A Comparative Analysis of Firm Based Training in East African Manufacturing Sector: Does Level of Education Matter?

Josaphat Kweka[1]

Senior Research Fellow

Economic and Social Research Foundation (ESRF) Dar es Salaam Tanzania

(jkweka@esrf.or.tz)

15 May 2006.

[A World Bank Research Paper]

Abstract

Using World Bank's (2003) firm-level Investment Climate Survey (ICS) data for Kenya, Tanzania and Uganda, this paper examines extent in which education and skill levels are important determinants of Firm-based Training (FBT) in the East African manufacturing sector. The findings show weak evidence on complementary hypothesis between education and FBT but one which differs significantly across (perhaps depending on educational and training capacity of) different countries. Although other determinants of FBT apply differently to specific countries, size and technology characteristics are common determinants across the three countries. Furthermore, firms that care about HIV epidemic train more as a means to abate the negative effects of the epidemic on their human resources. Since FBT has potential to contribute to skill development, the findings imply that enterprise training should receive similar policy emphasis as education in the bid to enhance human resource development for growth and poverty reduction.

Keywords: Firm-based training, Education and skill, East Africa
JEL Classification: M53, 121, J24, O55

---

[1] I am grateful to the World Bank, particularly Profs Vijaya Ramachandran and Mary Mbuyi for extending me the privilege and support to write this paper, and Giovanni Tanzillo for facilitating my access to the ICS data. I also thank Profs Haidari Amani and Sam Wangwe for their encouragement during the initial stages. Colleagues at ESRF gave me valuable comments and assistance, most of which I am indebted to Rose Aiko, Flora Kessy, Tchaka Ndlovu, Mr George Kabelwa and Mr John Kajiba, and finally Beatrice Mkenda of the Economics Department, University of Dar Es Salaam. However, I alone am responsible for all remaining errors and matters of interpretations.

1. Introduction

Research on the role of employment-based training on skill development by private sector firms in developing countries has been an important issue in academic literature and development policy debate in the last decade (Blunch and Castro, 2005; Arulampalam *et al*, 2003 and Xiao and Tsang, 2001). The main stylized fact is that, given the general shortage of required skills in Developing (especially sub-Sahara African – SSA) countries, firms are increasingly investing in employment-based training[2]. On the one hand, firms invest in training of their workers not only as part of their pro-active response to skill shortage, but also as a strategy for enhancing their competitiveness by adapting to new skills and technology. On the other hand, workers have been under pressure to continuously embrace training as way of enhancing their upward labor mobility and increase their human capital hence welfare (qualify for better job and higher pay). These reasons underscore the role of human capital in enhancing the economic growth for poverty reduction in SSA.

However, despite the importance of firm-based training (FBT) on firm productivity and worker's welfare, much of the previous studies[3] have been done in developed and semi-industrial countries of the USA, Europe and Asia and none in Developing countries (see Gervin, 2003; Arulampalam *et al*, 2003:1).[4] Covering this gap is extremely important for Sub-Sahara African countries where both the level of training and education is too low by international standards to generate the required skills for industrialization.

---

[2] We synonymously use work-related and employment-related concepts, but both referring to firm-based training (FBT)

[3] The implicit assumption in most of these studies is that the education systems and level of education across workers is advanced and near the required skill levels in the industry, such that training is just complementary to education. This assumption may not hold in the context of a developing country where education systems have not developed to match the market requirement of skills, such that training in industry is close substitute to education.

[4] The only exception is a study by Biggs (1995), which investigated and found positive links between firm training, technology and productivity in three African countries of Zimbabwe, Kenya and Ghana using the World Bank's RPED survey data. Apparently, Biggs study is somewhat dated, and recent unfavourable economic and political developments in Zimbabwe would not lead to similar results. Most recent paper by Rosholm *et al* (2005) addresses rather a different question – evaluation of training in African enterprises using RPED data on Zambia and Kenya.

This paper focuses on specific role of education and skills level of workers in influencing FBT. Clearly, education and skills, while external to the firm, are critical in augmenting human resource development (see Ariga and Brunello, 2002) especially deficient in SSA countries including those for the current study. Capturing the empirical relationship between firm's training and the workers level of education would inform on policy debate regarding the role of Government in developing skills. Furthermore, we include in the analysis the effect of HIV/AIDS factor (which is also exogenous to the firm) in determining FBT. The argument regarding the HIV/AIDS factor is that, since laws do not allow employers to discriminate employment, training or promotion of workers on the basis of his/her *sero status* (HIV/AIDS infection indicator), employers may be skeptic of increasing investment in training that enhance worker's upward mobility. Alternative argument is for employers to offer more training as new workers join in order to maintain their performance threshold.

The analysis attempts to compare results for the three East African countries of Kenya, Uganda and Tanzania, thereby examining how variation in the level of industrialization, private sector development and business operating environment affect the results on the determinants of (and effect of education on) firm-based training and its impact on productivity. Focusing on the three East African Countries (EAC) is consistent as these countries belong to same regional grouping (East African Community with clear thrust to fastening their integration), but also demonstrate important variations in per capita income, Manufacturing value added (MVA) and levels of openness to the rest of the world (trade and FDI). Kenya is most advanced industrially (while Tanzania is least), and has the most competitive business environment with its developed private sector and presumably more advanced education and skill supply systems compared to the others. Although the ICS data covers three other sectors (tourism, agriculture and construction), manufacturing sector is considered relatively most training-intensive sector, with more diversified skills, sub-sectors and technological capacities compared to the other sectors.

The paper is structured into six sections. After this introduction, section 2 gives a brief background to the East African economies and education policy context within which

firms undertake enterprise training. This is followed by a review of theory and existing empirical evidence in section 3. Section 4 describes data and the framework used for empirical analyzing of FBT, results of which are presented and discussed in section 5. Finally, section 6 concludes by summarizing key findings and their policy implications.

2.1 Country context and Policy Background

East African economies at a glance

As shown in Table 1, the three East African economies have been experiencing modest macroeconomic stability and economic growth since 2000, mainly attributed to the massive reforms that led to opening up to the rest of the world, privatize a large share parastatals, and institute policies favorable to attraction of investment flows and regional integration. Uganda has the highest growth record followed by Tanzania, and that of Kenya has also been improving. By population size, Tanzania and Kenya are more or less of same size, and Uganda is relatively smaller.

Table 1: Key Economic Indicators (1999-2003)

	1999	2000	2001	2002	2003
		GDP Growth rates (%)			
Kenya	1.3	-0.2	1.1	1.0	1.3
Tanzania	3.7	5.7	6.1	6.3	5.6
Uganda	8.0	6.0	5.0	7.0	5.0
		Share of the Manufacturing Sector in GDP (%)			
Kenya	-	11.4	10.9	10.9	11.1
Tanzania	7.3	7.5	7.4	7.3	7.2
Uganda	18.4	18.6	18.9	19.2	20.1
		GDP Per Capita, PPP (International $)			
Kenya	1009	1002	1016	1020	1037
Tanzania	491	517	547	581	621
Uganda	1183	1265	1336	1403	1457
		Inflation (%)			
Kenya	5.8	7.3	9.6	8.7	5.9
Tanzania	11.4	6.9	6.2	4.1	7.2
Uganda	0	4	6	-4	9
		Population, Mid-Year (Millions)			
Kenya (2004)			32.2		
Tanzania (2003)			35.9		
Uganda (2003)			25.9		

Source: Adapted from DTIS (2005), Government of Uganda (2005), Government of Tanzania (2005).

Education and training Policy in East Africa

Intuitively, one of the key outcomes of a training and education policy for any nation is to build skills required for raising productivity and welfare. Table 2 shows that the three East African countries exhibit different levels of skill development. On one hand, Kenya has the highest literacy rates followed by Tanzania. However, Uganda on the other hand Uganda is leading in terms of the expected number of schooling years.

Table 2: Education and Literacy indicators in the EAC (2002)

	Adult Literacy (15 year olds and above)		*Youth Literacy (15-24 year olds)*		*Average years of schooling*	
	Male	Female	Male	Female	Male	Female
Kenya	90	79	96	95	8	8
Tanzania	85	69	94	89	7*	7*
Uganda	79	59	86	74	12	11

Note: * Authors own calculation
Source: Adapted from World Bank – World Development indicators (2005)

Grieson (2002) on ILO (2002) studies on FBT in the informal sector of East African countries provide some important background highlights (given the paucity of studies) on FBT. In Kenya, for instance, the study found that high-level skills are being used in the formal sector low-level skills in the informal sector. Furthermore, the public-private partnership training has dwindled. Most firms have cut down their employment and rely on outsourcing, hence diminished job security. In addition, most firms have, in recent years been reducing formal firm-based training to opt for distance learning instead.

Training for the informal sector is offered not only by the government but also by private providers, which are usually supported by the Vocational Education Training Authorities (VETA for Tanzania - established since 1994; and UVETA for Uganda established in 1996). Generally, these Authorities are one of the key features of FBT policy in SSA, and which serves enterprises of all types (public and private, formal and informal, large and small etc.) unlike in Kenya where SME have separate training (the *Jua Kali*) institution.

In view of the large contribution of the informal sector to employment in these countries, both Governments have had formulated the SME policies in recent years to cater for development and promotional needs of the sector.[5]However, despite the noted similarities between Uganda and Tanzania in training policy, the ILO study considered the vocational education training in Uganda (UVETA) to be relatively ineffective due to a number of problems such as cultural bias, lack of focus, limited capacity and a training approach.

