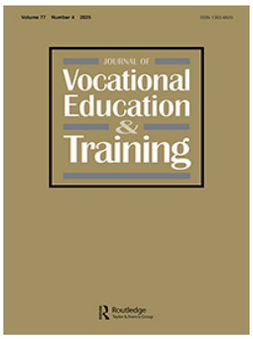

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Vocational skill development strategies of manufacturing companies in six low- and middle-income countries: an exploratory study

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ABSTRACT

This paper provides insights into relationships between formal Technical and Vocational Education and Training (TVET) and other types of on-the-job training in manufacturing companies in four Asian (Bangladesh, Cambodia, Laos, and Vietnam) and two African (Ethiopia and South Africa) countries. There are two components to the contribution. The first is that when different occupational levels and stages (pre- or in-employment training) are considered, we see a more nuanced picture of TVET than the common bleak story. Uptake of qualifications at the hiring stage follows an occupational hierarchy, from general worker to operator to technician, but with some differences by industry and country. Our study suggests that companies that take training seriously appear to do so across different types of training, and in some cases, formal TVET appears to be part of a broader training regime of companies. The second contribution draws on critical reflection on methodological choices made at various points of the research, and an analysis of the messiness and difficulties we encountered in the research process. We argue that the terminology available to differentiate different types of training are limited in understanding and analysing as well as developing potential policy interventions for training in low- and middle-income countries.

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Introduction

Insight into companies' use of formal vocational education provision and its relationship to other types of vocational skills development in companies in low- and middle-income (LMICs) countries is important, but barely covered in

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research literature. While skills policies and training systems are seen by policy makers and donors as crucial for inclusive growth, policies and reforms are often nationally designed, without differentiation across sectors and occupational levels, and with limited acknowledgement of relationships between formal, non-formal, and informal vocational skills development (Allais 2023b).

The contribution of this paper is to provide insights about the uptake of vocational qualifications for jobs in manufacturing companies, the kinds of training that takes place in manufacturing companies and the relationship between formal TVET and other types of on-the-job training. We explore this for different occupational levels and stages (pre- or in-employment training) in selected manufacturing companies in four Asian (Bangladesh, Cambodia, Laos, and Vietnam) and two African (Ethiopia and South Africa) countries.

The original aim of the study was to explore something ostensibly simple: which vocational education programmes appear to be valuable at a company level, what their value is, and under which circumstances. The research process revealed considerable complexity in these relationships and what it means to understand them, for a range of reasons, some of which relate to how different types of training are described and understood.

The paper therefore has two contributions.

The first is to present insights into how a sample of companies in these LMICs countries use TVET qualifications in hiring decisions, and how they train employees. We show that the picture of TVET in these countries is more complex than the traditional bleak story that is told. There is some uptake of qualifications at the hiring stage, following an occupational hierarchy, from general worker to operator to technician, but with some differences by industry and country, discussed in detail below. Some companies appear to value a wide range of different training strategies including formal and on-the-job training as complementary to each other, although there are also cases where the one seems to be substituted for the other.

The second is to consider the complexity of how different types of training appear to be understood and used in different contexts. This is important because it appears that much may be missed in policy and research through a lens that imposes specific categories and definitions on a complex world of training. More nuanced approaches are needed to capture different types of company-based training strategies in ways that make sense to policy makers, researchers, and company representatives, to facilitate better research and policy.

Vocational skills development in LMICs

Policy focus on TVET internationally, and in particular for development in LMICs, has intensified in recent decades, along with aid money and technical assistance (King 2020). Researchers and policy makers argue that TVET will facilitate

economic development, and explore policy solutions for the many problems that beset TVET systems (e.g. Martinez-Fernandez and Weyman 2014 on Asia; Mastercard Foundation 2020 on Africa; Palmer et al. 2007 on Africa and one Asian country).

And it is widely established that many LMIC countries have small, weak formal TVET systems (Allais 2022, 2023a; Cameron, Dhakal, and Burgess 2018; King 2020; McGrath et al. 2019; Panth 2014). Linkages between formal vocational education and training systems and industry are weak and there is little collaboration between TVET institutions and factories (Cramer, Sender, and Oqubay 2020). Formal apprenticeship systems are especially tiny – in general a small fraction of the small formal TVET systems (Franz 2017 on sub-Saharan Africa; Cameron, Dhakal, and Burgess 2018 on Asia; for a recent country-specific study see Maitra, Maitra, and Thakur 2022 on dual apprenticeships in India). Papers and reports provide analysis of what employers want or say they want from education systems (e.g. Jayaram and Engmann 2014 on Asia) or describe weaknesses and proposes policies (see Panth 2014 on Asia; Arias, Evans, and Santos 2019 on Africa). International development agencies argue for building tripartism, such as through sector skills councils, and involving employers in qualification design such as through competence-based training reforms (ILO 2021; Gessler and Peters 2020; Viet 2017; ILO (2006); UNESCO, IIEP and IFEF 2020).

