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Local Skill Development from China's Engagement in Africa: Comparative Evidence from the Construction Sector in Ghana

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ABSTRACT

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OVER THE PAST DECADE, CHINESE ENTERPRISES HAVE made significant progress in developing new business ventures in Africa. There is ongoing debate whether these Chinese enterprises contribute to local skill development in their host countries. We use survey data from the construction sector in Ghana to examine the heterogeneity in skill transfer to local workers in Chinese enterprises, other foreign and local enterprises, and the challenges faced by firms in local skill development. The results show that both Chinese and other foreign owned enterprises contribute positively to local skill development through the provision of general and specific training. However, Chinese enterprises have a higher propensity to provide short-term general training to local workers than those of other foreign enterprises. We identify low technical education quality, low employee retention rate, short project time frame, and communication and cultural barriers as key challenges that distort incentives for skill-upgrading in the construction sector. Foreign governments and host country stakeholders could strengthen bilateral cooperation in technical and vocational education to mitigate these structural challenges.

INTRODUCTION

OVER THE PAST DECADE, CHINESE ENTERPRISES have made significant progress in developing new business ventures in Africa. As of late 2016, the stock of China's foreign direct investment (FDI) in Africa amounted to around US\$40 billion, up from less than US\$1 billion in 2004.¹ Chinese investments in Africa have not only increased tremendously in size, but also diversified from concentration in the mining sector towards construction, manufacturing, financial services, and information and communications technology.² China is now Africa's biggest economic partner, with no other country matching the depth and breadth of China's engagement on the continent.³

China's engagement in Africa has also been controversial. The media, pundits, and policymakers often question whether the presence of Chinese enterprises in Africa contributes to knowledge transfer to host countries, and skill development of local employees. Some claim that by relying on the import of a large number of foreign workers from China, Chinese enterprises contribute little to local skill development and knowledge transfer in Africa.⁴ However, other researchers suggest that such claims may not be supported by empirical evidence. Corkin *et al.* show that formally owned Chinese enterprises across Africa engage in strong local hiring practices, and that Chinese expatriates in Africa are likely to be skilled workers that provide training to their local counterparts.⁵ Other qualitative studies attempt to examine how Chinese enterprises contribute to technical transfer and skill development in African countries, and find some positive evidence of technology and skill transfer from China's engagement in Africa.⁶

Besides the qualitative study by Corkin *et al.* that draws on field work in Angola, Sierra Leone, Tanzania, and Zambia discussing the institutional and political determinants of skill promotion by Chinese enterprises, and the works by Chen *et al.* and Sun and Lin that draw on qualitative data from Nigeria and Kenya respectively, empirical literature on Chinese enterprises' contribution to local skill development in Africa is very scarce.⁷ Further, there is still no clear evidence as to whether the approaches used by Chinese enterprises in local skill development differ from those used by other foreign entities and local enterprises. Are foreign enterprises from other emerging and developed countries and local enterprises different from Chinese enterprises in terms of promoting local skill development and knowledge transfer in Africa? If so, what is the degree of variation between them? And if not, what main challenges do enterprises face in transferring skills and knowledge to locally hired workers?

The aim of this study is to make a contribution to filling this knowledge gap using survey data collected in 2016 from 12 enterprises in Ghana's construction sector, of which six are Chinese, three foreign-owned, and three local. In doing so, the study first qualitatively compares the characteristics of the sampled construction enterprises and their workforce. It then proceeds to quantitatively examine the heterogeneity in promoting local skill development of local employees across the three groups of construction enterprises. In addition, we also identify some key challenges faced by construction enterprises in providing training to local workers. Given the strong

participation of both foreign and local enterprises, Ghana's construction sector serves as a suitable laboratory for such a comparative study of local skill development. The sector is one of the most competitive industries in Ghana, and employs more than half a million workers across the country.

To preview the main findings, our qualitative analysis shows that there are no significant differences in the characteristics of local employees from Chinese enterprises and those from other enterprises in terms of age, marital status, education background, work experience, and union membership. In terms of employment attributes, while workers in other enterprises on average stay longer with their employers than those working for Chinese enterprises, statistically, we do not observe any significant difference in the share of workers that receive training between Chinese and other construction enterprises. More importantly, multiple regression estimations suggest that Chinese enterprises contribute positively to both short-term general training and long-term specific training of local employees. When compared to local enterprises, we find that, both Chinese and other-foreign enterprises contribute more to local skill development through training of their local employees. Indeed, the likelihood of receiving training, especially short-term general training, is higher for Chinese enterprise employees than those of other-foreign enterprises. We identify low technical education quality, low employee retention rate, tight project implementation time frame, and communication and cultural barriers as key challenges that impede local skill development in the construction sector in Ghana. To mitigate these structural challenges, we recommend foreign governments and host country stakeholders strengthen bilateral cooperation in technical and vocational education.

BACKGROUND

CHINESE ENTERPRISES IN THE CONSTRUCTION SECTOR IN AFRICA

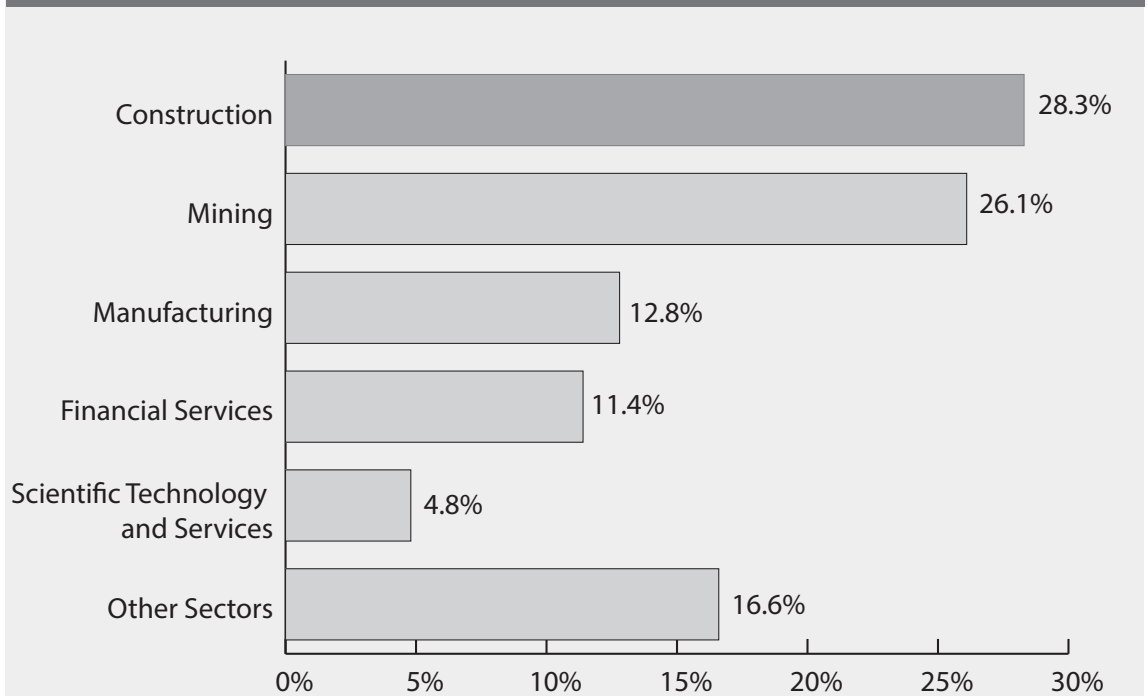
CHINA'S PRESENCE IN AFRICA'S CONSTRUCTION sector is not a new phenomenon. One of the well-known construction projects financed and supported by China is the Tanzam railway linking landlocked Zambia with the Tanzanian coast, which can be dated back to the early years of African independence almost half a century ago. The 1,860-kilometer railway project was constructed by China's Ministry of Railway, with the Chinese government as the main technical and financial supporter. Its construction, which began in 1970 and lasted for five years, involved more than 50,000 Chinese personnel, about 20% of whom offered training and skill transfer to an estimated 60,000 African workers that participated directly in railway construction.⁸