Another key feature of training and education policy in these countries is the intent of harmonization of policies, practices and programs across the three East African countries. Thus, our focus on the three East African countries allows us to evaluate the efficacy of the EAC integration prospects on training and skill development in the region by examining its development strategy.

The EAC Development strategy 2001-2005 recognizes the imperative for human resource development in the region, and the role of regional cooperation in realizing it. After establishment of the EAC, member countries are now considering harmonization of the education syllabi in a bid to fostering free movement of labor in the region (including training programmes envisaged for implementation at national level). These programs and objectives are envisaged to be implemented in the third EAC Development Strategy (2006 – 2010) in which process the findings of this study may be made useful.

[5] Example of training providers in Tanzania include VETA-based training centers; Post-primary technical training centers; Church owned training centers; Non-profit training centers; Private owned training providers; Informal sector/apprenticeships; Company based training centers.

3. Review of the theory and existing empirical evidence

3.1 Theory of firm-based training

With the shortage of skills widespread in many African countries, firm-based training has gained particular importance as means of raising workers skills level, and contributing to enhancement of firm's productivity. As Bassanini et al (2005) notes, contrary to the conventional macroeconomist sole focus on education when measuring human capital stock, it is now widely accepted that accumulation of human capital does not end with schools. Firm-based training is a key to augment and adapt existing skills to the changes of technology. Xiao and Tsang (2001), describe firm-based training as a form of adult education through which countries experiencing human capital shortage can build up their stock of this capital for development. Training is important for educated workers as their skills accumulated at school may be substantially depreciated or may not meet the demands in the employing firms and for the less educated as well who, unless they can be trained and gain proficiency in their jobs, run the risk of social exclusion. Training is also necessary because old skills of workers become obsolete due to advances in technology.

Barrie and Pace (1998) distinguishes two strands of firm-based training. First is on the job or 'shop floor' training where training is provided to employees, often with work-related content and is financed by the employer. In this case, training provided is related to job performance, meeting the needs of the organization, rather than emphasizing the cognitive perspectives of employees. Training is thus given a narrow meaning and specific purpose with weight of authority given over to the trainer (*op cit*). But while working, employees may also engage in voluntary adult education/training programmes outside the firms with or without financial support of their employers. These could be conveniently termed "off the job training". Contrary to the former, in this case training provided may or may not be related to their jobs, yet would still have a potential of enhancing their welfare for example through improving earnings or job mobility.

With increasing competition in the global industrial sectors due to economic liberalization, and other changes affecting firm productivity, for instance acquisition of new technology by firms and changes in organization structures of production companies

following acquisition of new technologies employers are obliged to seek ways of remaining competitive in the market. One of the channels is through ensuring adequacy of skills within the firms. Yet while studies linking on-the-job training and firm productivity (Xiao and Tsang, 2001; Biggs, 1995; Schafner, 2001; Bassanini et al 2005; Ariga and Brunello, 2002) have found an indisputable link between a higher incidence of job training and increases in average productivity among workers in their direct productive activities, firms may still be reluctant to train employees.

Xiao and Tsang (2001) notes that such reluctance occurs where the perceived cost of undertaking such training is higher than the expected gains—especially where employee turnover is high (see also Schafner, 2001) as is common in developing countries. Training amount and type may also vary among firms and between sectors, and by gender of employees. Studies on firm training behaviour in developed countries reveal that such variations, apart from costs associated with employee turn over may be due to firm size—where large and well established firms are more likely to invest in firm-based training compared to small firms as the average fixed training cost decreases with scale of production and number of workers[6].

Some studies, (Lynch 1994 cited in Biggs 1995; Biggs 1995; Xiao and Tsang 2001) have also cited trainability of workers as one of the reasons for high incidence of FBT (or Firm-based training): employers are likely to train workers who have a reasonable high level of education and thus a good ability to grasp the content of new skills that are imparted through training. The incentive to train more of this category of employees is also facilitated by the view that marginal cost of training decreases with the level of training of employees. In this spirit, Lynch (1994)[7] and a strand of literature on firm-based training (FBT) dating back to 1970s have argued that skilled workers are more likely to be trained than unskilled workers.

[6] Bowers and Swain (1992) cited in Biggs (1995)
[7] Cited in Biggs 1995

Existing evidence suggests that there are strong complementarities between education and training (see Arulampalam et al, 2003). However, Ariga and Brunello (2002) points to the contrary that there is no clear cut answer as to whether high education attainment leads to higher probability of attending FBT. In fact, some studies (Biggs 1995; Xiao and Tsang 2002) have reported a positive link, while others (e.g. Sicherman (1990) and Hersch (1991) have found the link to be negative—the higher the level of education the less likely an employee will receive FBT—it may be correct to argue that the link may be context dependent of certain institutional conditions within countries, firms or educational cluster of employees. In a study of the relationship between the level of education of employees and FBT in Thailand, Ariga and Brunello (2002) find that high education attainment is in fact inversely related to the probability of attending FBT in Manufacturing firms in Thailand, but that education and training are *technically complementary* in the case of "off the job training".

Another determinant of firms' decision to invest in training is the level of firm's investment in new technologies—firms that invest more in acquiring new technologies also happen to have higher training costs compared to those that do not. To the extent that total training cost can be taken as a proxy of firm' disposition to train, it appears firms investing in technologies also train more than those which do not invest in new technologies through acquisition of technologies or through R&D (Aw and Tan, 1995).

3.2 Existing empirical evidence

Empirical studies on determinants and economic effects of firm-based training in developing countries are relatively few and in African countries, even fewer. Furthermore, while there is a growing literature on this kind of training in developed countries (Bills 1999; Görg et al 2002; Arulampalam et al, 2003; Gerfin 2003; Bassanini et al 2005;) there are few studies on factors affecting (determinants of) employees' participation in firm-based trainings in developing countries. In Sub Saharan Africa, the gap is even wider. Studies of the role of FBT on firm productivity in Sub-Saharan Africa countries, to our knowledge, are Biggs (1995) and Rosholm et al (2005) both of which are based on Investment Climate Assessment (ICA) data compiled in the 1990s. Biggs

(1995) examines the impact of firm based training and investment in technology on enterprise productivity in manufacturing sectors of three African countries, Ghana, Kenya and Zimbabwe. The study looks at the incidence and pattern of investment in enterprises in the three African countries and explores whether it is similar or different to that in developed countries. Based on the structural characteristics of the firms, Biggs (1995) also studies the determinants of the likelihood that firms will invest in worker training; the effects of such training on firm productivity and whether the productivity effects of training are different for firms that invest in new technologies compared to those which do not but nevertheless train.

The study finds similarities in the pattern of training in these countries with the rest of the world, but also a number of important differences. It shows that the pattern of training and incidence across firms appears similar: small firms train much less than large firms; foreign owned firms train more than local firms; firms investing in acquisition of new technology and R&D train more and similarly exporting firms compared to producers of non-tradable goods. The study also finds that trainability of workers is an important factor where more managers and skilled workers attend trainings compared to their non-managerial non-technical counterparts.

Country location of firms also matters. Firms in Zimbabwe appear to invest more in training compared to their counterparts in Kenya and Ghana, possibly due to the differences in industrial development stages in these countries. The study finds that African firms appear to have much lower training incidence than their counterparts in developed countries and developing countries in Asia and Latin America due to differences in a number of institutional factors including limited support from the governments.

Considering that there have been important changes in the manufacturing sectors of East African countries in the last two decades, and the paucity of research on the determinants of FBT, this study is an attempt to fill this research gap. In fact except for cross-country comparisons that have included Kenya (Biggs 1995 and Rosholm et al 2005), it is safe to

claim that to the best of our knowledge, there has not been empirical studies of this nature on Uganda and Tanzania.

Bennel *et al* (1999) studies Vocational Education and Training (VET) in Tanzania and Zimbabwe but with a focus on explaining how VET has been affected by reforms and changing institutional support from the states in the context of various economic reforms undertaken in these countries. In Kenya, Wambugu (2003) examines changes in real earnings and private returns to formal education in manufacturing labor market over the 1990s using 4 waves of RPED data collected in Kenya between 1990 and 2001, but does not look at the determinants of FBT or contribution of such training to changes in firm productivity and workers earnings.

In this study, an attempt is made to establish the extent and determinants of firm-based training in East African manufacturing sector with focus on specific role of education, skill level and HIV threat in influencing firms to engage in FBT.

4. Description of Data and Analytical Framework

4.1 Description of Data used in the Analysis

Firms' data

The ICS data was developed through a survey of a number of firms in different manufacturing sectors in several countries. The basic unit of analysis in the ICS data is a firm or establishment, which gives clear understanding of microeconomic dimensions of firm-based decisions on training. The data used for our analysis is on manufacturing sector (although ICS covered other important sector of the economy including tourism, construction and agriculture). Our sample includes 280 firms for Kenya, 276 for Tanzania and 300 for Uganda. These are distributed differently in different sub-sectors, size categories and ownership patterns. Each country covered different mix of nearly similar sectors (see Appendix 1) and adopted the same ILO definition of size of firms. Table 3 shows distribution of firms by size categories. Other important distinguishing factors in the sampled firms include exporting status (i.e. exporting vs. non-exporting firms), ownership – especially foreign versus domestic firms.

Our choice of variables follows largely from the literature survey. Different variables vary reasonably in importance among the three countries reflecting the underlying economic structure and institutional context. The purpose of this (descriptive) analysis is to bring out such variations that can enlighten our empirical analysis.