In terms of formal TVET provision, the six countries in our study are no exception to these general patterns (Lao PDR Ministry of Education and Sport (2015); Yok, Chrea, and Pak 2019, Ethiopian Ministry of Education 2017, Zinabu 2019BANBEIS (2019); Taylor and Shindler 2016, Allais 2023a, Phoumilay 2019, Tuan and Cuong 2019, Aphayvanh 2018, Maurer, Haolader, and Shimu 2023). Enrolments in TVET relative to general senior secondary school and university enrolments are low. All six countries have TVET systems that are primarily based in education institutions (schools or colleges), not workplaces. All have very small or tiny apprenticeship systems. All have perceptions of skills mismatches and TVET provision that does not meet employers' needs. All are low status TVET systems.

In both sub-Saharan Africa and Asia, researchers report significant non-formal provision delivered by public, private, or nongovernmental organisations, but with little detail (Adams, Johansson, and Razmara 2013; Arias, Evans, and Santos 2019; Cameron, Dhakal, and Burgess 2018; Ngatia and Rigolini 2019; Perotti 2019). However, information on these forms of provision are even more patchy than formal public provision (McGrath et al. 2019). A special edition of the *International Journal of Training and Development* (Pilz 2023) argues that the area of vocational skills development is under-researched even in wealthy countries and even more so in LMICs.

The International Labour Organization (ILO 2019) argues that a more nuanced approach to workforce development is needed in LMIC countries, where underqualification is generally higher but overqualification is comparable to that of wealthy countries. According to the ILO study, often two-thirds of underqualified workers are educated only to either primary or lower secondary level, but highly qualified workers exceed the small number of jobs typically requiring graduate qualifications. But there is little published research on this issue in LMICs.

Part of the limitation of data sources is the use of different definitions and different boundaries around different types of training. It is easier to find out to what extent companies are offering nationally recognised qualifications and units of competency to their workers, than to find out what informal training they do – although, as discussed in the findings below, we struggled with even the first part. Smith and Smith (2023), examining company-based informal training in Australia, argue that a new definition of informal training, which is comprehensible to employers and workers alike, is needed to enable more, and more reliable, research. This appears even more urgent in LMICs: what is apparent from our research is how complex the mix of forms of training is, and how much is missed through a lens that imposes specific categories and definitions on this complex world.

In short, while 'relevant' TVET is the holy grail for researchers and policy makers, there is little insight in research literature into take up of TVET by companies, and how it relates to other training strategies of companies. In this paper, we share findings that contribute to filling the research gaps discussed above, by presenting descriptive findings showing some nuanced differences in the take-up of formal TVET programmes for different occupational levels, industries, and countries, as well as some insights into the nature of other training that companies undertake, and the relationship between the two. This offers a start at a task that we argue is crucial for understanding the full picture of how vocational skills development is taking place, as well as developing better policies for formal TVET and better policies for supporting and incentivising workplace-based training and other forms of vocational skills development.

Methodology

The research reported here was part of a broader research project considering the relationship between vocational skills development and company level industrial transformation and growth in the six countries. This section discusses the methodology of the research only in so far as it relates to the purpose of this paper.

The selection of countries was based on a number of different considerations. The study was interested in low- and middle-income countries where TVET is an important policy focus, and where there was interest in

understanding the contribution of TVET qualifications to industrial development. Based on a consideration of literature on vocational education systems in low- and middle-income countries as well as in relation to the challenges of economic and social development, we were interested in exploring countries with differences in geographic size as well as population size – historically, in some cases smaller countries in both respects have had more successes in building vocational education that is well aligned to industry and economic development priorities (Sung 2008). As low- and middle-income countries is a broad group, and yet a group as a whole in which research on vocational education is weak, we also wanted a spread of middle-income and least-developed countries and ideally, different geographic regions. Finally, there was an element of convenience sampling, in terms of where we were able to build a research team of researchers with suitable capacity.

The research had three components: first, a review of the vocational education and training provision of the six countries, with a focus on formal provision for key industrial sectors; second, a survey of 847 manufacturing companies across the six countries; and third, 117 in-depth interviews of a smaller number of companies in the six countries. Each is discussed briefly below.