Following the Tanzam railway project, China's presence in the construction sector in Africa has continued to increase, and has become a traditional element and major area of China-Africa cooperation. The Chinese government launched the "Going Global Strategy" in 1999 encouraging a large number of Chinese enterprises, particularly those owned by central and provincial governments, to develop their global strategies and venture abroad, including expanding into Africa. The "Belt and

Road Initiative”, proposed in 2013 by China’s President Xi Jinping, further strengthened the partnership between China and countries along the “Silk Road Economic Belt” and the “21st-Century Maritime Silk Road”, which includes many African countries. At the Johannesburg Summit and the 6th Ministerial Conference of the Forum on China-Africa Cooperation held in December 2015, the Chinese government announced a plan to upgrade the China-Africa partnership to a comprehensive strategic and cooperative partnership, and outlined a number of initiatives, including scaling up mutually-beneficial cooperation in infrastructure planning, design, construction, operation, and maintenance. More recently, a declaration and an action plan were adopted at the 2018 Beijing Summit of the Forum on China-Africa Cooperation, which set the direction to build an even closer China-African community with a shared future in the new era. Among the major initiatives, many measures are designed to promote local skill development in African countries. For example, China committed to set up ten Luban Workshops across Africa to provide vocational training for youth. This will help translate Africa’s population dividends into development growth.

Estimates suggest that, in 2013, Chinese enterprises won 17% of civil works

Figure 1: Stock of China’s FDI in Africa by Sector, 2016



Notes: Data is from the 2017 Report on Development of China’s Outward Investment and Economic Cooperation published by the Ministry of Commerce of the People’s Republic of China.

contracts by number and 42% by value in Africa’s international engineering, procurement, and construction market.⁹ Not only have Chinese construction projects in Africa increased in number and value, they have also increased in complexity, including the building of a mini city on the outskirts of Johannesburg; diversity, including ports, airports, stadiums, malls, public buildings, and renewable energy

The likelihood of receiving training, especially short-term general training, is higher for Chinese enterprise employees than those of other-foreign enterprises. We identify low technical education quality, low employee retention rate, tight project implementation time frame, and communication and cultural barriers as key challenges that impede local skill development in the construction sector in Ghana.

projects; as well as the number of countries served across the continent. The market share of Chinese enterprises in Africa's construction market increased sharply from 9.9% in 2002 to 40.1% in 2011, and has since remained stable.¹⁰ As shown in Figure 1, by the end of 2016, the construction sector had attracted US\$11.3 billion of China's direct investment in Africa, representing the largest share of China's FDI stock on the continent, exceeded the mining sector for the first time. China's increasing commitments to Africa's construction sector have supported some of the continent's most ambitious infrastructure development, including the Mombasa-Nairobi standard gauge railway, inaugurated in 2017.

THE CONSTRUCTION SECTOR IN GHANA

GHANA'S CONSTRUCTION SECTOR HAS GROWN STRONGLY over the past decade, and has become of increasing importance to its broader economy. According to Ghana Statistical Services, construction activities contributed US\$3.8 billion to Ghana's gross domestic product (GDP) in 2014, up from US\$280 million in 2006. The construction sector as a share of GDP also more than doubled over the same period, increasing from 5.7% to 12.7%. As the fourth largest sector in terms of job creation in the economy, the construction sector employs over 580,000 workers across the country. The workforce is dominated by male workers, who account for 96.2% of all employees in the sector. A typical employee in the sector works for about 30.8 hours a week, and earns an average monthly salary estimated at GHS 1,181.39, equivalent to about US\$ 270.¹¹

The sector is highly competitive, with significant foreign and local participation. Foreign enterprises active in the sector include, but not limited to, those from Brazil, Canada, China, Germany, Israel, Italy, Serbia, South Africa, and the United States. Foreign participation has been attracted by two main factors. First, rapid urbanization due to population growth, rural-urban migration, and an expanding middle class has led to increasingly congested cities. In 2015, Ghana's urban population was estimated to be 51.9% of the total population, with an annual growth rate of 3.5%. The rapid rate of change is putting pressure on housing stock, working spaces, and public infrastructure. This has brought a desire to develop ultra-modern infrastructure, such as highways, interchanges, bridges, malls, and other social infrastructure capable of supporting a growing urban population. To resolve these issues, many construction projects are getting larger and more technically complex, and thus require contractors that have adequate experience, capacity, and technical know-how to undertake such initiatives.

Second, project sponsors, financiers, and other stakeholders (often governments, local communities, non-governmental organizations, and development finance institutions) are increasingly requiring contractors to meet higher technical, safety, environmental, and social standards that were previously often ignored. These standards have increased project complexity and construction costs, making it difficult for local construction enterprises to successfully bid for large projects without the backing of foreign counterparts, especially for more technically complex projects. Even

in cases where locally-owned enterprises may have the technical know-how, high competition in the construction sector means that only more productive and efficient enterprises are able to win contracts.¹²

China's "Going Global Strategy" coincided with a period of strong economic growth in Ghana in the early to mid-2000s, during which the government of Ghana undertook a number of large-scale infrastructure projects, such as roads, hospitals, power plants, and transmission lines. Hence, the country presented an attractive business environment to utilize the excess capacity of Chinese construction enterprises looking for market opportunities abroad. Indeed, Ghana became one of the top African recipients of FDI from China, receiving above 20% of China's FDI flows to Africa in 2016.¹³ There are currently over 20 major Chinese construction enterprises operating in Ghana, including both state-owned and private enterprises, working on various types of construction projects across the country. Not only do these Chinese enterprises compete with other-foreign and local construction enterprises, but they also compete intensely among themselves for contracts.