One of the innovative aspects of the ICS data is its coverage of quantitative information on several aspects of business operating environment (BOE) in addition to the usual contents of firms surveys such as production accounting, investment, technology, markets, human resources, technology and infrastructure. The training and labor markets section of the data is key for our purpose and contain information on the pattern, structure and level of employment, training, labor market issues, skill levels, employee turnover and welfare, and HIV issues. To reflect the importance of human resources and labor market issues in analysis of firm productivity and competitiveness, the ICS data contain

an appendix of workers individual data on labor market and welfare issues (described below). Each firm sampled up to ten different employees from all skills categories.

Structural Characteristics of Firms in the ICS data

Table 3 (and Appendix 2) reveals important structural characteristics of firms in the ICS data showing variations of firms across the three countries in their structure and pattern of training and skill levels. The extent of foreign ownership is generally similar (about 20% of firms have FDI share of more than 30% showing that majority are domestically owned) and the share of public owned firms is insignificant across the three countries. Kenyan firms have greater extent of trade orientation, are larger in size and older relative to other two countries. Only 7% of firms in Kenya were established after 2000 compared to 10% and 13% in Tanzania and Uganda respectively reflecting the relatively older industrialization in Kenya. Extent of workers turnover (measured as average share of permanent workers who died, dismissed or just left) differ markedly where Kenya stands out with highest rate of 60% compared to 20% in Tanzania and only 7% in Uganda. Such high turnover rate for Kenya may be reflecting higher level of competitiveness and flexibility of the Kenyan labor market, where workers have incentive to solicit higher-paying jobs after attaining the (market demanded) skills.

Patterns and Structure of Training, skills and Education

Given the focus of this paper, we examine the data to comparatively pursue three questions. First, which firms offer formal training to its workers, and which do not? Second, how is training incidence related to education and skill level of workers? And finally do (and which) trained workers get higher pay after taking on a FBT? Identification of training firms is made using descriptive analysis of a number of variables. These are selected based on the review of literature. The list of variables is shown in Appendix 2. Except for sub-sectors (defined in discrete form and listed in Appendix 1), the variables include some firm characteristics (e.g. age, ownership and size etc), turnover, technology, skills and education, business environment, etc).

Table 3: Structural characteristics of firms in the ICS data

Characteristics	Measurement	Kenya	Tanzania	Uganda	Average
Ownership	% firms with FDI > 30%	16.6	21.7	22.6	20.3
	% firms State owned > 30%	7.4	7	2.7	5.7
Formal vs Informal	% firms paying by credit	79.2	61.21	59.3	66.6
Trade orientation	% of firms exporting	52.1	28.3	17	32.5
	% of firms importing	56.3	44.9	23.3	41.5
Firm size	% Micro (<10 workers)	3.5	17	18	12.8
	% Small (>=10 - <50 workers)	32	40	51	41.0
	% Medium (>=50 - <100 workers	16.2	17	11.3	14.8
	% Large (>100 workers)	48.2	26	19.7	31.3
Age of firms	% established before 1990	73.2	51.1	28	50.8
	% established btn. 1990 - 2000	19.7	38.4	58.7	38.9
	% established after 2000	7	10.5	13.3	10.3
Worker turnover	Average % workers left, died or dismissed	58.6	18	6.5	27.7

Source: World Bank's Investment Climate Survey Data, 2003.

Importance of training differs from one sub-sector to another depending on level of competition and technological sophistication or innovations in that sub-sector. We measured sector in discrete. The leading sub-sectors with highest ratio of training versus non-training firms are chemicals and paints, textiles, and plastics compared to construction, furniture and wood, which had lowest training incidence (majority of these are informal/micro enterprise, more so in Tanzania and Uganda). Kenya has a slight variation given the more disaggregated sectoral grouping. For instance, while textile and leather are highly training sectors for Tanzania and Uganda, in Kenya it is garment sub-sectors that train most.

Apparently, decision to train and extent of FBT will differ among firms depending on size, ownership and other firm characteristics. Correlation analysis shows that size,

foreign ownership, technology and trade orientation are strongly related with FBT and comparable across the three countries. Foreign firms (especially in Kenya) are most likely to train than domestic firms while in Tanzania and Uganda publicly owned firms train more than privately owned firms. However, in all the three countries, more trade-integrated firms (measured by export and import share of production) are more likely to train. With regard to size and age of firms, the sample shows that, overall large-scale firms train most relative to smaller ones especially in Uganda where small firms virtually do not train. Across the three countries, age of the plant is not significant and is negatively associated with FBT (that is newer firms may be less likely to train, which is logical as firms their FBT needs are immature).

High worker turnover can cause anxiety to employers and *discourage* further FBT since it increases labor mobility so that it is easy for a skilled worker to find another job. An alternative view is that, high turnover may *necessitate* the firms to train more often to replace moved workers. The two arguments imply that the impact of turnover on FBT is essentially ambiguous. In our descriptive analysis, training is negatively correlated to turnover (implying the firms are discouraged to train). Only about one third of firms with high turnover in Kenya and Tanzania do train, and the ratio is even lower (25%) for Uganda, implying that turnover may not be a significant determinant of training. Correlation analysis shows that Tanzanian firms train less when faced with higher turnover. We also examined the influence of age (measured in log of number of years) of workers, where the data shows that in Uganda and Kenyan firms, older workers are more likely to be trained than younger one. This result is counterintuitive because one would expect more training for firms with relatively greater share of younger employees.

Our fourth dimension of training firms is technology. Some studies on the determinants of FBT have found technology factors are significant drivers of FBT in that firms engage in FBT to upgrade the technological capability of workers (e.g. R&D activities) or orient them to new technology. We propose two technology indicators: R&D activities, and "invested in new technology" (both measured as binary variables taking value of 1 if a firm engage in those indicators, and 0 otherwise). These factors are not associated with

FBT in Uganda but significantly so in Kenya and Tanzania firms (perhaps because many firms in Uganda are relatively younger so that technological upgrading is not required in the short term).

Although skill level of workers is theoretically an increasing function of training, in practice, the relationship between the two is not apparent. Overall, skill level is not significantly important factor for FBT. However, it is interesting to note that high level of skill is associated with more training than low skill level in Kenya and vice versa for Tanzania (that is training is complementary to skills in Kenya but supplementary to skills in Tanzania). Although explanation for this finding is not straightforward, it may be related to the fact that skills rather than education level are key force in the Kenyan (as opposed to Tanzanian) labor markets[8]. Correlation results show that the positive relationship between training and skills is more evident in Kenya than (and to some extent Uganda) than in Tanzania in which training is associated by larger extent with unskilled than skilled labor.

This finding leads to the question: are firms that are more likely to train face skill shortage of skills/human resources? The "yes" answer is 50% for Kenya, 40% for Tanzania and less than 30% for Uganda, which support the finding that Kenya experiences higher labor turnover. Nevertheless, a clear conclusion emerges from the data: FBT has different utility in each country. For Kenyan firms, FBT augment skills and education levels, for Uganda FBT supplements the shortage, while in Tanzania it mainly supplements the low level of skills in the manufacturing sector.

Education is important factor determining FBT. Gertler and Glewwe (1990:251) argue that education is one of the most important means of raising worker productivity and thus incomes in developing countries. High level of education is usually associated with more training across all the three countries (although this association was not supported by

[8] That is why in Kenya, the education levels among workers are much lower than in Tanzania or Uganda but skills are much higher unlike in Uganda or Tanzania. This implies that the relationship between skills and education are not same across countries and may be influenced both by nature of human resources and labor markets of particular country.

subsequent empirical analysis). Unlike in Kenyan case, FBT in Tanzania and Uganda are notably associated with lower level of training (in fact in the empirical analysis, lower level of education/skills more or less collinear with training). Furthermore, an important issue in human resource development discourse in the contemporary Sub-Saharan Africa (SSA) is the effect of HIV/AIDS pandemic, which has implication on skill dispensation. Our study takes cognizance of this fact by analyzing whether firms that have HIV/AIDS activities do offer training. Findings indicate this to be the case especially (also supported by the empirical analysis) for Kenya and Tanzania.

Since FBT is costly to firms (in terms of time, human and financial resources) some firms also fail to offer FBT because of lack of resources. We consider this factor important (especially in SSA) by examining the extent in which better performing (e.g. positive sales/export growth) firms have higher likelihood of undertaking FBT. Only Kenyan sample shows consistent association where 42% of firms with strong sales growth and 38% export growth offer training (the corresponding shares for Uganda and Tanzania are about half of Kenya's). But more surprisingly, FBT relates inversely to sales and export growth in Uganda and Tanzania respectively (perhaps high performing firms are newer or hires high skilled workers hence requires less training). Theoretically, one of the motivations for FBT is to enhance competitiveness of firms. Subsequently, one would expect one-to-one relationship between export growth and FBT given competitive nature of exporting (unlike non-exporting) firms. The ICS data show that this is not always true as (especially Kenyan) exporting firms train less.

Our final set of variables refers to "business environment" factors, a key feature/thrust of the ICS data. We select four dummy business environment variables that are likely to affect labor market outcome or FBT and are reported by ICS. These are of two types. First, constraints faced by firms, where we select labor regulations and inadequate skills or low education level of workers. So if a firm report these as one of its top three constraints, we assign value of 1 and zero if not. And secondly is the extent in which firms do collaborate industrially. We also select two binary variables (taking value of 1 if firms) "collaborate with others" in training exercises, and "belong to business

association" such as chamber of commerce, and zero otherwise. Generally firms that face the first set of constraints are more likely to offer formal training, and even so if firm collaborate with others in FBT (since it is costly). Kenya is found to show stronger associations (over 50% of firms that are faced with business environment obstacles offer FBT), which is generally weaker in Uganda and specifically stronger in the specific case of labor regulations and industrial collaboration factors for Tanzania.