In terms of the contextual studies,[1] we started with an analysis of the TVET system of each country, located in some broader political and economic analysis. Because we wanted ultimately to explore the factors that affect how TVET qualifications contribute to company-level industrialisation and growth, we had hoped to identify specific qualifications to be a unit of analysis. A key task of the contextual studies was to isolate the qualifications used in the different industries. However, this task proved complex.

A first challenge was setting boundaries around what is TVET. We considered qualifications aimed directly at preparation for work, at senior secondary level and above. The grey area in this definition is technician level qualifications; this is problematic because, as discussed in the findings, they turn out to be the type of qualification most mentioned by companies across countries and industrial sectors. In most cases, we did not find clear sets of qualifications and programmes catering to the industries we had targeted in most cases, particularly at secondary level. This first hitch in our planned methodology was the first indication that the world was going to turn out to be more complex than envisaged. In Bangladesh, our preliminary investigations led to mainly informal or on-the-job training. This was the same in Cambodia, with the exception of technicians. We found TVET qualifications aimed at operators and supervisors in Ethiopia, and at operators in Laos. In Vietnam, we found information mainly about post-secondary qualifications, and some short courses aimed at operators, particularly in the Garment industry. In South Africa, we found a complex set of TVET qualifications, dating to different periods of educational reform at which new qualifications were introduced, but old ones not phased out, as well

as lists of qualifications that had been developed on paper but were not yet used.

Already, this presented a stumbling block in our survey design. Our original intent had been to test specific qualifications with companies in our survey (the specific relevant questions are listed in Appendix 1). The survey design had to be modified to ask companies to list which formal TVET qualifications they use for hiring and for on-the-job training for five different occupation levels: general workers; operators, supervisors, technicians, and higher management. What we meant by formal TVET qualifications was defined, but, based on the responses, was clearly understood in different ways, leading to a different set of complications in the analysis, discussed below.[2]

The contextual studies also isolated industries that were important parts of the manufacturing sector in each country, shown in Table 1 below. The Garment industry was included in all six, despite it being relatively small in South Africa, to have at least one industry common to all six countries. In Laos, the manufacturing sector as a whole was considered, given the relatively small size of the sector; hence, the label 'other' in Table 1, and smaller companies were included. Sampling then started from lists of formally registered companies operating in each industry, based on information from employer associations or government bodies. Only companies with 50 or more employees were selected. Depending on the number of entries on each of the respective lists, either the full population was asked to participate in the survey – for example, in Lao's Garment industry – or a random sample was drawn as in Bangladesh's Garment industry (Table 1 below).

For each of the industries and countries, a company list was compiled, from which either all companies were contacted, or a random sample was drawn. The lists were compiled from official company registration lists, industry association member lists, and ad hoc research. We attempted a representative geographical distribution, mirroring the concentration of manufacturing in certain provinces and areas. Only formal sector companies were included.

Response rates varied widely, and selection bias is a possibility. We partly attempted to address it by checking the sample against broader trends in the industry. The survey was in some cases filled in by companies and sent back to

Table 1. Number of surveyed companies by industry and country.

Industry/Sector	Bangladesh	Cambodia	Ethiopia	Laos	South Africa	Vietnam	Total
Automobile					61		61
Electronics		20				40	60
Food and Beverage		16		44	22	66	148
Garment	100	65	64	54	31	56	370
Leather and Shoes			33				33
Metal			68				68
Other				46			46
Pharma	61						61
Total	161	101	165	144	114	162	847

us; in some cases filled in telephonically in discussion with a company manager, and in some cases administered face-to-face in companies. The survey was designed to establish which TVET qualifications employers used for hiring and training, as well as obtaining information about proxies for company industrial growth and transformation; we do not discuss the latter issue in this paper as our focus is on use of TVET qualifications.

The complexity of data systems and how qualifications are understood was further revealed in the analysis. Employers in many cases listed school qualifications, some listed occupational health and safety training, and some listed induction training. In many cases, the information reported by companies did not correspond with the information we had found from official sources in our initial contextual studies. We return to this in the findings and discussion on implications at the end of the paper. Data analysis involved cleaning and recleaning data, and considerable debate and contestation among researchers about what counts as a formal training programme and TVET qualification; after this we used mainly descriptive statistics to find patterns of usage.