FOREIGN PARTICIPATION AND LOCAL SKILL DEVELOPMENT

EXISTING LITERATURE SUGGESTS THAT ONE OF THE KEY benefits from foreign direct investment, particularly in developing countries, is the human capital development that accrues in host countries through local skill development and technology transfer.¹⁴ As local workers change jobs and bring with them new and improved production methods acquired from foreign enterprises, they contribute to productivity improvements for domestic enterprises.¹⁵ Foreign enterprises may have an incentive to promote local skill development if doing so is more cost effective than importing skilled workers from their home countries. Interviews conducted with construction project managers confirm that importing foreign labor is indeed very expensive and enterprises weigh the costs and benefits of doing so carefully. As noted by a project manager of a Chinese construction firm, during interviews "... bringing workers from China can easily cost up to 10 times as high as hiring workers locally. Expatriate and repatriation compensation and benefits are now too expensive [sic]". Finding local employees in the construction sector that can deliver projects that meet quality standards on time and efficiently is therefore vital for foreign enterprises to remain competitive in the market. Where there is a significant skills gap, foreign enterprises often rely on on-the-job training to upgrade the skill set and capacity of locally-hired workers.

In the case of Ghana, two types of training are observed in the construction sector: short-term general training, and long-term specific training. Short-term general training is typically related to occupational safety, health, and environmental and social awareness; while long-term specific training is often related to the skill set required by a specific profession, such as stone masonry, welding, plumbing, digital mapping, and surveying. Workers that receive short-term general training often do so as part of a group for short training sessions, usually lasting for up to half a day per

As local workers change jobs and bring with them new and improved production methods acquired from foreign enterprises, they contribute to productivity improvements for domestic enterprises.

session per month. This type of training is normally recurrent throughout the project cycle in order to maintain workers' awareness of occupational safety, health, and environmental and social issues. Long-term specific training on the other hand typically takes the form of apprenticeship and builds on initial skills already accumulated by the worker through previous work experience or technical education. Workers are normally assigned a supervisor who trains them while working. This type of long-term specific training can last up to three to five years depending on the complexity of the task. Workers usually earn a daily wage during the apprenticeship period, and reach the professional level of competence upon successful completion of the apprenticeship. Estimates show that 13.1% of all employees in Ghana's construction sector were engaged in apprenticeships in 2015.¹⁶

Short-term general training and long-term specific training ensure that new and improved skills are transferred to local employees. Hence, it is possible to see manual workers or unskilled laborers acquire specific and complicated skills that increase their competencies and competitiveness within the construction sector. The experience of one local employee who rose through the ranks as a manual laborer to a project manager in a foreign-owned construction enterprise better exemplifies this mechanism. As he noted during a survey, *"I have never been to a vocational school, everything I know that got me to this position, I learned through observation and instructions by working with highly skilled foreign workers from other countries [sic]."* Once new skills are acquired, not only do they help increase the skill set of local workers, but they may also contribute to improvements in the quality of work delivered, reduction in waste, and improvements in efficiency during project construction.

MODEL DEVELOPMENT

THEORETICAL FRAMEWORK

THE CLASSIC WORK OF BECKER SUGGESTS that in a competitive labor market, employers are reluctant to invest in training on skills that are highly transferable across enterprises.¹⁷ The rationale is that, if skills acquired through training are easily transferable, workers can move to join a competing enterprise, especially when the outside wage offered is higher. Therefore an enterprise that chooses to offer training may bear the costs but not gain the benefits associated with that training. Surprisingly however, in the construction sector in Ghana, both short-term general training and long-term specific training are typically offered free of charge by employers, with workers receiving a wage that corresponds to the average wage in the industry while undergoing training. This suggests that the training cost is not offset by offering trainees a correspondingly lower wage before their marginal productivity rises from skills transfer.

This type of enterprise-sponsored training exemplifies the work of Acemoglu and Pischke which shows that when there is wage compression, such that the marginal increase in skills from training is not valued appropriately by the outside market and

workers are credit constrained, enterprises can choose to pay for general training.¹⁸ At least three forces account for this observation in the context of the construction sector in Ghana. First, training contributes to reducing future monitoring cost and helps enterprises avoid potential large costs associated with occupational safety, health, environmental and social accidents, or latent defect that can arise by using low-skilled workers. Second, project sponsors, financiers, and regulators increasingly demand that construction enterprises offer training on health and safety assessments and environmental and social risk awareness as part of the standard protocol required to obtain funds or to be able to bid for contracts. Finally, in an economy with low levels of financial and credit market development, lack of collateral and weak credit worthiness make it difficult for low-skilled workers to borrow against future earnings for training, especially when jobs are not stable, leaving construction firms to bear a large portion of the burden for skill upgrading.

A MODEL OF TRAINING INCIDENCE

WE ARE INTERESTED IN WHETHER A WORKER HAS RECEIVED short-term general training or long-term specific training provided by the current employer, and whether we can document any systematic differences in the probability of being trained between workers employed by Chinese enterprises and those employed by other-foreign and local enterprises. Given the aforementioned labor market attributes in the construction sector in Ghana, we assume an environment of wage compression and severe credit constraint where workers cannot sponsor their own training, and firms earn higher profits from a trained worker. The basic conceptual framework follows the same simple form as in Hui and Smith.¹⁹

A construction enterprise j decides to train worker i or not. If the enterprise decides to do so, the discounted present value of expected future earnings to the enterprise is given as $Y_{ji}(X_{ji})$. If the enterprise decides not to offer training, then the discounted future revenue is expressed as $Y_{jo}(X_{ji})$. We assume that the net opportunity cost of training to the enterprise is given as $C(X_{ji}) + \varepsilon_{ji}$, where the first term, $C(X_{ji})$, represents the deterministic component of cost, and the second term, ε_{ji} , represents the idiosyncratic component of cost. X_{ji} is a wildcard that represents a vector of worker or enterprise characteristics such as education background, work experience, employment tenure, marital status, age, union membership, and whether the enterprise is Chinese-owned or not.