Workers data

Variables constructed from workers data for analysing FBT are apparently individual characteristics of a worker. Mainly motivated by various previous evidences, the selected variables include sex (given the importance of gender dimension of HRD debate), age (assuming younger workers are more aptitude for training), job/skill category (role of training in building skills, and demand for FBT for various levels), education level (as argued in the literature, FBT can either complement or supplement education) and tenure (to examine if FBT is dispensed only to the permanent workers). Others variables include labor market status of workers such as experience (number of years) in the current job, whether belong to a trade union or (and number of) training received.

Appendix 2 lists and shows the definition of these variables and how they have been constructed from data[9]. As in the case of firms' data, these variables were selected on the basis of previous studies, but with similar specific focus on education, skills and HIV/AIDS factor. However, in using this sub-set of the ICS data, our major emphasis is on the impact of FBT on workers earnings.[10]

Basic Characteristics of the sample workers

The total number of workers sampled is 1968 for Kenya, 1598 for Tanzania and 1462 for Uganda. Gender distribution is generally similar for all the three countries (about a quarter of all are women). Highest level of education level for workers is mostly (over 50% are) secondary and tertiary education, and only 13% had university degree or higher.

[9] To keep analysis tractable, we avoided merging the two data sets, instead we estimate each separately.
[10] The benefits for firms (increased productivity and competitiveness) is assumed to exist, and given our cross-sectional analysis, are not immediately transmitted after the training.

Male workers are more educated and are more permanent tenure than female workers except for Kenya where women have more secure employment. Perhaps unsurprisingly, the level of unionization among East African manufacturing workers seems to be notably low, averaging below 20% but relatively higher for Tanzania which has longer history of trade unionism from the socialist era when it was almost mandatory for each worker to be a member of a National trade union.

Training incidence and impact of training on Earnings

Although majority of workers do not receive training, even for those who do, the impact of training in terms of higher wages after taking a training course is not significant. Table 4 shows incidence of training for the three countries. First, smaller proportion of sampled workers currently receives FBT[11] especially in Kenya showing that FBT may be more costly there. The proportion of workers receiving FBT for Tanzania is 8% for female and only 4% for male workers. The corresponding figures for Kenya is 4% and 2%. Education level of those receiving training is mostly mid-level (tertiary and University degree) perhaps reflecting the fact that it is more costly for firms to train the highly educated workers, and the fact that those with low level of education may not be easily trainable. In this respect a direct one-to-one relationship between FBT and level of education can best be established empirically. Finally, in terms of intensity of training, majority of workers receive about 2 training courses per year, often for duration of couple of days or weeks for short and long courses respectively.

[11] In Kenya and Uganda, the data set also included information on off the job training and self financed training while Tanzanian data set does not.

Table 4: Training incidence of workers (% of sampled workers)

Indicator	Kenya	Tanzania	Uganda
Receiving Firm-based training	12	15	23
-of which inside the firm	4	5	6
-of which outside the firm	2	10	6
-of which Self financed training	6	NA	11
Received training in the past by this firm	25	14	12
Received higher wage after training	32	9	20
No current training	88	85	75
No past training	52	53	75

Notes: All data are computed by the Author from the World Bank's (2003) ICS workers data.

HIV issue

Asked if a particular worker is willing to be tested for HIV/AIDS anonymously, almost three quarters of (especially female) workers said "yes" although the proportion is slightly lower for Uganda. However, the willingness to be tested and concern over HIV/AIDS epidemic is not biased by education level neither sex status.

Worker mobility

In a typical manufacturing firm with serious training and HR development programs, unskilled production workers would acquire skills hence upgrade upwardly along the skill ladder (say to be machine and maintenance repair or supervisory roles). The data show very few workers start working in a low-skilled job upgrade to relatively more skilled HR functions. For instance, only about 11% of Ugandan workers who started as machine repairs or operators experienced upward mobility to work as foremen and supervisors. Corresponding shares are higher for Kenya (over 20%) and Tanzania (12%). Of all the workers who started working as unskilled production workers, about one-third of them now work in a higher wage functions.

Skill and education Status

The sample of workers shows that distributions of skills or Human Resource (HR) functions have notable gender and education bias[12]. Over half of female workers in Kenya and 40% in Tanzania (25% in Uganda) work as office and sales workers, while male workers (about 30% and 25% in Tanzania) dominate in managerial and supervisory functions. However, this gender bias in the distribution of HR functions and skills is less acute in the case of Uganda, where most male workers work as production as well as office/sales workers. In general, male workers are more evenly distributed across the different HR functions compared to female workers. Finally, nearly half of the Managerial and Professional workers have highest levels of education, while over 57% of the production and office workers have lowest levels of education. Education level of workers is independent of tenure and trade union status.

4.2 Analytical framework

Main features of the previous analysis

Analysis of firm-based training can be distinguished into four major categories. The first is the determinants of FBT, which essentially examines the efficacy of various firm/worker/institutional characteristics and factors in determining training incidence or intensity. Second group of analysis are those that compare cost and benefit of FBT either as a theoretical framework for further identification of factors affecting decision to train (training incidence) or elasticity of training (i.e. marginal benefit of training relative to marginal cost of training). The third group is studies that test the empirical relationship between training and education motivated by the "education and training co-movement" hypothesis. Finally, the fourth and final group is studies that examine the impact of FBT on firm productivity (hence improvement of firm performance) or workers earning, skills or upward mobility.

[12] Categorization of skill into different levels/status is not directly measured from the data, rather derived from the various HR positions; thus assuming that the job category is directly proportional to skill categories. We follow this assumption throughout in defining skill level.

Econometric approach

Our analytical focus combines aspects of these categories in two respects. First by including education and skills level as part of the explanatory variables we effectively explain FBT, identify specific role of education and skills. We use simple model following (Blunch and Castro, 2005) in which the probability of offering FBT is modelled as a function of the key variables of interest to us (i.e. education, skill level, HIV/AIDS factor) and a set of other factors usually included in FBT determinants, including: firms characteristics, workers aggregate characteristics, technology factors, firm performance, labor market factors and business environment factors.

$$\lambda(fbt) = \alpha_0 + \alpha_i X_i + e_i \qquad (1)$$

Where λ is a latent variable of probability of receiving firm-based training (*fbt*), and which assumes value of 1 if offer *fbt* (implying that the firm benefit from training) and 0 if no training is provided. X_i are the explanatory variables, which are related to the probability of firm i offering FBT, and α_i are coefficient that reflects the impact of changes in X_i on the probability to offer FBT. As usual, e_i stands for the error term (accommodating other unobservable variations in *fbt* that are not included in X_i). Secondly, based on the fourth group of studies we examine the impact of FBT on workers earnings through the following equation.

$$\log(wage) = \beta_0 + \beta_i W_i + n_i \qquad (2)$$

Where $\log(wage)$ is log of wage level (monthly earnings) for a particular worker; W are the variables explaining variations of wage levels between different workers (such as education level, age, sex and occupational position or experience, in addition to our key variable – training incidence/intensity) and α_i are coefficients that reflect the impact of a changes in W_i on the wage level, while n_i are the usual error term.

Estimation strategy/approach

The above models will be estimated in the context of cross-sectional analysis using Stata software, which is efficient in handling the problem of censored data and missing values. Subsequently, we follow previous studies to use probit estimates for the binary dependent variable (and subsequently compute marginal effects)[13] as opposed to the latter case where for convenience we directly use OLS estimates. The appropriate estimation method as in previous studies is to use non-linear probability (probit) model for binary dependent variable and the linear OLS estimation for continuous dependent variable. Unlike the easier linear model, the use of non-linear probit avoid nonsensical feature of linear model that probability can be greater than 1 or less than 0 (Stock and Watson, 2003:302).

However, in estimating the above-mentioned models it is important to emphasize two features of our specification consistent to the focus of the analysis. Firstly, we use the same explanatory variables (X) to analyze both the training incidence (whether a firm offer train or not) and training intensity (to what extent does firm train). Thus, estimation of equation [1] takes the following specifications for training incidence (probit of FBT) and training intensity (log of proportion of workers received FBT) respectively:

$$\lambda(fbt) = \alpha_0 + \alpha_i X_i + e_i \qquad (1.1)$$

$$\log(pfbt) = \alpha_0 + \alpha_i X_i + e_i \qquad (1.2)$$

Secondly, the determinants aspect of our analysis makes use of two sets of data: the ICS firms data, and ICS individual workers data. As noted earlier, we do not merge the two data sets given limitations of the latter. Instead we estimate equations [1.1] and [1.2]

[13] The probit coefficients are estimated using the method of maximum likelihood (MLE), which produces estimators, which are efficient, consistent and normally distributed (Stock and Watson, 2003:322). However, the estimated coefficient are difficult to interpret because they affect the probability that the binary dependent variable (*fbt*) is equal to 1 via the usual *z*-value (although the estimates can be used to show the nature of the relationship between probability of *fbt* and *X*. To get round this difficult, the practice among cross-section econometrician is to compute marginal effects from the estimates probabilities. Marginal effects are first derivatives of the coefficients (d_y/d_x) showing change in the dependent variable given one unit change in the particular explanatory binary variable that would not be inferred directly from probit estimates which are

separately using the latter data set. Thus, while the motivation in the first aspect was to use similar explanatory variables for two different dependent variables (one binary, measuring incidence; and another continuous, measuring intensity), the focus of the second aspect of estimation scheme is to pursue similar questions with a different sort of data as follows:

$$\lambda(fbt) = \alpha_0 + \alpha_i W_i^{'} + e_i \qquad (1.3)$$

$$\log(pfbt) = \alpha_0 + \alpha_i W_i^{'} + e_i \qquad (1.4)$$

Where $W_i^{'}$ is a set of the same explanatory variables as in [2] but modified to exclude *fbt* log(*pfbt*) i.e. the training incidence and intensity variables used in [2] to measure impact of FBT on wages; and which are now the dependent variables. The rest of the variables are as defined earlier.