In order to unpack the training strategies of companies further, in-depth interviews complemented the formal training information by asking employers to reflect on their training strategies of medium skilled employees (production workers or machine operators) and high skilled employees (technicians and skilled trades workers, called artisans in South Africa). Around 18 companies were targeted per country, reflected in Table 2 below. Sampling was random, based on an attempt to balance countries that had grown and those that had not, in terms of turn over, in the previous 5-year period.[3]

The original intent if we had obtained specific programmes either in the first stage (contextual study) or second stage (survey) would have been to explore what about the different programmes appeared to be useful to companies through the interviews. As discussed above, we obtained some information on programmes in the context studies, but with many limitations, and similarly in the survey employers in many cases listed formal qualifications that were not TVET, or non-formal training programmes. Even in the interviews, it was in many cases difficult to get information about formal TVET programmes. Instead,

Table 2. Number of companies interviewed in-depth by industry and country.

Industry/Sector	Bangladesh	Cambodia	Ethiopia	Laos	South Africa	Vietnam	Total
Automotive					11		11
Electronics		6				6	12
Food and Beverage		6		6	5	7	24
Garment	9	6	7	6	7	10	45
Leather and shoes			6				6
Metals			6				6
Other				4			4
Pharma	9						9
Total	18	18	19	16	23	23	117

companies shared criticisms of formal TVET (discussed in a forthcoming paper) and discussed their own training strategies.

In the in-depth interviews conducted in a smaller sample of companies ($N = 117$), we discussed different training modalities with companies including formal apprenticeships (formal dual), induction training, informal training and different forms of non-formal training. Much of the work developing terminology for types of learning outside of formal education comes from the area of lifelong learning – where terms such as non-formal education, informal learning, and so on, have been argued over and defined.[4] We adapted UNESCO's definitions in creating a set of working definitions for analysing the qualitative data, to understand dominant training strategies in companies (our working definitions are provided in Appendix 2). Research teams made qualitative judgements about the relative importance of the following types of in-house training:

formal dual or apprenticeship programmes;
non-formal company-based training;
orientation/induction programmes;
non-formal programmes offered by other providers through arrangement with companies;
informal on-the-job training.

The importance of different types of training, listed below, for operators and technicians, respectively, was ranked by researchers on a scale from 1 to 4" with 1 indicating '*not at all*', 2 '*not very important*', 3 '*quite important*' and 4 referring to '*very important*'. Researchers' assessment of the importance of different types of training for the companies in which they had conducted interviews were quality checked by one researcher across all teams, to ensure some degree of uniformity in how conclusions were being reached. This judgement-based process was important because it was clear from the transcripts that respondents understood and used terms differently.

Ethics approval was obtained,[5] and the usual ethical procedures were followed: all participants were kept anonymous and cannot be traced from any aspect of the publicly available data or analysis; informed consent was obtained from all participants.

In the findings section below, we present descriptive statistical overviews derived from the analysis of both the survey[6] and qualitative interviews, to show insights into vocational skills development. Discussion of issues arising during the interviews, as well as quotes from the interviews, are used to provide further insights into individual company perceptions of TVET use and the context in which companies decide on the use of TVET, as well as to illustrate different perspectives on different types of training. Finally, we also reflect on the complexities of the research and data analysis processes, as part of understanding this complexity.

Findings and discussion

We start by discussing the reported uptake of formal vocational qualifications during the hiring process of companies across the six low- and middle-income countries, as well as a breakdown of different training strategies to train employees. We focus mainly on only two occupational levels, because TVET systems in the countries are mainly designed to develop the skills of these occupational levels: production workers or machine operators, hereafter operators; and technicians/skilled trades workers, hereafter technicians. We consider general workers in some instances. This is followed by a discussion on reported use of TVET qualifications in training, as well as other training strategies discussed by company representatives in interviews.

The main findings are as follows:

Companies are more likely to report using formal vocational qualifications higher up the occupational hierarchy from general worker to operator to technician, but with some differences by industry and country.

In terms of industry differences for operators, more companies in the Metal, Electronics, and Food and Beverage sectors report using formal TVET qualifications to hire operators, with fewer in the Automotive, Garment, Pharma, sectors, while Leather and Shoe sectors don't report using them at all. In terms of industry differences for technicians, companies in the Food and Beverage, Metal, and Electronics sectors report using TVET qualifications to hire technicians. In the Automotive sector, this is even higher: more than 90% of companies in the Automotive sector report using TVET qualifications to hire technicians, and they also report being more likely to draw from a larger number of formal vocational qualifications to select technicians.

In terms of countries, companies in Laos, Vietnam, and Ethiopia report a higher use of TVET qualifications across occupations, while companies in South Africa, Bangladesh and Cambodia report a lower use of TVET qualifications. However, survey data and interview data were inconsistent in some cases, particularly in the reported use of TVET qualifications in hiring in Laos and Vietnam.[7]

In terms of training, the majority of companies reported not using formal training programs to train their workforce. In the main, companies that reported *not* using formal TVET qualifications during the hiring process of operators were *less* likely to use formal TVET programmes to train their operators. Companies that reported using formal TVET for training also emphasised other forms of training except in the Metal industry, where they seem to be seen as substitutes for each other. In other words, companies that value training appear to value all forms of training. In the main, on-the-job training predominates.