If we assume that an enterprise is interested in maximizing the present value of expected future revenue, then it will decide to undertake training if and only if the net benefit of training to the enterprise is greater than that of no training. That is:

$$Y_{ji}(X_{ji}) - C(X_{ji}) + \varepsilon_{ji} > Y_{jo}(X_{ji})$$

This expression can be simplified as:

$$Y_{jt}(X_{ji}) - Y_{j0}(X_{ji}) - C(X_{ji}) + \varepsilon_{ji} = \Delta_{ji}$$

where Δ_{ji} is the net benefit to enterprise j for providing training to worker i . Although Δ_{ji} is not observable in practice, we can observe if enterprise j trains individual i or not. We can therefore estimate a reduced form binary choice model of an enterprise's decision to train a worker if we make a distributional assumption about ε_{ji} . To do so, we define an indicator variable T_{ji} equal to 1 if enterprise j provides training to individual i and 0 otherwise. We specify the binary choice of training model as:

$$T_{ji} = \begin{cases} 1, & \text{if } Y_{jt}(X_{ji}) - Y_{j0}(X_{ji}) - C(X_{ji}) + \varepsilon_{ji} > 0; \\ 0, & \text{otherwise.} \end{cases}$$

If we assume that $Y_{jt}(X_{ji})$, $Y_{j0}(X_{ji})$, and $C(X_{ji})$ are all linear functions of X_{ji} and that ε_{ji} follows a standard normal distribution, that is $\varepsilon_{ji} \approx N(0, 1)$, then we have a Probit model of the form:

$$\begin{aligned} \pi_{ji} &= \Pr(T_{ji} = 1 | X_{ji}) \\ &= \Phi(\alpha_0 + \alpha_1 Education_i + \alpha_2 Experience_i + \alpha_3 Age_i + \alpha_4 Tenure_i + \alpha_5 Marriage_i + \alpha_6 Union_i + \alpha_7 Chinese_i) \end{aligned}$$

where $\Phi(\bullet)$ is the cumulative distribution function of the unit-normal distribution, and π_{ji} is the probability that enterprise j trains worker i conditional on the observable worker and firm characteristics. The α s represent the coefficients of the respective observed firm and worker variables. The coefficients and marginal effects obtained from the Probit model represent the combination of the underlying structural parameters determining training costs and benefits. *Education* represents a worker's technical education background, *Experience* captures the worker's relevant work experience, *Age* is the age of the worker, *Tenure* is the worker's tenure at the current enterprise, *Marriage* represents marital status of the worker, *Union* indicates whether the worker belongs to a labor union or not, *Chinese* indicates whether individual i works for a Chinese construction enterprise or not. We present the benchmark results using the probit estimation. For robustness checks logit regression results are also reported, where we assume that $\Phi(\bullet)$ is the standard logit cumulative distribution function.

DATA AND VARIABLES

ABOUT THE SURVEY

THE STUDY RELIES ON SURVEYS CONDUCTED through interviews with construction workers and project managers in Ghana in 2016. The strong participation of foreign enterprises in Ghana's construction sector allows for a sizable number of enterprises,

both foreign and domestic, from which a random sample can be selected for a reliable comparative study. For comparative purposes, and given that smaller scale projects typically involve limited knowledge transfer and local skills development, this study focuses on formally registered construction enterprises working on projects with a total cost of at least US\$10 million and hiring a minimum of 50 employees on site at the time of the survey. Since Ghanaian construction enterprises typically tend to be smaller than their foreign counterparts, these conditions eliminate the possibility of comparing small local enterprises with large foreign counterparts. We focus on construction projects located across five of the ten regions in Ghana, namely Greater Accra, Ashanti, Central, and Eastern regions. Together these regions account for 55% of the country's total population and 67% of total construction sector employment.

The primary units of analyses are project managers and local skilled workers in the construction sector. Interviews are conducted based on a stratified random sampling. From a total of about 45 construction enterprises that meet the abovementioned criteria, we selected 12 with on-going projects in Ghana.²⁰ This consists of six Chinese enterprises, three other-foreign enterprises, and three local enterprises.

For each of the 12 enterprises, we group employees into the main sub-categories of skills required for a construction project, including bricklaying and stone masonry, carpentry and joinery, electrical work, painting and decoration, plumbing, equipment operation, and technician. We randomly selected 20 employees per construction enterprise for an overall sample of 240 employees. Employees in the sample cover a wide range of professions, which ensures that our sample is not biased towards employees with a particular skillset or against professions that require more training than others. While the sample size may appear to be small, it is worth noting that sampled construction projects employ an average of 190 workers.

The survey specifically entails questions designed to extract information aimed at answering the key indicators including, but not limited to, information on age, technical education background, years of relevant work experience, duration of work with current enterprise, roles and responsibilities in the project, if employees received short-term general training and/or long-term specific training, duration of training received, cost and sponsorship of training, and general perception of usefulness of training for and beyond responsibilities at current enterprises.

In addition to the employee survey, the project managers of the 12 sample projects with which the employees are associated were also interviewed to obtain information on the projects. We focus on project managers of ongoing projects since decisions related to skill development, such as providing training and offering apprenticeship, are typically made at the project level rather than the enterprise level. Project manager interviews capture information on project type, location, total cost, major financier, cost structure, number of employees, whether short-term general training and/or long-term specific training is offered to local workers, duration and cost of training offered, number of training beneficiaries, constraints to local skill development, as well as recommendations on how to facilitate local skill development.

VARIABLE DEFINITION

DUE TO HIGH COMPETITION AMONG CONSTRUCTION enterprises in Ghana, and in some cases unwillingness to disclose personal information among workers (such as exact age, work experience, educational background), questionnaires are coded in such a way as to encourage respondents to answer. For the relevant covariates used in the study, *Education* is defined to be 1 if a worker has received formal technical education equivalent to at least 12 years of education, including at least 3 years of relevant vocational or high school education, and 0 otherwise. *Experience* is the *log* of months of experience in current profession. *Tenure* is the *log* of months of tenor with current enterprise. *Marriage* is a dummy variable that equals to 1 if a worker is married, and 0 otherwise. *Age* is defined as 1 if a worker is below 30-years old (but above 18 years old), and 0 otherwise. *Union* is defined as 1 if a worker belongs to a labor union or a corporative association in the construction sector, and 0 otherwise. *Chinese* is defined as 1 if a worker currently works for a Chinese construction enterprise, and 0 otherwise. *T* represents training, which is the dependent variable of interest. Two measures of training are used in the study. We ask employees whether they received short-term general training or long-term specific training from their employer. For each case, we defined *T* as 1 if an individual received a short-term general training or long-term specific training, and 0 otherwise. The summary statistics of the key variables are presented in Table 1.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
<i>Education</i> (Dummy)	240	0.471	0.500	0	1
<i>Experience</i> (<i>log</i> of months)	194	3.181	1.251	0	5.620
<i>Tenure</i> (<i>log</i> of months)	237	2.616	1.298	0	5.257
<i>Marriage</i> (Dummy)	240	0.467	0.500	0	1
<i>Union</i> (Dummy)	234	0.325	0.469	0	1
<i>Age</i> (Dummy)	240	0.542	0.499	0	1
<i>T</i> (Short-term general training dummy)	234	0.500	0.501	0	1
<i>T</i> (Long-term general training dummy)	221	0.597	0.492	0	1

ENTERPRISE AND EMPLOYEE CHARACTERISTICS

TABLE 2 PRESENTS STATISTICS THAT COMPARE THE MEAN difference of personal characteristics and employment attributes of workers from Chinese construction enterprises and those from other-foreign and local enterprises. We observe that workers from Chinese enterprises are on average younger, have a stronger technical education background, are less likely to be married, and have less experience than those working for other construction enterprises. However, these differences are not statistically significant. Also, there is no significant difference between workers from Chinese enterprises and those from other enterprises in terms of labor union membership, with roughly 32% of workers from both groups belonging to a labor union.

