

# **The impact of training on firm productivity: Evidence from a large sample of African firms**

**By**

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# Introduction

- The importance of on-the-job training, cannot be overemphasized. Its benefits at firm, individual worker and government levels are well documented. E.g., Barron et al (1989), Landy et al (2000), Yang et al (2010), Aragon-Sanchez et al (2003), Dosties (2010), Almeida and Carneiro (2009).
- It is generally accepted that general education (e.g. primary, secondary and tertiary) brings about a number of benefits, including higher productivity and profitability for firms, and high wages for employees (Mincer, 1962, Becker, 1962).
- However, on-the-job training is usually more specific and tailored in line with the needs of a firm. It therefore tends to significantly boost firm productivity, profitability and competitiveness.
- While most studies have not separated the benefits of on-the-job training into those that accrue to the worker and those that accrue to the firm, it is possible that firms benefit more from the training.
- This implies that individual workers may not optimally acquire education through own efforts, hence firms must train the workers given the likely payoffs that accrues to them.

- On-the-job training can also help boost innovation. For example, new knowledge gained by the trained workers can be transferred to other workers within and outside the firm. Such skills and knowledge can also help in product quality improvement; improving firm competitiveness.
- The change in a country's economic structure can also make those already working redundant/obsolete.
- This means firms may be forced to train continuously train workers to better meet their requirements.

- This study aims to close a gap in the extant literature by looking at the benefits of on-the-job training for African firms.
- The aim of the study is to assess the impact of on-the-job training on firm performance.
- The indicators to be used for performance include: sales, output, productivity and investment.

- We attempt to answer a number of questions related to the issue of worker training. These include:
  - Who are the firms that conduct on-the-job training in Africa? Are they local-owned, government-owned or foreign-owned?
  - What is the intensity of on-the-job-training in Africa compared to other regions?
  - What factors affect the decision of the firm to decide to conduct on-the-job training?
  - Do firms that conduct on-the-job training perform better than those that do not?

# Study Justification

- This study is important for a number of reasons:
  - There is a dearth of literature on the causal link between training and performance using African firms. Most studies on this issue tend to focus on developed economies.
  - The returns to other form investments are well documented. E.g., in the literature the benefits to education have been looked from different angles. First, there is the human capital theory paradigm by Becker and Mincer. Second, there is the macro approach which looks at the causal link between investment in education and economic growth.
  - Unlike the returns to physical investment which has received a lot of attention in the literature, the economic benefits of on-the-job training has not received sufficient attention in the literature, particularly for the firms offering the training.

# Study Justification (cont.)

- In an African context this study is critically important. E.g., an increase in investment in training stimulates firm growth, stimulating the growth of the entire country. Growth theories have emphasized the importance of education. In this paper we emphasize the role of on-the-job-training offered by firms.
- Firm growth, if it creates more employment and generates more profits, can also generate more tax revenue for the government. High tax revenues can then increase the capacity of African governments to not only better deliver social services but to also efficiently correct market failures.
- With sufficient resources African governments may be able to provide better infrastructure and safety nets for the society's most vulnerable.
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- In a more globalized world the need for a well-trained work force is critically important. Such workforce can better prepare African economies for global competition, since a highly skilled labour force enables firms to adapt to change and to compete in new markets.

# Empirical Literature Review

- A significant amount of research effort has been expended trying to better understand the link between training and firm performance. Examples include: Barron *et al.* (1989), Almeida and Carneiro (2009), Stanca (2008), Tan and Batra (1996) and Lynch and Black (1995). Most of the studies are on developed economies. This study tries to fill the gap in the literature by focusing on African firms.
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- Almeida and Carneiro use a data set covering 1500 Portuguese firms over the period 1995-1999 to investigate the impact of on-the-job training on firm performance. They find that on-the-job training positively influences firm performance. More specifically, investment in human capital was found to yield a return of 8.6%; a figure comparable to the return to investments into physical capital.
- Tan and Batra (1996) use firm-level data from five countries - Colombia, Indonesia, Malaysia, Mexico, and Taiwan, China – to assess the incidence, determinants, and productivity outcomes of enterprise training in developing countries. They find strong evidence of the productivity-enhancing effects of training.
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- In Lynch and Black (1995) it is found that an extra year of education raises manufacturing productivity by between 4.9% and 8.5%.



# Methodology

- To better understand role of on-the-job-training we use a number of approaches.
- First, we estimate the propensity to train among African firms. For this we estimate a training probit equation in which the likelihood of conducting training is a function of individual firm characteristics.
- This helps us better understand the firms that conduct on the job training. Are they small or large firms? Are they local or foreign owned firms? Are they government owned or privately owned firms? For example, are foreign owned firms playing a role in transferring skills to the locals?

# (1) Estimating the Propensity to Train

- $\text{Prob}(\text{Training}) = F(\text{firm characteristics})$ , where Training is a dummy variable taking a value of 1 if firm conducts on-the-job training and zero otherwise.
- Firm characteristics include firm age, firm size, ownership, ethnicity, listed, export, audit, etc.

## (2) Assessing impact of training

- To assess the impact of training we use two approaches:
  - (a) Matching Approach - Propensity score matching
  - (b) Normal OLS.

## **(a) Propensity Score Matching Approach**

- The propensity score matching approach matches firms that train to those that do not and then compare the difference in performance indicators.
- If the assumptions for matching are met this approach may help us better assess the impact of training on firm performance.

# Propensity Score Matching (cont.)

- Suppose we have a random variable  $Y$  on which we want to measure the impact of receiving training.
- Let  $D$  be an indicator variable denoting receipt of training; if  $D = 1$ , the individual firm received training, and  $D = 0$  otherwise.
- Let  $Y_1$  be the outcome in the presence of training and  $Y_0$  the outcome in the absence of training.
- Think of  $Y_1$  and  $Y_0$  as two latent variables, of which only one is observed.
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## Propensity Score Matching (cont.)

- Hence, for a given firm, the effect of training is the effect of shifting from 'D = 0' to 'D = 1', or  $Y_1 - Y_0$ . The mean effect of training in the population is  $E[Y_1 - Y_0]$  while the average effect of training on the trained (ATET) is:

$$\begin{aligned}\Delta &= E[Y_1 - Y_0 | D = 1] \\ &= E[Y_1 | D = 1] - E[Y_0 | D = 1]\end{aligned}$$

- The first term in the second line – the outcome in the presence of training among those firms receiving training – is directly observed in the data.
- The second term – the outcome in the absence of training for a firm offering training – is not observed.
- To estimate the impact of training one thus needs to estimate the unobserved counterfactual ( $E[Y_0 | D = 1]$ ) in the equation above.
- The average effect of training on those firms that trained is given by the parameter  $\Delta$  above.

## (b) OLS

- Firm performance indicator = F(training variable, other firm characteristics, country dummies).
- Specifically: 
$$\ln\left(\frac{Y_i}{N_i}\right) = \alpha + \beta T_i + \gamma \ln N_i + \theta X_i + \varepsilon$$
- Where Y output or other performance indicator, T is an indicator for the presence of training, N is the number of workers, X are other controls.

# Data to be Used

- We shall use the data from the World Bank's investment climate surveys.
- The surveys – covering the period 2000 to 2012 - cover a significant number of countries in Africa and beyond.
- The firms are asked the following question:
- **“In year X, did this establishment run formal training programs for its permanent, full-time employees?”**
- **Firms are also probed on the number of workers trained.**
- We aim to include 10 African countries in the study.
- Although we shall attempt to ensure that the sample is representative we foresee problems with missing data, so the countries shall be chosen on the basis of data availability.