junior secondary	-0.4428	-8.15
Primary-secondary or higher	-1.1839	-18.37
Junior secondary-secondary or higher	-0.7410	-14.56

- Of particular notice is the incremental difference between wages of persons as one climbs up the educational ladder.
- The trend in difference in earnings as one moves up is also indicative of a convex shape in the earnings education curve

	Base	General	Public	Private	Privt Inf	NF SE	Farm
Primary	0.116	0.078	-0.377	-0.195	0.2702	0.093	0.002
	(2.27)	(1.48)	(-1.21)	(-0.88)	(2.05)	(1.20)	(0.03)
Junior sec	0.559	0.376	0.004	-0.069	0.448	0.326	0.304
	(14.76)	(9.23)	(0.03)	(-0.39)	(4.55)	(5.27)	(4.39)
Secondary or higher	1.300	0.795	0.391	0.346	0.607	0.685	0.542
	(28.95)	(15.10)	(2.36)	(1.97)	(5.19)	(7.59)	(3.24)
Experience		0.021	0.030	0.017	0.033	0.059	0.027
		(6.89)	(2.36)	(1.09)	(4.28)	(7.16)	(5.03)
Experience sq		-0.0003	-0.0005	0.0003	-0.0004	-0.0013	-0.0003
		(-4.68)	(-1.38)	(0.73)	(-2.47)	(-5.17)	(-3.02)
Female		-0.072	0.132	-0.115	-0.051	-0.126	-0.131
		(-2.44)	(1.88)	(-1.48)	(-0.68)	(-2.60)	(-2.39)
Manual		-0.617	-0.416	-0.074	-0.319	-0.226	-0.685
		(-13.12)	(-4.27)	(-0.88)	(-2.07)	(-1.42)	(-2.07)
Urban		0.415	0.183	0.059	0.080	0.209	-0.003
		(12.29)	(2.33)	(0.43)	(0.96)	(3.89)	(-0.04)
Locational dummies-reference is Gt Accra region							
Western		0.029	0.124	-0.097	-0.228	0.142	0.250
		(0.49)	(0.89)	(-0.71)	(-2.18)	(1.65)	(1.15)
Central		-0.269	0.025	-0.590	-0.313	-0.022	-0.171
		(-4.02)	(0.18)	(-1.96)	(-2.03)	(-0.21)	(-0.81)
Volta		-0.307	-0.171	-0.490	-0.525	-0.066	-0.072
		(-5.41)	(-1.43)	(-2.78)	(-2.93)	(-0.69)	(-0.37)
Eastern		-0.021	-0.057	-0.102	-0.303	0.096	0.253
		(-0.39)	(-0.43)	(-0.70)	(-2.11)	(1.10)	(1.25)
Ashanti		0.008	0.187	-0.001	-0.119	0.301	0.087
		(0.19)	(1.67)	(-0.01)	(-1.40)	(4.30)	(0.45)
Brong Ahafo		-0.098	-0.073	-0.229	-0.302	0.392	0.068
		(-1.57)	(-0.69)	(-1.37)	(-2.10)	(3.55)	(0.32)
Northern		-0.170	-0.210	-0.096	-0.054	-0.164	0.127
		(-2.71)	(-1.10)	(-0.43)	(-0.32)	(-1.58)	(0.64)
Upper East		-0.733	-.0791	-.720	-.534	-.089	-.742
		(-8.45)	(-0.41)	(-7.50)	(-1.18)	(-0.65)	(-3.48)
Upper West		-0.404	-0.285	0.018	-0.509	-0.491	-0.417
		(-3.77)	(-1.78)	(0.03)	(-1.98)	(-2.01)	(-1.64)
Constant	11.029	11.535	12.081	11.987	11.527	11.204	11.143
	375.14	151.82	59.24	53.43	52.86	61.65	30.67
Observations	6726	6726	571	385	830	2366	2333
R-squared	0.13	0.20	0.20	0.16	0.14	0.11	0.07
F stat	311	108	8.8	9.18	6.58	16.32	10.8

Education & Earnings Mincerian Estimation Results

- The magnitude of the coefficient on education increases progressively with educational levels.
- Compared to persons with no education, those with primary education have increased wages at 16%.
- Completing junior secondary raises real wages by 56%,
- Workers with secondary or higher education attract much higher wage (130% increase)
- Clearly there is an increasing trend in returns to education.