Therefore, our estimations will involve five different specifications i.e. equations [1.1] to [1.4] and equation [2]. As noted earlier, we shall follow the practice from previous related studies (Xiao and Tsang 2001; Arulampalam et al (2003); Leuven and Oosterbeck 1999 and Ariga and Brunello 2002) to estimate separate country equations for each of the five specifications. Estimating separate country specifications approach has several advantages over cross-country panel estimations. First, it reduces the complexity of analysis involved in manipulating survey data. Second, it is convenient way to identify cross-country differences in the estimates. These differences arise due to observable individual, demographic and institutional characteristics (see Arulampalam *et al*, *op cit*). And third, separate country regressions can accommodate individual country weaknesses in the data (that are likely in SSA countries with huge informal economies and weak institutions) without requiring enormous modifications.

Since, in a comparative analysis as in this study, some factors may appear important is one but not in another country, we thus include in our analysis a wide range of possible determinants/indicators of FBT (elements of *X* and *W*) that can be subsequently reduced to identify a reasonable parsimonious specification for explaining variations in FBT. Our

choice of explanatory variables is mainly informed by reviewed literature and insights from conducting firm level surveys in Tanzania. Reducing to the model from general to parsimony requires efficient evaluation of results, which can be made by examining significance of various reported statistical tests including *t*- (for the specific variables) and Chi^2 or Log likelihood ration (LR) tests (for significance of particular specification).

5. Results

It is not mandatory for firms to offer formal firm-based training (FBT). Thus, while some firms may be offering FBT, others may choose not to for various reasons. However, the development policy considers training, as one of the key input for enhancing human capital and capability needed for raising productivity hence higher growth rate necessary for poverty reduction. Thus, if some firms do and others do not offer formal training, it is pertinent to know factors determining this outcome in order to inform policy intended to build human capital.

This section presents and discusses the results of our five estimations. We first present and discuss the estimates of the determinants of training incidence (marginal effects of the probit model) and training intensity (based on OLS estimates). We then proceed in the same order to show estimates based on workers module before finally discussing the impact of FBT on workers earnings (wage level). Note that we are not trying to compare the two data sets but rather take motivation from of examining the determinants of FBT from firm and workers characteristics approaches.

5.1 Determinants of Firm-Based Training in East African Manufacturing Sector

Determinants of training Incidence

Marginal effects of training incidence from the parsimonious probit estimations are given in Table 5.1. Two points are notable from these results. First, in all the three countries, the size of firms is a key factor determining decision to offer formal training, although the extent of influence with respect to size of the firm seem exceptionally large for Kenya (about 50%), compared to both Tanzania and Uganda (about 5%).

The second notable result is that factors determining training incidence differ markedly across the three countries with a reasonable similarities between Kenya and Tanzania, and not Tanzania and Uganda as one would have expected (The industrial sector of/and Kenyan economy is much more advanced than that of Tanzania and Uganda).

Thirdly, the performance of our specification for individual country shows that, while most of the factors hypothesized as determinants of firms' decision to offer formal training are significant especially for Tanzania, most of them are not significant for Uganda. In the latter case, only firm size, technological capacity and (to a smaller extent) foreign ownership are found to be significant determinants of incidence to train.

It is important to note that, since the socio-economic policy regime and business environment is different for different countries, it should not be too surprising to obtain some different results for different countries. Our discussion and interpretation of the different array of major drivers affecting training incidence should therefore take this factor into consideration. For instance, while firms' characteristics largely determine training decision in Kenya, in Tanzania it is business environment factors that matters most. In Uganda, training depends largely on the sectors in which particular firms are operating – a result which is not important for the other two countries. In all cases though, smaller firms are largely incapable of offering training relative to large firms.

One of the key issue underlying discourses on Human Resource Development (HRD) in SSA countries is the threat of HIV/AIDS pandemic. Since the conceptual framework of this study is motivated by HRD theory (see Becker, 1964), we reflect HIV/AIDS issue in this study by assessing whether FBT is influenced by employers perceptions about HIV/AIDS. Two contrasting hypothesis abound. First, firms may resort to training in order to cover the gap caused by HIV infected workers (died or under care) so as to maintain the level of productivity desired by the firm. Thus, firms that have HIV prevention programs are more likely to offer formal training unlike those who do not have, so that we expect a positive relationship between the HIV conscious and training incidence. Second, firms may also avoid training if they perceive high turnover due to HIV epidemic, so that firms that are HIV conscious train less than those that are not (negative relationship). Another possibility is that firms reduce the risk associated with the epidemic (shortage of skilled workers etc.) by mechanizing their production process so that they rely less on labor and thus demand less training (negative relationship).

Our results confirm the first hypothesis for Kenya and Tanzania, where we found a positive and significant (at 1% and 5% levels respectively) relationship between training incidence and HIV-consciousness. This suggests that firms which care about HIV epidemic train more as a means to abate the negative effect of the epidemic and maintain their human capital.

The finding in most previous studies that foreign ownership is one of the most important determinants of training incidence is only evident in Kenya and surprisingly negative in Uganda. It may be that given the high cost of training to a firm, Kenyan domestic firms are less inclined to train compared to foreign ones, an explanation which contradicts the Ugandan results (that firms are less likely to train if they have higher share of foreign ownership).[14] Both theory and empirics would suggest that exporting firms are likely to offer FBT unlike non-exporters but this evidence was only weakly supported by Kenyan data.

Firm age is found to be only significant and negatively related to training incidence for Tanzania suggesting that older firms - most probably (previously) state-owned enterprises are less likely to train compared to younger (Greenfield investment) firms that are presumed to consider training as part of its competitiveness strategy.

Individual characteristics are important factors that firms consider in deciding to offer formal training. This is because selection of the employees to be offered training is made strategically, first to maximize the benefits of training to the firms. And secondly, to ensure effectiveness of training, the trainee has to be trainable (possess minimum requirements). We will in a later subsection, elaborate more on the individual characteristics based on ICS workers data set[15].

[14] Since the foreign ownership factor for Uganda is weakly significant, we defer its interpretation as a possible issue for future research, but generally concur to the literature that, based on Kenyan results, foreign firms are more likely to train more than domestic owned ones.

[15] Note that in the main ICS data, there is a limited range of individual characteristics to model in addition to skill (proportion of skilled labor), education level (low, medium and high) and the work position of employee (HR function).

Overall, these variables were less significant except for few cases such as skill level that was only significant for Tanzania (and negative) and job position (HR function) that was weakly significant for Kenya. Generally, the negative relation between skill level and training suggest that in Tanzania, training is a complement to the low level of skills that is characteristic of the Tanzanian business-operating environment. Related to this, lack of adequate skilled labor is also found to be a significant constraint that induces firms to offer FBT. That is, Tanzanian manufacturing firms experiencing shortage of skilled labor are more likely to offer formal training to their employees, consistent with the human capital argument in favour of FBT.

Furthermore, Technology factors were significantly associated with FBT for Uganda and Kenya (indicated by investment in new technology) and Tanzania (indicated by R&D activities) showing that firms typically require more FBT as a means to adapting (to) new technology. The labor market factors we proposed vz. the extent of unionisation and employee turnover were not significant, although high labor turnover positively affect training decision in the case of Tanzania.

Finally, most of the various business environment factors matter for Tanzania but not at all for Uganda. For both Kenya and Tanzania, firms that are (more) constrained by labor regulations are (more) likely to offer formal training than those that are not. Furthermore, membership to business associations (e.g. chamber of commerce) is a significant determinant of training incidence in both (but with different nature of influence) Tanzania (positive) and Kenya (negative). Firms in Tanzania are more likely to offer training if they cooperate in undertaking training. These results corroborate the above finding that membership to business associations may be useful for training.

Table 5.1 Marginal Effects of Training Incidence using Firms' data

Dependent variable: Offer formal training – *fbt* (Equation [1.1])

Major Drivers	Selected Variable	Kenya	Tanzania	Uganda
Firm characteristics	Sector	-0.011 (0.011)	-0.001 (0.016)	0.030** (0.013)
	Foreign ownership	0.218** (0.109)	0.040 (0.090)	-0.123* (0.065)
	HIV factor	0.316*** (0.077)	0.215** (0.083)	0.071 (0.064)
	Exporting	0.141* (0.082)	0.006 (0.090)	0.114 (0.092)
	Firm size	0.154*** (0.047)	0.109** (0.052)	0.160*** (0.042)
	Firm age	0.022 (0.068)	-0.105** (0.055)	0.030 (0.051)
Individual characteristics	Education level	-0.001 (0.066)	-0.025 (0.061)	0.036 (0.046)
	Proportion of skilled	-0.002 (0.001)	-0.002** (0.001)	0.001 (0.001)
Technology factors	Active in R&D	0.097 (0.080)	0.207** (0.092)	Dropped – collinearity
	Invest in Technology	0.153* (0.083)	0.050 (0.080)	0.254*** (0.057)
Labor market factors	Unionization	-0.000 (0.001)	-0.000 (0.001)	0.003 (0.002
	High worker turnover	-0.081 (0.110)	0.173* (0.090)	0.076 (0.087)
Business environment factors	Constrained by labor regulations	0.319** (0.167)	0.342** (0.135)	-0.020 (0.102)
	Constrained by inadequate skills	0.124 (0.136)	-0.209** (0.078)	-0.082 (0.061)
	Cooperate in training	0.124 (0.137)	0.330* (0.171)	-0.033 (0.062)
	Belong to business association	-0.205** (0.091)	0.191** (0.080)	0.076 (0.063)
Model performance	LR Chi2 (p – value)	94.7 (0.000)	81.8 (0.000)	96.6 (0.000)
	Pseudo-R^2	0.34	0.25	0.27
	No. of Observations	244	246	291

Notes: ***, **, *: statistically significant from zero at 1%, 5% and 10% respectively. Figures in parentheses are standard errors, except for Chi2 (p-value), which shows that the joint significance of the variables in the specifications for all countries is statistically different from zero, and Pseudo-R^2 of the specification for each country shows a good fit. Number of observations shows that the sample attrition rate was modest.