Table 2: Differences between Workers from Chinese-owned and Other Construction Enterprises

Variable	Chinese enterprises	Other enterprises	Difference
Personal Characteristics:			
Age (Dummy)	0.655 (0.045)	0.441 (0.044)	0.214 (0.063)
Education (Dummy)	0.513 (0.047)	0.433 (0.044)	0.080 (0.065)
Marriage (Dummy)	0.416 (0.047)	0.512 (0.045)	-0.096 (0.065)
Experience (months)	36.821 (4.302)	49.741 (5.883)	-12.920 (7.517)
Union	0.327 (0.045)	0.323 (0.042)	0.005 (0.062)
Employment Attributes:			
Tenure (months)	23.708 (2.556)	34.073 (4.048)	-10.365** (4.893)
T (Short-term general training dummy)	0.558 (0.047)	0.446 (0.045)	0.111 (0.065)
T (Long-term specific training dummy)	0.664 (0.046)	0.535 (0.47)	0.128 (0.066)

Notes: Standard errors in paratheses, *** $p < 0.01$, ** $p < 0.05$.

In terms of employment attributes, on average, 56% of local workers in Chinese enterprises received short-term general training and 66% received long-term specific training. These shares are higher than those of local workers in other enterprises of whom 45% received short-term general training, and 54% received long-term specific training. These differences in likelihood of training between local workers in Chinese

In terms of employment attributes, on average, 56% of local workers in Chinese enterprises received short-term general training and 66% received long-term specific training. These shares are higher than those of local workers in other enterprises of whom 45% received short-term general training, and 54% received long-term specific training.

enterprises and those in other enterprises are also not statistically significant. Finally, employees of Chinese construction enterprises have been with their employers on average 10 months less than those working with other construction enterprises, with the difference being significant at the 5% conventional level. Overall, the qualitative analyses suggest that the local workers employed by Chinese construction enterprises are not different from those employed by other enterprises, which indicates that they are from the same domestic labor pool.

Table 3 summarizes enterprise characteristics. Note that our sample consists of only 12 enterprises, and the results must be interpreted with some caution. In terms of total number of employees, there is no significant difference between Chinese and other-foreign construction enterprises. The average number of employees for Chinese enterprises is around 219, while that for other-foreign enterprises is 220. For local enterprises, the average is roughly 113, although it is acknowledged that this average is skewed by one enterprise with 250 employees. Foreign enterprises are generally larger in terms of employment size. It is noted that, in addition to construction workers, foreign enterprises, particularly those owned by Chinese, tend to hire workers in other professions such as translators, cooks, and medical doctors who facilitate communication, and provide food and healthcare services for their employees. Similarly, the share of local workers in total employment is also not significantly different between Chinese and other-foreign construction enterprises. On average, the Chinese-owned enterprises are 90% comprised of employees hired locally, while other-foreign enterprises are about 93% comprised of employees hired locally. Our results clearly show that foreign construction enterprises, including those owned by Chinese, contribute significantly to job creation and local employment. This is contrary to the perception that Chinese enterprises rely on the import of labor from China and contribute little to local job creation. It is also worth noting that some other-foreign enterprises have reached 100% localization in non-managerial workforce, suggesting that there is still room for improvement for Chinese enterprises in terms of localization. Surprisingly, our results show that the indigenous Ghanaian enterprises have the lowest share of local employees (85%) as shown in Table 3. This statistic, however, is skewed by one local enterprise, which has hired 20% of its employees from foreign countries in order to construct a technically complex building. In terms of firm age, the average Ghanaian enterprise is older than their foreign counterparts, although again this is skewed by one local enterprise that has operated in Ghana for 27 years.

Table 3 also reports the share of skilled workers hired locally. For Chinese enterprises, the share of skilled workers hired locally is 86%, while the share of skilled workers hired locally for other foreign-owned and locally-owned enterprises are 91% and 78%, respectively. This data suggests that a non-trivial share of skilled workers are locally hired across all construction enterprises. Finally, the proportion of project supervisors hired locally is also reported in Table 3. For local enterprises, 78% of all project supervisors are Ghanaian. This share, however, is much lower for foreign enterprises, standing at 57% and 35% for Chinese and other-foreign construction enterprises, respectively.²¹ Overall, these statistics do show that relative to other-foreign

enterprises, local hires are not underrepresented in Chinese enterprises in supervisory positions or skilled workforce.

Table 3: Differences between Chinese and Other Construction Enterprises

Enterprise ID	Years of operation in Ghana	Total employees	Share of employees hired locally	Share of skilled employees hired locally	Share of supervisors hired locally
Chinese-owned Enterprises:					
1	13	163	92%	90%	71%
2	20	200	88%	84%	31%
3	20	249	88%	83%	72%
4	9	300	90%	85%	40%
5	10	150	90%	79%	89%
6	11	250	92%	90%	67%
Average	13.83	218.67	90%	86%	57%
Other Foreign-owned Enterprises:					
7	15	92	100%	100%	33%
8	25	279	96%	96%	31%
9	4	290	88%	83%	37%
Average	14.67	220.33	93%	91%	35%
Locally-owned Enterprises:					
10	27	45	100%	100%	100%
11	16	45	100%	100%	100%
12	11	250	80%	75%	75%
Average	18	113.33	85%	78%	78%

REGRESSION RESULTS

DETERMINANTS OF SHORT-TERM GENERAL TRAINING

THE REGRESSION RESULTS ARE PRESENTED IN TABLES 4 and 5. Column 1 of Table 4 presents the baseline results using the logit estimation. The coefficients reported are marginal effects evaluated at the sample mean of the respective dependent variables for the continuous independent variables (i.e. *Experience* and *Tenure*); while for the discrete independent variables (i.e. *Education*, *Marriage*, *Union*, *Age* and *Chinese*), they show how $\Pr(T_i=1)$ is predicted to change as the respective variable changes from 0 to 1. Our baseline results indicate that previous technical education and age status have a statistically significant effect on the probability of receiving training. More specifically, the likelihood of an employee obtaining short-term general training increases if the worker received formal technical education and is younger. These findings are consistent with the human capital investment theory. First, pay-offs from training are inversely related to a worker's age, such that the returns from training are likely to last longer for younger workers. Furthermore, the marginal costs of training are likely to be lower for workers with previous technical education, making them more likely to participate in training. Column 1 also shows that marital status and tenure at current enterprise have a positive effect on the probability of participating in short-term general training. Union membership and years of relevant work experience have negative effects on the probability of receiving short-term general training, although their statistical significance are not robust across further specifications.