Finally, companies and researchers have different understandings of what constitutes TVET programmes. They reported even less use of formal

training than was reported in the survey, and mainly emphasised on-the-job training. Further, in some instances, they contradicted what was reported in the survey – raising questions about the difficulty of this type of methodology.

Reported uptake of vocational qualifications in hiring decisions

Take-up follows an occupational hierarchy for hiring decisions

Companies reported being more likely to use formal vocational qualifications higher up the **occupational hierarchy**. As shown in Figure 1 below, the vast majority of companies in our sample (83%) report not to use any formal TVET qualifications when they hire general workers. This changes when they recruit operators and technicians: just under half (47%) of the companies in our study report *not* using formal TVET qualifications to select suitable operators, and even fewer (24%) claim not to use formal vocational qualifications when they hire technicians. At the technician level, an increasing share of companies report using more than just one formal vocational qualification in their hiring decisions, with 40% of companies using two or more TVET qualifications in the selection process of technicians.

There are clear differences by industry in reported use of vocational qualifications in hiring decisions

We observe some significant differences across **industries**, shown in Figure 2 below for operators. Most companies in the Metal, Electronics, and Food and Beverage sectors report using formal TVET qualifications to hire operators, while more than 50% of companies in the Automotive, Garment, Pharma, and Leather and Shoe sectors don't report using them.

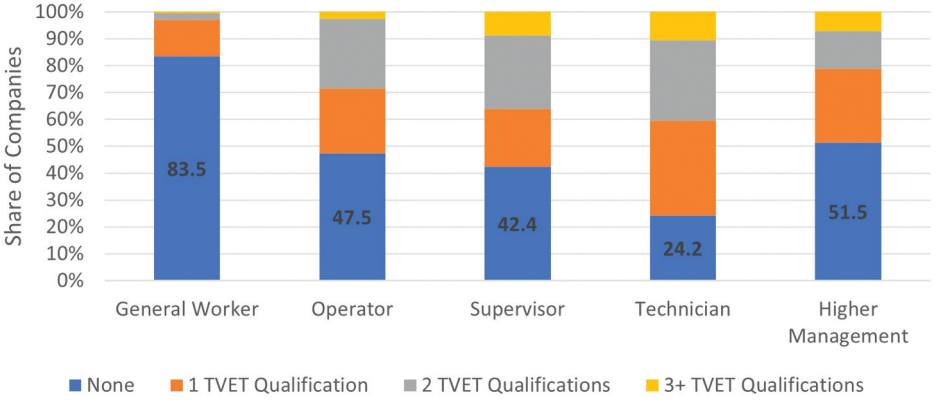

Figure 1. Reported use of formal TVET qualifications used in hiring decisions (by occupational level).

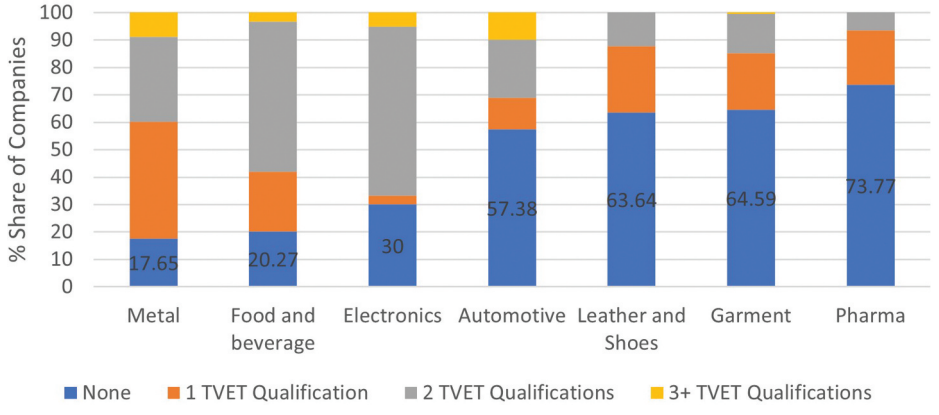

Figure 2. Reported use of formal TVET qualifications used in hiring operators (by industry).