We also estimated the above equation with skill variable defined in terms of job position (assuming that higher the job position are occupied by more educated and skilled workers). The significance of skill variable did not improve (except slight change for Kenya).

Determinants of training Intensity

Training intensity is measured as a share of workers that receive formal training, which was firstly transformed to logarithmic form alongside other continuous variables for convenient use of OLS estimation[16]. We used similar independent variables as those used above for two purposes. First, to examine if similar factors that determine training at firm level can also indicate the extent with which firms undertake training. If not, then our second objective is to identify factors that uniquely determine extent of training. Compared to the case of training incidence, the specification for training intensity is highly parsimonious. Obviously, we cannot expect all the variables that matter for incidence to also be significant in determining intensity, thus the number of variables for the latter would tend to be far fewer than in the former case.

The OLS results for training intensity (shown in Table 5.2) show that Ugandan estimates are generally insignificant. And, that firm size is a significant determinant of training intensity but with different signs between Kenya and Tanzania. For Kenyan firms, proportion of workers trained decreases the larger is the size of firm – perhaps reflecting the fact that, training is done only for a selected (presumably few skilled) workers as majority of workers are expected to have the required skills. This is vise versa to Tanzania where, as we expect, the larger the size of firm the greater the proportion of firms trained, thereby substantiating the fact that training complements skill requirement in the manufacturing sector. This proportion increases with increase in the share of workers in high job position.

As in the case of training incidence in Kenya, FDI is an important determinant of training intensity (i.e. foreign owned firms train larger proportion of their workers than domestic owned firms). Likewise for Tanzania, skill level is significant and negatively related to training intensity – implying that firms train larger proportion of their workers (or equivalently offer more training) to complement low level of skills. Interestingly, and

[16] The share of workers receiving FBT is used as a convenient indicator of training intensity since the best indictor would be the number of times the training is given (training frequency), a variable that could not conveniently be measured directly from the main ICS data, but was possible to do so from the individual workers sub-survey data.

unlike in the case of training incidence, R&D activity is a significant and positive determinant of training intensity for both Tanzania and Kenya. Clearly, as firms aim to introduce a new product, process or improve the existing one, it is imperative to train larger proportion of workers (across the production process/chain) or conduct repeated training for precision before adopting it.

Worker turnover is found to be negatively associated with training intensity – implying that, high turnover discourages firms to continue investing in FBT for Kenya. Finally, in all the three countries, none of the business operating environment factors were found to be significant determinant of training intensity.

Table 5.2 Determinants of training intensity using Firm data

Dependent variable: Share of workers that received formal training –*pfbt* (Equation [1.2])

Selected Variable	**Kenya**	**Tanzania**	**Uganda**
Constant	-0.853 (1.138)	-0.157 (2.819)	-1.617 (1.256)
Foreign ownership	0.940** (0.355)	0.079 (0.571)	-0.244 (0.402)
Exporting	0.183 (0.335)	-1.662** (0.602)	0.277 (0.387)
Firm size	-0.561** (0.202)	0.979** (0.433)	-0.071 (0.194)
Firm age	-0.224 (0.261)	-0.480 (0.383)	0.556** (0.254)
Education level	0.135 (0.228)	-1.006 (0.863)	0.095 (0.221)
Proportion of skilled	-0.054 (0.214)	-0.774 (0.493)	-0.108 (0.215)
Active in R&D	0.813** (0.305)	1.098** (0.547)	Dropped – collinearity
High worker turnover	-0.829* (0.436)	0.758 (0.701)	0.362 (0.395)
F-test (p-value)	**3.12 (0.003)**	**2.17 (0.053)**	**1.24 (0.298)**
Adj-R^2	**0.15**	**0.18**	**0.03**
No. of Observations	**94**	**246**	**291**

Notes: ***, **, *: statistically significant from zero at 1%, 5% and 10% respectively. Figures in parentheses are standard errors, except for *F-test* (p-value), which shows that the joint significance of the variables in the specifications for all countries is statistically different from zero only for Kenya and slightly so for Tanzania. Note also that several variables were dropped from this specification in the course of improving the estimates but results did not change. Diagnostic tests using the "`vif`" stata command show that multicollinearity is not serious problem in our estimations.

What can we learn from Individual Workers Data?

Different from the firms' data, we have a reasonably smaller number of variables to use from the workers data, and so we concern less about parsimoniousness in order to maintain a fairly comparable results (effectively avoiding a mis-specification error of dropping variables that are least significant in one country but most significant in another). For instance, experience is one of the key determinants of the extent of training a particular worker, thus omitting it made all other variables insignificant.

Based on the workers data, we report probit estimates (since our concern is on the probability of workers being trained and not elasticity) of training incidence in Table 5.3, and OLS estimates of training intensity in Table 5.4. Overall, the estimates of training incidence are generally insignificant (except for few variables in Tanzania) compared to training intensity. Some interesting variations in results emerge. Education influences the extent of training for both Kenya and Uganda, and determines decision to participate in training in the case of Tanzania. For Tanzania, experience increases the likelihood to train but only to an extent: the more experienced staff are trained less often than newer staff, apparently to give room for less experienced/newly recruited workers. But its opposite in Ugandan case where the more experienced workers are trained more often (perhaps that is why age is so significant in that case). Unlike the case of experience in Tanzania, high skilled (or positioned) workers are trained less often in both Kenya and Ugandan cases.

Another interesting finding is that membership to trade union is different for Kenya (positive) and Tanzania (negative). This implies that Kenyan trade union exert rather activist force to their HRD needs – which is realistic finding given a rather mature/stronger labor market there compared to Tanzanian one where trade union is often regarded as a remonstration. Overall, compared to the ICS firms' data, results based on workers individual data provide better estimates in terms of the significant role of education and skills in firms' training policy.

Table 5.3 Marginal Effects of Training Incidence using Workers' data

Dependent variable: Received formal training – *fbt* (Equation [1.3])

Selected Variable	Kenya	Tanzania	Uganda
Constant	5.999**	-1.231	-0.478
	(2.520)	(0.231)	(1.688)
Sex	0.667	0.005	-0.094
	(0.526)	(0.211)	(0.237)
Age (log)	0.896	-0.058	0.679*
	(0.965)	(0.386)	(0.430)
No. of FBT received in the past (log)	0.342	-0.029	-0.079
	(0.261)	(0.091)	(0.133)
Education level (discrete categories)	0.108	0.444***	-0.019
	(0.092)	(0.087)	(0.091)
Experience (log of years in this firm)	-0.007	0.356***	-0.058
	(0.225)	(0.118)	(0.117)
Skill and HR category	-0.008	-0.016	-0.015
	(0.063)	(0.027)	(0.034)
Belong to a trade union (or not)	0.146	-0.415**	-0.239
	(0.379)	(0.193)	(0.337)
Tenure (Full time or not)	-0.542	0.049	-0.055
	(0.442)	(0.356)	(0.373)
LR Chi2 (p – value)	**8.15 (0.320)**	**43.5 (0.000)**	**3.90 (0.866)**
Pseudo-R^2	**0.10**	**0.14**	**0.02**
No. of Observations	**247**	**253**	**340**

Notes: Reduction of the model size to a more parsimonious specification did not change results substantially. Other notes as explained in Table 5.1.

Table 5.4 Determinants of training intensity using Workers data

Dependent variable: Number of training received in this firm – *pfbt* (Equation [1.4])

Selected Variable	Kenya	Tanzania	Uganda
Constant	-1.290 (1.218)	-1.500 (0.923)	1.090* (0.650)
Sex	0.032 (0.136)	0.211 (0.148)	0.202** (0.091)
Age (log)	0.340 (0.309)	0.270 (0.267)	0.216 (0.168)
Education level (discrete categories)	0.086*** (0.028)	0.045 (0.051)	0.172*** (0.035)
Experience (log of years)	0.029 (0.072)	-0.4440** (0.077)	0.106** (0.048)
Skill and HR category	-0.034* (0.019)	-0.020 (0.019)	-0.025** (0.013)
Belong to a trade union?	0.312** (0.150)	-0.018 (0.133)	-0.088 (0.125)
Tenure (Full time or not)	-0.208 (0.220)	-0.112 (0.254)	0.115 (0.151)
F-test (p-value)	**5.03 (0.000)**	**6.55 (0.000)**	**10.53 (0.000)**
Adj-R^2	**0.10**	**0.13**	**0.16**
No. of Observations	**262**	**261**	**340**

Notes: Parsimonious specification required that we omit "Experience" variable from the full specification. However, by doing so, variables "Age" and "Education" that were insignificant become slightly significant (at 10% level) for Kenya and Tanzania respectively. Other notes in Table 5.2 apply. Diagnostic tests using the "vif" stata command show that multicollinearity is not serious problem in our estimations.