Column 2 of Table 4 presents the result for the model estimated in Column 1 but accounts for whether an employee works in a Chinese enterprise or not. Here, the *Chinese* variable is defined as 1 if an employee works for a Chinese construction enterprise, and 0 otherwise. Our empirical evidence suggests that working in a Chinese construction enterprise increases the probability of receiving short-term general training by about 0.025, with the result being statistically significant at the 5% conventional significance level. Probit results in Columns 3 and 4 confirm those reported in Columns 1 and 2 using the logit regressions, respectively. They show that *Education* and *Age* have a positive and statistically significant effect on the probability of receiving short-term general training. Further, Column 4 suggests that the probability of being trained increases by 0.029 if an individual works for a Chinese construction enterprise. This result is highly significant at the 1% significance level.

In Columns 5 and 6, we estimate a variant of the model including dummy variables that capture the differences among Chinese, other-foreign, and local construction enterprises. The base case here is local enterprises, such that the marginal effects reflect the difference between Chinese and local enterprises, and that between other-foreign and local enterprises, respectively. Columns 5 and 6 indicate that working for a foreign-owned construction enterprise generally has a positive and statistically significant effect on the probability of being trained, and the likelihood is much higher for those who work in enterprises owned by Chinese. More specifically, Column 5 shows that, for local workers, the probability of getting short-term general training is 0.36 higher if they work in a Chinese construction enterprise than in a local

Table 4: Determinants of Short-term General Training in the Construction Sector

Variables	(1) Logit	(2) Logit	(3) Probit	(4) Probit	(5) Logit	(6) Probit
<i>Education</i>	0.093*** (0.022)	0.090*** (0.022)	0.087*** (0.021)	0.083*** (0.022)	0.072*** (0.022)	0.074*** (0.021)
<i>Experience</i>	-0.008 (0.007)	-0.007 (0.008)	-0.004 (0.009)	-0.003 (0.009)	-0.018** (0.008)	-0.024*** (0.009)
<i>Tenure</i>	0.005 (0.007)	0.004 (0.006)	0.008 (0.008)	0.007 (0.007)	0.012 (0.008)	0.013 (0.009)
<i>Marriage</i>	0.033** (0.013)	0.033*** (0.012)	0.025 (0.014)	0.025 (0.013)	0.009 (0.019)	0.004 (0.019)
<i>Union</i>	-0.011 (0.017)	-0.011 (0.016)	-0.007 (0.018)	-0.006 (0.017)	0.071*** (0.025)	0.083*** (0.028)
<i>Age</i>	0.145*** (0.033)	0.144*** (0.031)	0.144*** (0.034)	0.143*** (0.033)	0.069*** (0.019)	0.076*** (0.024)
<i>Chinese</i>	-	0.025** (0.011)	-	0.029*** (0.011)	0.357*** (0.038)	0.367*** (0.032)
<i>Other-foreign</i>	-	-	-	-	0.241*** (0.026)	0.243*** (0.021)
Log Likelihood	-48.30	-48.24	-48.51	-48.43	-42.03	-42.04
Observations	114	114	114	114	114	114

Notes: Dependent variable is whether an individual receives short-term general training or not. Marginal effects evaluated at sample means are reported for continuous independent variables (i.e. *Experience* and *Tenure*). For discrete independent variables (i.e. *Education*, *Marriage*, *Union*, *Age*, *Chinese*, and *Other-foreign*), the coefficients show how $\Pr(T_i=1)$ is predicted to change as the respective variable changes from 0 to 1. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$. Enterprise and regional dummies are included in the estimation but not reported.

construction enterprise. For workers in other-foreign construction enterprises, the probability increases 0.24 relative to those that work for local construction enterprises. The coefficients are highly significant at the 1% significance level. Probit estimation results reported in Column 6 confirm those reported in Column 5. In a nutshell, our results suggest that Chinese construction companies contribute more to local skill development through the provision of short-term general training to local workers as compared to other construction enterprises, not only the indigenous ones but also those from other foreign countries.

DETERMINANTS OF LONG-TERM SPECIFIC TRAINING

TABLE 5 PRESENTS RESULTS THAT SHOW the factors that influence local workers' participation in long-term specific training or apprenticeship. Baseline results presented in Column 1 show that previous technical education background and

marital status have positive effects on the probability that a worker receives long-term specific training provided by the employer. It is not clear why marital status has a positive and significant effect on participation in long-term specific training. However, we speculate that this could stem from the fact that married workers are typically heads of households with a strong desire to improve their financial situation by upgrading their skills. Long-term specific training, which can make a worker more competitive and marketable in the labor market, is an attractive option for married workers. We also observe that participation in training decreases with years of experience, tenure, and age, and increases with membership in a labor union. However, the coefficients on tenure, age, and union membership are not statistically significant.

Table 5: Determinants of Long-term Specific Training in the Construction Sector

Variables	(1) Logit	(2) Logit	(3) Probit	(4) Probit	(5) Logit	(6) Probit
<i>Education</i>	0.102*** (0.010)	0.089*** (0.009)	0.098*** (0.010)	0.083*** (0.013)	0.089*** (0.007)	0.084*** (0.008)
<i>Experience</i>	-0.051** (0.024)	-0.048** (0.021)	-0.053** (0.025)	-0.049** (0.022)	-0.057*** (0.022)	-0.061*** (0.024)
<i>Tenure</i>	-0.021 (0.023)	-0.022 (0.025)	-0.021 (0.025)	-0.020 (0.026)	-0.020 (0.020)	-0.019 (0.020)
<i>Marriage</i>	0.169*** (0.025)	0.172*** (0.020)	0.161*** (0.022)	0.163*** (0.019)	0.156*** (0.033)	0.149*** (0.031)
<i>Union</i>	0.052 (0.044)	0.050 (0.054)	0.046 (0.049)	0.045 (0.060)	0.131 (0.072)	0.125 (0.079)
<i>Age</i>	0.145 (0.093)	0.140 (0.086)	0.134 (0.095)	0.129 (0.087)	0.099 (0.083)	0.089 (0.079)
<i>Chinese</i>	-	0.082 (0.080)	-	0.078 (0.077)	0.272*** (0.052)	0.272*** (0.055)
<i>Other-foreign</i>	-	-	-	-	0.235** (0.094)	0.228** (0.094)
Log Likelihood	-67.94	-67.56	-68.06	-67.71	-65.84	-65.97
Observations	114	114	114	114	114	114

Notes: Dependent variable is whether an individual receives long-term specific training or not. Marginal effects evaluated at sample means are reported for continuous independent variables (i.e. *Experience* and *Tenure*). For discrete independent variables (i.e. *Education*, *Marriage*, *Union*, *Age*, *Chinese*, and *Other-foreign*), the coefficients show how $\Pr(T_i=1)$ is predicted to change as the respective variable changes from 0 to 1. Robust standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$. Enterprise and regional dummies are included in the estimation but not reported.