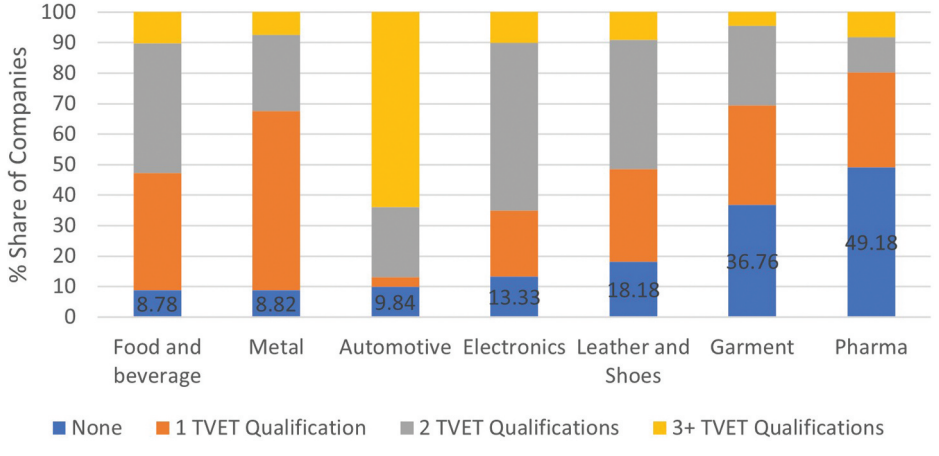

Figure 3. Reported use of formal TVET qualifications used in hiring technicians (by industry).

When it comes to hiring technicians, Garment and Pharma sector companies are again least likely to report using TVET qualifications, while the vast majority of companies in the Automotive, Food and Beverage, Metal, and Electronics sector report using TVET qualifications to hire technicians, as shown in Figure 3 below. Not only do more than 90% companies in the Automotive sector report using TVET qualifications to hire technicians, they also report being more likely to draw from a larger number of formal vocational qualifications to select technicians.

There are also country differences in terms of reported use of vocational qualifications in hiring decisions

Similar to the industry differences, we observe **country differences**, shown in Figure 4 (hiring of operators) and Figure 5 (hiring of technicians) below. Companies in Laos, Vietnam and Ethiopia report a higher use of TVET

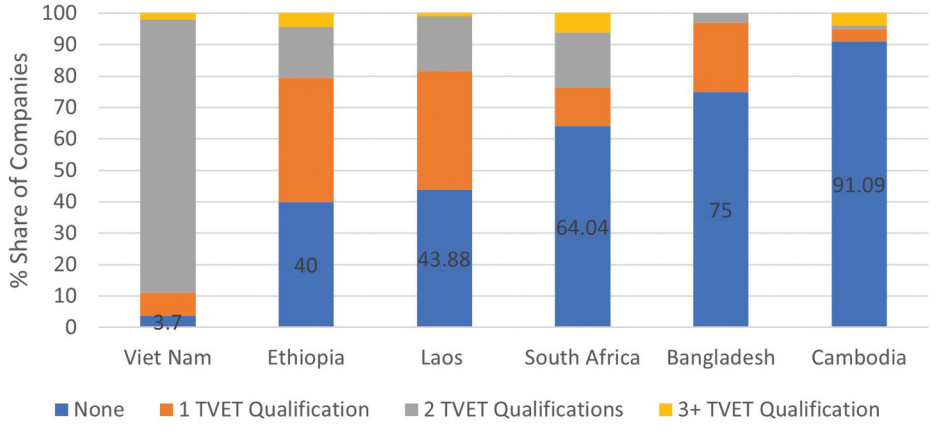

Figure 4. Reported use of formal TVET qualifications used in hiring operators (by country).

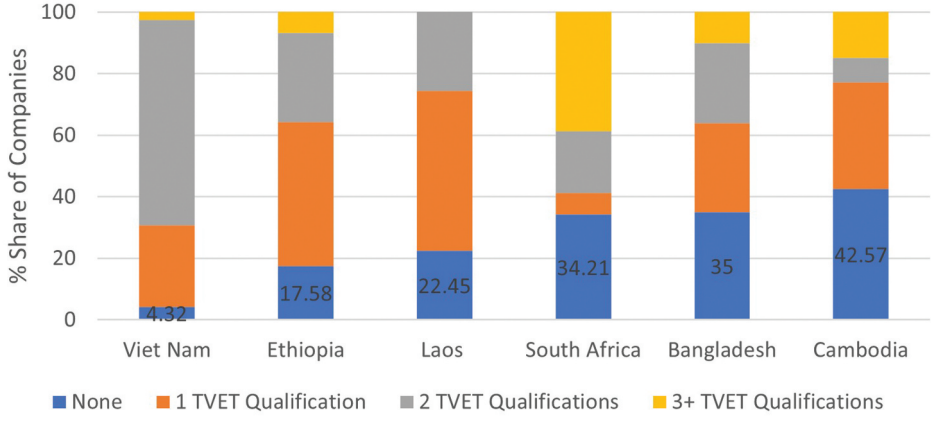

Figure 5. Reported use of formal TVET qualifications used in hiring technicians (by country).

qualifications across occupations, while companies in South Africa, Bangladesh and Cambodia report a lower use of TVET qualifications.