5.2 Impact of Education and Skills on Firms-based Training

Based on the above results, this section discusses further the empirical relationship between training, education and skills (as these were the key variables) to qualify some of the empirical results reported above. As noted above, the variable "level of education" is generally not statistically significant when using firm-based data, but significant and positively related to both incidence and intensity equations when we use the workers data. Furthermore, as shown in Table 5.5 below, education is one of the strongest factors determining workers earnings. Thus, if training complements educational level, which in

turn determines earnings level, then it is logical to presume that training essentially augments earnings.

Nevertheless, it remains surprising that firms' data did not echo this finding in any reasonable extent (an obvious issue for further research). Nevertheless, one supposition is that, the measurement of the education variable was not appropriate. Since our education variables was measured in discrete forms Therefore we attempt to change to three alternative ways of measuring it and in turn include them in both incidence and intensity estimations.

Firstly, we generated variables for each (measured as log of the share of permanent workers) specific educational level. Secondly, we changed to measure these educational level variables as dummies (e.g. taking value of "1" if that particular level and "0" otherwise); and finally we estimate impact of these different forms of educational variables directly without controlling for (or including) other explanatory variables in log form[17]. Although results did not change in any notable way, there are indications of association of FBT with both the lower and upper ends of the education ladder. Graduate degree variable became significant and positive for Tanzania but negative for Kenya, and in the case of Uganda only the "primary education" became slightly and negatively significant.

A change in the measurement of skill levels from discrete to dummies did not change results substantially, except that for both Kenya and Tanzania, "high level of skills" variable became slightly significant (at 10%). Although we find education and skill levels not highly correlated (based on correlation analysis), in practice level of skill more or less reflects that of education. Thus we dropped skill level from the specification to examine any change of the educational variable(s), but overall, the results did not improve.

[17] We also tried to estimate using "educational level" variables measured in level (not logs) form but results were worse than those in log form.

Two conclusions can be advanced at this juncture. First, although we cannot reject the association of education characteristics with FBT, evidence of its existence is not certain, and may differ significantly across (depending on educational and training policy of) different countries. Secondly, the different results in this study imply that firms are not necessarily induced by educational characteristics of workers as much as productivity effect of in providing FBT.

3. The Impact of Firm Training on Workers Earnings: Do Workers Receive Higher Wages After Training?

One of the main motivations for both firms and workers to engage in FBT is the skills acquired to complement initial stock of human capital or orient to new technology. As a result of training, firms expect to benefit through increased competitiveness and productivity; and workers expect higher earnings among others. The workers data set is also used in estimating the impact of training on earnings by undertaking mincerian regression. To keep the analysis tractable, we more or less maintain same explanatory variables as used in the determinants specification except for we use (log of) the level of basic salary as a dependent variable and change the training incidence and intensity to be explanatory variables.

In addition to the training variables, we regress wage level (in log form) on a number of other variables including among others, sex (for gender bias), age (younger workers may be paid less than older ones), experience, education level, tenure and HR position. Training incidence variable is binary (taking value of 1 if the worker does receive FBT), while the training intensity is continuous (measuring the number of times the worker has received training in the past). Other variables includes in the analysis but dropped for parsimonious reasons include: membership to trade union and experience (number of years in the same firm).

The results are shown in Table 5.5. One key objective is to examine if wage level respond positively to training incidence (or intensity). Although these variables were not

significant to a reasonable extent, the nature of impact of training is generally shown to be positive. However, only in Tanzania is training incidence variable highly significant, and only in Uganda is training intensity highly significant determinant of earnings. The high significance of the constant term implies existence of many other factors affecting wage level.

Given our parsimonious strategy we included only a few variables that we know both from literature and common sense that they directly relate to wage level. The results show some country variations with regards to the impact of these factors, but three were highly significant and common across the three countries: education level, skill/HR position and tenure. One clear finding from the results is that, (the higher) the education level of employee the higher the wage earnings. However, across the countries in question, apparently wage level depends positively on the level of skill and HR position of a particular employee.

The impact of tenure on wage level is mixed albeit significant in all the three countries. Unlike in the case of Tanzania where the permanent workers are paid more than non-permanent workers, the relationship for Kenya and Uganda is negative (that is, non-permanent employees are paid higher wage in relative terms compared to permanent ones). One way to interpret this result is to consider the short-term nature of non-permanent workers whose wage level would include (in addition to basic pay) all remunerations such as payments for pension and social security contributions, which would not be paid to the permanent workers.

In addition, some factors matter only for a particular country. For instance, sex is significant (at 5% level) only in Kenya (men are paid more relatively)[18]. In Tanzania and Uganda, the age variable is significant (at 5% and 10% respectively) implying that the older workers receive higher wage. At first instance, one would tend to associate such a finding to experience factor, but the variable remains significant even when we control

[18] In Uganda, although the sex variable is insignificant (we cannot make statistical inference on this), the negative sign imply that female workers get higher pay than male workers unlike in Tanzania where the practice seem to echo that of Kenya.

for experience factor. The experience factor (measured as log of number of years with the same firm) is strongly significant but negative for Kenya, and weakly so but positive for Uganda. Interpreting the negative relationship between experience and wage (in Kenya) is not straightforward (it is counterintuitive).

Table 5.5 Training and Workers Earnings

Dependent variable: Wage earnings per month – *wage* (Equation [2])

Selected Variable	**Kenya**	**Tanzania**	**Uganda**
Constant	6.082**	6.360***	8.335***
	(2.429)	(1.006)	(0.851)
Received on job training (FBT)	1.069**	-0.019	0.009
	(0.544)	(0.159)	(0.137)
Sex	0.527**	0.095	-0.073
	(0.268)	(0.159)	(0.122)
Age (log)	0.471	0.713**	0.895***
	(0.620)	(0.288)	(0.242)
No. of FBT received in the past (log)	0.013	0.067	0.202**
	(0.125)	(0.067)	(0.075)
Experience (log of years in this firm)	-0.638***	0.045	0.121*
	(0.143)	(0.089)	(0.067)
Education level (discrete categories)	0.378***	0.428***	0.421***
	(0.057)	(0.059)	(0.050)
Skill and HR category	-0.111**	-0.026	-0.036**
	(0.038)	(0.021)	(0.017)
Tenure (Full time or not)	-1.470***	1.031***	-0.852***
	(0.433)	(0.284)	(0.198)
F-test (p-value)	**18.85 (0.000)**	**15.08 (0.000)**	**34.70 (0.000)**
Adj-R^2	**0.36**	**0.33**	**0.46**
No. of Observations	**256**	**253**	**321**

Notes: ***, **, *: statistically significant from zero at 1%, 5% and 10% respectively. Figures in parentheses are standard errors, except for F-test (p-value) that show significance of the entire specification. Number of observations shows that the sample attrition rate was high but adequate. Despite, the joint significance of the variables in the specifications for all countries is shown to be statistically different from zero, and Adj-R^2 of the specification for each country shows a good fit. Diagnostic tests using the "`vif`" stata command show that multicollinearity is not serious problem in our estimations.

6. Conclusion and Policy Implications

In recent years, studies on firm-based training (FBT) have assumed great importance both in academic and policy discourses given the role of FBT in enhancing workers skills for increasing productivity hence economic growth. Despite this importance, studies on Sub-Sahara African countries are rare in SSA where both education and skill levels are too low by international standards to generate the required level of industrialization. Using the World Bank's (2003) firm level Investment Climate Survey (ICS) data for Kenya, Tanzania and Uganda, this paper examines the extent to which education and skill characteristics are important for the East African manufacturing firms in deciding to offer FBT.

Although relatively fewer firms do offer FBT, our analysis finds that different factors apply to specific countries differently but size and technology status of firm are key determinants of FBT across the East African manufacturing sector. Given the low level of skills and education in these countries, our evidence suggests that FBT has potential to contribute to skill development among other objectives. Given its threat in Human Resource Development in sub-Saharan Africa, the study also examine the effect of HIV/AIDS on FBT and found that, firms which care about HIV epidemic train more as a means to abate the negative effect of the epidemic in order to maintain their human capital.

Furthermore, although using the ICS data we may not reject the complementary relationship between education characteristics and FBT straightforwardly, evidence of its existence is not certain, and may differ significantly across (perhaps depending on educational and training status of) different countries. However, our evidence suggests that FBT augment skills/education levels in Kenya while for Uganda, it supplements the shortage of skills compared to Tanzania where FBT mainly supplements the low level of skills in the manufacturing sector. Nevertheless, FBT may augment workers earnings even when the latter depend on their education level.

The findings imply that enterprise training should receive similar policy emphasis as in the case of education in the bid to enhance human resource development for growth (through increased productivity and competitiveness) and poverty reduction. That is, FBT is not only for supplementing low levels of education in Africa, but can be used to complement the intrinsic skill in the educational attainments. Such emphasis may include the need to strengthen and increase support to the vocational training initiatives, and reviewing the education and training policy to aim at skills enhancement. For instance, most of the fresh graduates may be effective beneficiary of skill enhancement program that connects graduate education with labor market skill demands. In addition to this, the finding that size is a key determinant implies that SME may require Government support for providing FBT.