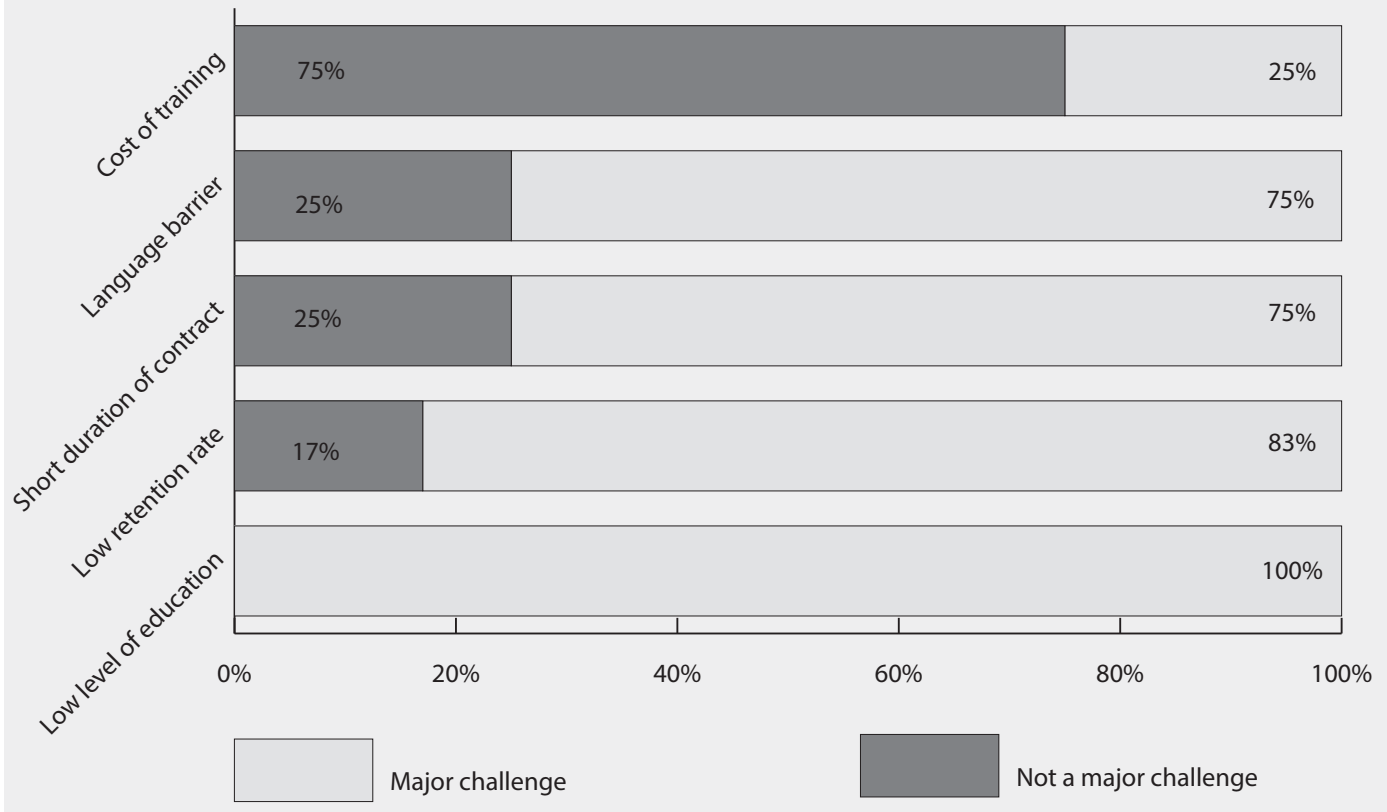
Turning to the coefficient on the foreign ownership status of the enterprise of an employee, we observe a positive relationship between foreign ownership status and

participation in long-term specific training. Economically, logit and probit results presented in Columns 2 and 4, respectively, suggest that, for a local worker, the probability of receiving long-term specific training increases by 0.08 if the worker is employed by a Chinese construction enterprise, although the coefficients are not statistically significant. Columns 5 and 6 present estimation results including dummy variables that capture the difference between Chinese, other-foreign, and local construction enterprises. Again, the base case here is local enterprises, such that the marginal effects reflect the difference between Chinese, other-foreign enterprises, and local enterprises. The results show that foreign enterprises, both from China and other foreign countries, play a significant role in providing long-term specific training of local employees. For local workers, the probability of getting long-term specific training increases by 0.27 if they work in a Chinese construction enterprise than in a local one. For workers in other-foreign construction enterprises, the probability increases by 0.23 relative to those who work for local construction enterprises. Our results suggest that foreign construction enterprises, including those owned by Chinese, contribute significantly to knowledge transfer and skill development of local employees in the construction sector relative to the indigenous Ghanaian enterprises. Intuitively, information asymmetry may explain why local enterprises contribute little to training local workers. Because locally-owned firms may have better access to information and the local labor market, they may source skilled workers who do not have to be further trained for a job. More importantly, our results reveal that Chinese construction enterprises' contribution to knowledge transfer and local skill development through the provision of long-term specific training is at least as significant as that of other-foreign enterprises.

CHALLENGES IN LOCAL SKILL DEVELOPMENT AND POLICY RECOMMENDATIONS

FINALLY, WE EXAMINE THE KEY CHALLENGES FACED by construction enterprises in promoting local skills development in the construction sector in Ghana. To overcome these challenges, we also propose several policy recommendations in an attempt to maximize the mutual economic and social benefits from active foreign participation, particularly China's engagement, in Ghana's construction sector. An summary of the key challenges faced by construction enterprises in promoting local skills development are presented in Figure 2.

Figure 2 shows that low level of education among workers is cited by 100% of enterprises as a major challenge in providing training to local workers. It takes more time and requires more effort to train workers without prior understanding of basic technical and vocational skills. Both foreign and local enterprises argue that there is a lack of collaboration between the construction sector and vocational training institutions such that many graduates lack the basic skills, particularly hands-on experience, needed on the job that allow enterprises to upgrade their skills. Many project managers, both foreign and local, noted that, "*Even graduates from vocational*

Figure 2 : Challenges in Promoting Local Skill Development

schools do not know how to work on project sites. Many of them had never touched any machines in school.” To bridge this gap, enterprises in Ghana’s construction sector should liaise with technical and vocational education and training institutions specialized in relevant fields. This will help the institutions better identify skills required by the industry, understand employers’ expectations, and improve the design of their vocational training programs. Arrangements could also be made to give workers trained by construction enterprises opportunities to enroll and obtain a certificate in their profession if they meet certain criteria. Both Ghanaian and foreign governments could play a role in encouraging and facilitating such collaborations between industries and vocational training institutions. In December 2015, the Chinese government announced at the Johannesburg Summit that China was committed to mobilizing financial resources from both public and private sectors to help Africa countries establish, update, or renovate local education and training institutions, and provide them with not only physical infrastructure but also teaching equipment, technical assistance, and management support. Similarly, the High Commission of Canada to Ghana has started initiatives through its “Construction Canada Program” and the Saskatchewan Institute of Applied Science and Technology (SIAST) to support the development of technical and vocational institutions in Ghana, as well as to upgrade the skills of local workers to internationally accepted standards. These

initiatives can complement the existing efforts made by construction enterprises in providing on-the-job training, and should focus on skills that are mutually beneficial for domestic and foreign construction enterprises, and local employees.