Robustness

- We estimate the model by various sector groupings.
  - In the public sector, the only significant educational variable in relation to real earnings is the secondary and higher education level.
  - In the nonfarm small enterprise sub sample, workers in Western, Ashanti and Brong Ahafo Regions earn 14%, 30% and 39% higher respectively as compared to workers located in Greater Accra.
- We also estimate the model replacing educational variables with average years of schooling. Generally the results do not differ.
  - Additional schooling yields 7% increase in earnings for public and private sectors

- firms export about 60% of what they produce.
- Foreign ownership of firms is about 7%
- And average age of firms is about 16 years.
- Majority of the firms are small (64%), medium sized (25%) with just a few large firms (11%).

	1	2	3
Employment (log)	0.540***		0.198***
	(0.153)		(0.0488)
Capital (log)	0.196***		
	(0.0482)		
Education of manager (ref: primary)			
Secondary	0.159	0.319**	0.148
	(0.147)	(0.151)	(0.149)
Tertiary	0.601**	1.037***	0.571**
	(0.234)	(0.216)	(0.245)
Share of employment that is skilled	0.193		0.197
	(0.221)		(0.226)
Average education of workforce	-0.0156		-0.0117
	(0.0674)		(0.0671)
Export share	0.302*	0.444**	0.257
	(0.166)	(0.175)	(0.161)
Firm age	0.00553	0.0151***	0.00302
	(0.00504)	(0.0056)	(0.00502)
Foreign firm	-0.104	0.157	-0.19
	(0.307)	(0.352)	(0.31)
Female manager	0.00963	0.0723	0.00186
	(0.136)	(0.151)	(0.14)
Firm size (ref: Small)			
Medium	0.402*	1.281***	0.0951
	(0.241)	(0.162)	(0.159)
Large	0.712	2.936***	-0.0749
	(0.547)	(0.351)	(0.347)
Constant	13.69***	18.15***	13.12***
	(0.706)	(0.228)	(0.723)
Industry dummy	Yes	Yes	Yes
Observations	291	291	291
R-squared	0.80	0.75	0.44

- Managers with higher education are more likely to add value to production as compared to managers with only primary education.
- The results mimic the allocative effect (Corvers 1997). Educated managers are able to allocate factor inputs more efficiently to achieve higher value added in the production process
- The results are also in line with the previous Mincerian regression estimates, where returns to education is significantly higher for higher education.
- Surprisingly there is no worker effect; neither the share of employment that is skilled nor the average education of workers plays a significant role in productivity. Whilst this is a strange result, it is plausible that the size may be biasing the results. Also the definition of skilled labour in the survey could be a problem.

- We find that returns to education more than triples from primary to secondary level or higher-an indication of a rather strong convex relationship.
- We also find that managerial education plays a strong and positive role in driving firm productivity.
- What is clearly obvious from our results is that education plays a stronger role in efficiently combining factor inputs into achieving higher productive gains.

Explaining Findings so Far

- What might explain these convexity trends? Colclough et al (2009) offer explanations that point to
  - demand (falling demand for low skilled workers in developing world),
  - supply (increased supply of primary school completers in the developing world) and
  - possible weakening in the quality of primary school systems in developing countries. In the case of Ghana these factors may all have been at work.
- In Ghana demand for more skilled workers is rising as the production patterns become more biased towards skilled and tech based production.
- The FCUBE and Capitation Policy increased the supply of primary school completers.
- There is also some evidence of a declining quality; the National Education Assessment scores for 2005 shows that mean competency scores for P3 English (38.1%) and mathematics (36.6%) were just above the minimum of 35% for competency, these further declined to 37.6% and 35% respectively in 2007. The scores are only slightly better for P6 English and Mathematics.