References

Ariga, K., and Brunello G., (2002), "Are the More Educated Receiving More Training? Evidence from Thailand." *IZA Discussion Paper* No. 577 September 2002.

Arulampalam, W., Booth, L. A., and Bryan L. M., (2003), "Training in Europe" University of Warwick and IZA, Bonn.

Aw, B., and Tan, H., (1995), "Training Technology and Firm Level Productivity in Taiwan and (China)." Conference on Enterprise and Training Strategies and Productivity, the World Bank, June 1995.

Barrie, J., and Pace, W., (1999), "Learning of organizational effectiveness: Philosophy of education and human resources development". *Human Resource Development Quarterly* 9(1), 40-44.

Bassanini, A., Booth, A., Brunello G., De Paola, M., and Leuven, E., (2005), "Work Place Training in Europe." *IZA Discussion Paper Series,* No. 1640 June 2005.

Becker, G. S. (1964) *Human Capital*, New York, Columbia University Press.

Bennel, P., Bendera S., Kamyenze G., Kimambo E., Kiwia, S., Mbiriyakura T., Mukyanuzi F., Munetysi, J., Muluzi, J., Pursalaw, W., and Temu J., (1999), " Vocational Education and Training in Tanzania and Zimbabwe in the Context of Economic Reforms" Education Research Paper No. 28, DFID.

Biggs, T., (1995), "Training, Technology and Firm Level Efficiency in Sub Saharan Africa" The World Bank, RPED Paper No. 48, August 1995.

Bills B. D., (1999), " Participation in Work Related Education: Variations in Skill enhancement among workers, employers and Occupational Closure" (incomplete reference)..

Blunch, N. and P. Castro (2005) "Multinational Enterprises and Training Revisited: Do International Standards Matter?, *Social Protection Discussion Paper Series* No. 0504, The World Bank.

EAC (2001), "East African Development Strategy 2001", EAC Secretariat, Arusha.

Gerfin, M. (2003), "Firm-sponsored work-related training in frictional labor markets – An empirical analysis for Switzerland", *IZA Discussion Paper*, Department of Economics, University of Bern.

Government of Tanzania (2005), "*Economic Survey 2005*", Ministry of Planning, Economic Affairs and Empowerment.

Government of Uganda (2005), "Macroeconomic performance for FY 2003/04", Ministry of Finance, Planning and Economic Development, Kampala, Uganda.

Hersch, R. (1991), "Education Match and Job Match. *The Review of Economics and Statistics*", Vol. 73 No. 1, pp 140-44.

Haan, Hans Christian (2002),"Training for Work in the Informal Sector: New Evidence from Eastern and Southern Africa", International Training Centre of the ILO, Turin, Italy, http://www.itcilo.it/french/bureau/turin/whatisnew/flyers/EB.

Görg, H., E. Strobl and F. Walsh, (2002), "Why Do Foreign-Owned Firms Pay More? The Role of On-the-Job Training" IZA Discussion Paper Series No. 590, October.

Leuven, E., and Oosterbeck, H., (1999), "Demand and Supply of Work Related Training: Evidence from Four Countries" Research in Labor Economics Vol. 18, pp 303-30.

Maddala, G.S (1983) *Limited-Dependent and Qualitative Variables in Econometrics*, Econometric Society Monograph, Cambridge.

Reid, R. and R. Harris (2002) "Determinants of Training in SME Enteprises in Northern Ireland" Mimeo.

Rosholm, M. (2005), "Training in African Enterprises: Public-Private Wage Gaps in Zambia and Kenya, The World Bank, African Region.

Schaffner A., (2001), "Turnover and Job Training in Developing and Developed Countries: Evidence from Colombia & The United States" (incomplete reference).

Sicherman, N., [1990], "Over education" in the Labor Market, Journal of Labor Economics, Vol 9 No 2 pp. 101-122.

Stock, J. and M. Watson (2003) *Introduction to Econometrics*, Pearson Education, Inc.

United Nations (2005), East African Investment, United Nations, Geneva and New York.

Wambugu Anthony (2003), "Essays on Earnings and Human Capital in Kenya", Department of Economics School of Economics and Commercial law Göteborg University.

World Bank (2005a), Uganda Diagnostic Trade Integrated Study, World Bank, Washington DC.

World Bank (2005b), Tanzania Diagnostic Trade Integrated Study, World Bank, Washington DC.

World Bank (2005c), *World Development Indicators 2005*, Washington, DC.

Xiao, J., and Tsang, M., (2001), "Determinants of on the Job training and Adult Education in Shenzhen China." *Paper Presented at International Conference on Economics of Education* Beijing University, Beijing, China May 16-19, 2001.

APPENDIX 1:
List of Sub-sectors included in the ICS of Manufacturing Sector

(a) Distribution of Sectors in the Kenya ICS data

Sector	Particulars	Frequency	Percent
1	Agro industry	69	24.47
2	Bakery	14	4.96
3	Chemical and Paints	25	8.87
4	Construction Materials	17	6.03
5	Furniture	8	2.84
6	Metals	42	14.89
7	Machinery	7	2.48
8	Paper, Print and Publishing	18	6.38
9	Plastics	23	8.16
10	Textiles	22	7.8
11	Garments	20	7.09
12	Leather	5	1.77
13	Wood	12	4.26
Total		282	100

(b) Distribution of Sectors in the Tanzanian ICS data

Sector	Particulars	Frequency	Percent
1	Agro industry	81	29.3
2	Chemical and Paints	27	9.8
3	Construction Materials	11	4.0
4	Metals	29	10.5
5	Furniture/wood	65	23.6
6	Paper, Printing and Publishing	25	9.1
7	Plastics	7	2.5
8	Textiles, Garments, Leather	31	11.2
	TOTAL	276	100.0

(c) Distribution of Sectors in the Ugandan ICS data

Sector	Particulars	Frequency	Percent
1	Agro industry	122	40.7
2	Chemical and Paints	18	6.0
3	Construction Materials	40	13.3
4	Furniture	47	15.7
5	Metals	21	7.0
6	Paper, Printing and Publishing	23	7.7
7	Plastics	7	2.3
8	Textiles and Leather	15	5.0
9	Wood	7	2.3
	TOTAL	300	100.0

APPENDIX 2

Description of Variables (X_i) determining FBT by country

S/n	Name (expected sign)	Type	Measurement	Kenya	Tanzania	Uganda	Average
1	Foreign ownership (+)	Continuous	% with FDI > 30%	16.6	21.7	22.6	20.3
2**	Public ownership (-)	Binary	% with State owned > 30%	7.4	7	2.7	5.7
3**	Formal vs. Informal (+)	Binary	% paying by credit	79.2	61.21	59.3	66.6
4	HIV factor (+/-)	Binary	% with HIV prevention activities	40	30	32	34.0
5	Exporting (+)	Binary	% of firms exporting	52.1	28.3	17	32.5
6	Firm size (+)	Discrete:	% Micro (<10 workers)	3.5	17	18	12.8
			% Small (>=10 & <50 workers)	32	40	51	41.0
			% Medium (>=50 &<100 workers	16.2	17	11.3	14.8
			% Large (>100 workers)	48.2	26	19.7	31.3
7	Firm's age (+/-)	Discrete:	% estab. before 1990	73.2	51.1	28	50.8
			% estab. between 1990 - 2000	19.7	38.4	58.7	38.9
			% estab. after 2000	7	10.5	13.3	10.3
8**	Worker's age group (-)	Discrete:	% with young (<30yrs)	0.4	1.1	11	4.2
			% with mid-age (>=30 & <45 yrs)	8.5	9.1	38.3	18.6
			% with older (>=45 yrs)	91.2	89.8	50.7	77.2
9	Educational level (+/-)	Discrete:	% with *low level* (primary and sec)	78.2	19.6	24.3	40.7
			% *mid level* (>sec. sch.&< degree)	15.5	23.2	44.7	27.8
			% with *high level* (>= first degree)	6.3	57.2	31	31.5
10	Proportion of skilled (+/-)	Continuous	Avg. prop of skilled employees				
11	Active in R&D (+)	Binary	% with R&D activities	42.6	22	**32.3**	32.3
12	Invested in new tech (+)	Binary	% investing in new technology	66.5	47.5	47.3	53.8
13	Sales Performance (+)	Continuous	% with growing sales	82	84.4	90	85.5
14**	Export performance (+)	Continuous	% with growing exports	63.4	85.1	84	77.5
15	Unionisation (+/-)	Continuous	% workers in trade union	38.1	40.1	4.4	27.5
16	High worker turnover (+/-)	Continuous	% workers left, died or dismissed	58.6	18	6.5	27.7
	Selected Business environment factors: % number of firms:						
17	Constrained by labor regulations (-)	Binary	Labor Regulations listed as critical constraint	4.2	8	9.3	7.2
18	Constrained by inadequate skills (+)	Binary	Low level of education and skills listed as critical constraint	9.2	17.8	26.3	17.8
19**	Constrained by low access to finance (-)	Binary	Access to finance listed as critical constraint	22.2	25.4	42.3	30.0
20	Cooperate in training (+)	Binary	Whether usually cooperate with other firms in training				
21	Belong to Business Association (+)	Binary	Whether belong to a chamber of commerce	36.6	50	31	39.2
22*	Offering formal training	Binary	Whether offer formal training	44	37.3	29.7	37.0

Notes: *Not included in the regression (dependent/descriptive variable), **Included in regression but successively dropped in various (for parsimonious) estimations. The sign in brackets after the variable

name represents our hypothesis regarding relationship between (impact of) that variable and (on) FBT. Other variables include sub-sector (see list in Appendix 1).