The second most cited challenge that impedes local skills development in Ghana's construction sector is low worker retention rate. About 83% of enterprises express reluctance to train workers who are likely to change jobs after training. Enterprises have a disincentive to invest in training local employees when they cannot capture those productivity gains. A key concern among construction enterprises in Ghana is that many workers they train moved to the gold mining sector for a better salary. A local project manager complained during an interview, *"Last few years, I had several excavating-machine drivers left me and went to gold mines. I cannot pay as much as the mining companies [sic]."* This issue could also be partially addressed by improving the quality of technical and vocational education and training, especially training on broader occupational skills. If technical and vocational graduates are well trained and equipped with basic skills, enterprises could then focus mainly on providing them with training on firm-specific or project-specific skills. Enterprises generally have more incentive to provide training on firm-specific or project-specific skills that are less transferrable across sectors and enterprises. Furthermore, workers receiving firm-specific or project-specific training are more likely to stay longer with their employers, increasing worker retention rate. Intensive education and campaigns are also needed to increase local workers' awareness of the importance of skills development in medium and long-term career planning. This will encourage them to participate more actively in training offered by their employers and training institutions to increase their competitiveness in the job market.

Language and communication barriers are among the most significant challenges that foreign enterprises face in their attempt to train and retain local employees. This is particularly true for Chinese enterprises, which often need to employ translators to bridge the communication gap between Chinese trainers and local trainees. Even so, there is the tendency for certain skills to be lost in translation, as in most cases the translators do not have a sufficient technical background. The comments of one Chinese project manager typify this, *"Chinese employees who can speak English do not have technical know-how, those who have technical know-how cannot speak English well. They often complain about each other. Sometimes, we feel that we are willing but unable to provide training well [sic]."* This is consistent with research suggesting that for Chinese enterprises operating in Africa, language barriers are a major challenge, particularly in Lusophone and Francophone countries, as it is difficult for most Chinese workers to communicate in Portuguese or French.²² Similar evidence from South Africa also suggests that language and cultural barriers impede knowledge transfer by Chinese enterprises.²³ In addition to the efforts made by construction enterprises to bridge the language and communication gaps, both the Chinese government and the governments of African host countries should promote people-to-people and cultural exchanges. Such exchanges can create a favorable environment for China-Africa cooperation, and in some cases help mitigate mistrust that exists between Chinese

Our results clearly show that foreign construction enterprises, including those owned by Chinese, contribute significantly to job creation and local employment.

employers and local African workers. To facilitate people-to-people and cultural exchanges, the quality of basic education should also be improved. For example, foreign languages (mainly English) should be included in the curricula of technical education and vocational training institutions, which is still not the case for many institutions in China and Ghana.

The short duration and tight deadline for most construction projects is another major challenge faced by enterprises in providing training to their employees. For turnkey contracts, enterprises have a binding constraint to complete projects on time. Delays and latent defects resulting from using unqualified personnel are often expensive. Such time constraints leave little room for experimentation with apprentices and trainees, making it difficult for enterprises to offer long-term specific training. Among the enterprises surveyed, 75% suggested that short contract duration made it difficult to offer training, particularly long-term on-the-job training. To allow local workers to gain required skills and sufficient experience, a project contract could include training of local employees as a component, and give the contractor correspondingly longer time to complete the project. This is suitable for construction projects sponsored by government agencies and financial institutions with development objectives. For the large number of construction projects involving Chinese state-owned enterprises and agencies across the African continent, local project sponsors and Chinese financiers and contractors could take the cost and timing of training local workers into consideration when they negotiate project contracts. Foreign construction enterprises, particularly Chinese enterprises, should also develop their long-term strategies to guide their operations in African host countries, including business development and human resource management. Foreign construction enterprises with long-term commitment to local African markets are more likely to develop a strong pipeline of construction projects, and have more incentive to invest in skill development of their local workers who can be deployed across different projects.

Finally, Figure 2 also reveals that only 25% of enterprises see the monetary cost of training as a significant barrier to local skill development. This suggests that local skill development in Ghana's construction sector is not constrained financially; rather there is a structural inefficiency in skill-upgrading. Even though training workers is mutually beneficial for enterprises and employees, the time sensitive nature of most construction projects, low retention rate because of high competition, lack of basic vocational training, and language barriers mean that the opportunity cost of training tend to be high for enterprises and may discourage enterprises from training and upgrading local workers' skills. Therefore, there is a need to strengthen the vocational education system and promote technical training beyond the enterprise level. Stakeholders from African host nations and origin countries of foreign enterprises should collaborate to promote local skill development in a mutually beneficial way. While China has developed a comprehensive Africa strategy as outlined in the cooperation plans announced by President Xi Jinping at the Johannesburg Summit,

African countries should develop their own China strategy to harness the full benefits of China's engagement in Africa.

CONCLUSION

OVER THE PAST DECADE, CHINESE ENTERPRISES HAVE MADE significant progress in developing new business ventures in Africa. Anecdotal evidence often suggests that they contribute little to human capital development in Africa. We use survey data from the construction sector in Ghana to examine the heterogeneity in local skill development of employees across Chinese, other-foreign, and local enterprises, and to identify the key challenges faced by enterprises in training local workers. When compared to workers from local enterprises, we find that both Chinese and other-foreign enterprises promote short-term general training and long-term specific training among their employees. More importantly, our results reveal that provision of training is higher for employees of Chinese enterprises than those working for other-foreign enterprises, especially for short-term general training.

Within Ghana's construction sector, the major challenges that hinder enterprises' abilities to train local workers include: low quality of technical education, low retention rate of trained workers, language barriers, and short duration of contracts that make it difficult to undertake training programs. These structural challenges suggest that addressing the skill gap in the construction sector requires more collaboration between countries and enterprises to lower the barriers to training. Stakeholders should strengthen cooperation in technical training, improve the quality of vocational education, and promote collaboration between the sector and training institutions. Further research is also needed to better understand the progress and challenges of Chinese enterprises operating in Africa, and to further develop African countries' China strategy to maximize the mutual benefits from China's engagement in Africa. ★

ENDNOTES

1. Data is from the 2017 Report on Development of China's Outward Investment and Economic Cooperation published by the Ministry of Commerce of the People's Republic of China. A recent report by Sun et al. (2017) suggests that the official figures underestimate the true value of financial flows from China to Africa by around 15%.
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