However, interview data was not always consistent with this.

It was most consistent in the Ethiopian case. Company em22436e, operating in the Metal industry, revealed that 'although TVET graduates have difficulty in understanding the machines, they prioritise them because they are better at understanding new technologies. Some TVETs send their students to this company for practical training'. Company eg459a from the Garment industry also acknowledged that 'Those that have TVET training are more comfortable with the machines'. And for companies like em79d0d7 'TVET graduates are usually ready to work'. Another metal industry company em3d1887f stated that 'In order to sustain our growth company, we need formal training and is also important in terms of the technical skills required'. For shoe and leather company el867, they prefer that new recruits have had

some basic training in footwear. They suggest that they usually recruit from TVETs who provide at least 6 months of training. They also take students from the Leather Industry Development Institute (LIDI). Although TVET isn't mandatory, company representatives suggested that it takes less effort to train new employees who have TVET training. Whilst all three sectors formal training is crucial for new entrants, for shoe and leather and metal industry, they also require this training even at mid-level except garment industry where at mid-level they do not necessarily require formal qualification. However, there was also criticism of formal vocational programmes from some Ethiopian company respondents, especially in the Garment, and Shoe and Leather industries.

In the cases of Laos and Vietnam, the differences were most pronounced. In interviews, respondents from Laos mainly suggested that they did not use vocational qualifications in hiring decisions, often because people with such qualifications did not want to work in factories. Interview data from Vietnam was also rather different from survey data. Some mentioned formal qualifications, such as a company representative in the Electronics industry (VE42 hr) who stated that '100% of operators must have a certificate at least', and that the

> ... company mostly accepts candidates who have TVET qualifications for the case of the operator position. For operators who have been trained, that is, they must pass a specialised certificate, not just a high school certificate.

And another company in Vietnam (VE157 pr), a respondent stated that, 'For the operator position, we require candidates to hold at least the diploma degree up to the university degree. They also have good health and from 18 years old to 35 years old'. For a supervisor's position, besides above criteria, 'they have to be required to have at least 2 years' experience from our company or 5 years' experience if working at a different company.' But other companies suggested that 'In general, we do not need any qualifications. The operators only need to know how to read and write. They are unskilled labourers. The labour sources are quite scarce' (VH4 hr) and 'At the operator level, we only need candidates who are good health enough to work' (VH4 hr). This view was affirmed by other representative from Vietnamese companies in the Garment industry who emphasises the importance of experience. Similarly, in terms of promotion, respondents argued that 'In my company, the supervisors are promoted from the experienced employees' (VH4 hr) and 'In ten supervisors, there are only two people holding the TVET qualifications (one is in charge of the statistical field; another is in charge of the material stock room)' (VH4 hr).

In Cambodia, company respondents suggested that firms were not satisfied with the quality of education and training offered by formal TVET institutions and about the performance of TVET graduates:

> Until now, the company has not found any TVET program that fits the demands of the company. (CE5913F pro)

Additionally, some respondents, particularly in Cambodia and Laos, suggested that educated people don't want to work in factories, as captured by this respondent from Laos:

> We do but the work at the factory is not easy and I honestly say that sometimes it stinks. Some people try to work for a day but they cannot accept it. Because they feel headache or nausea. Most of people who have a TVET education do not want to work like this. Then, we have to create our own employee from who is a unemployed.

Respondents from these countries also suggested that workers with technical skills and qualifications were even harder to recruit outside of the main urban centres.

General education for hiring

As discussed above, some companies listed general school qualifications as requisites for hiring. We could not analyse this systematically, as we had *not* asked for this information, and had only asked for vocational qualifications, which we had defined. These were therefore removed from the survey analysis. The issue emerged again in the interviews. Company participants in Bangladesh (9 garment companies and 9 pharmaceutical companies) explained that while TVET qualifications are used when recruiting technical and management positions, for general workers and operators they focus on school qualifications, and in specific, a Higher Secondary Certificate, with a minimum of 8th class pass qualification. South Africa companies show a similar pattern. The following assertion by one of the South African Garment companies (SF166717) sums up the attitude of South African companies regarding entry level recruitment of workers:

> Unskilled production workers are just entry level workers in our organisation, it is very very elementary. We will say the minimum qualification must be grade 12 as long as you can read and write, no maths or science.

Another company representative (SA707CB) captured it like this:

> Normally we require that people we recruit should progress to operator level, at least must have grade 12 maths and science, obviously we would train them after we have recruited them.

Uptake of formal TVET programs for training

In general, the majority of companies do not use formal TVET training programs to train their workforce, as seen in Figure 6 below. Companies report being least likely (only 23%) to use formal TVET programmes to train general workers.

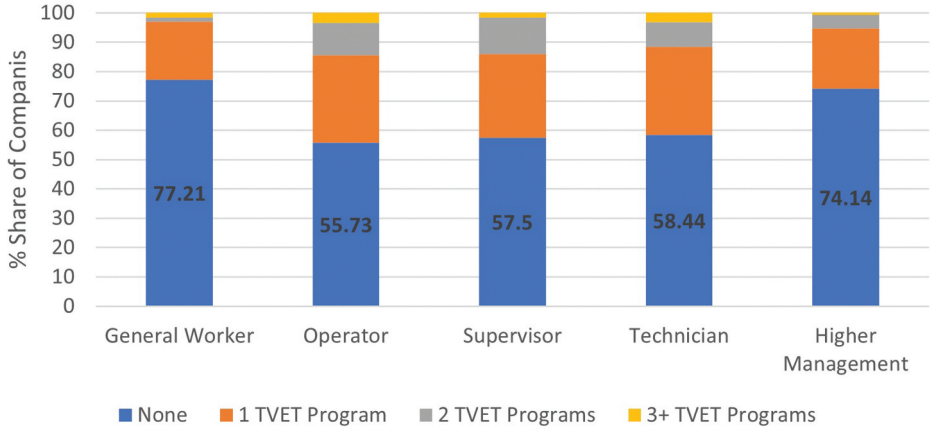

Figure 6. Number of formal TVET programs used for in-employment training (by occupational level).

Around 44% of companies use TVET programmes to train operators and 42% use TVET programmes for the training of their technicians.

In the main, companies that do *not* use formal TVET qualifications during the hiring process of operators are *also* less likely to use formal TVET programmes to train their operators. Only 16% of companies that report *not* to have used TVET qualifications when hiring operators then use formal TVET programmes to *train* their operators. On the other hand, companies that report using formal TVET qualifications at the hiring stage are *also* more likely to report using formal TVET programmes to train their workers: 70% of companies that report using formal TVET qualifications for hiring *also* report training their operators through formal vocational training programmes. For technicians, the pattern is less distinct. Only a little more than half of companies that recruit technicians with TVET qualifications also train their technicians using formal programmes.

Again, the patterns for operators and technicians vary by industry and country, and we see considerable differences when other training strategies are considered (based on interview data).

Differences by industry in reported use of formal TVET qualifications in training as well as other training strategies

Companies in the Automotive, Electronics, and Food and Beverage sectors report more formal TVET programmes for upskilling operators and technicians; companies in the Garment, Leather and Shoe, and Pharmaceutical industries report the least use. This is broadly aligned with the hiring pattern except for companies in the Metal industry. Companies in the Metal sector that reported a high uptake of TVET qualifications for hiring do not use formal TVET programmes to train their operators and technicians in the same proportion.

Figures 7 and 8 below show the patterns of reported use of TVET programmes in training decisions from our survey, by industry, for operators and technicians, respectively. Companies in the Automotive industry are also more likely to rely on a more diverse range of formal vocational training programmes compared to all other sectors, with around 50% of Automotive companies using two or more formal training programmes to train operators and technicians.

Interview data shows interesting patterns in terms of how company representatives described formal training versus other training. For operators, formal dual apprenticeships do not feature across sectors, except for Automotive companies and a lesser extent for companies in the Metal sector. The majority of companies emphasise combinations of induction training, informal on-the-job training, and different forms of non-formal training. As shown in Figures 9 and 10 below, there are noticeable differences between occupational levels and industries. Automotive companies were the only ones that mentioned formal dual or apprenticeship-type training.

In Figure 11 we show how interview respondents from Garment, Pharma, and Leather and Shoe sectors (all sectors that reported a low take-up of TVET in the survey) also tend to report a lower emphasis on other training strategies to upskill operators. Both Pharma and Garment companies do not emphasise many training strategies, while Leather and shoe companies report more different forms of non-formal training as well as informal and induction training for their operators. The picture changes, however, when we look at their training strategies for technicians (Figure 12). While Garment companies still do not mention other training strategies, Leather and Shoe companies emphasise non-formal company based and other non-formal training, with less emphasis on induction and informal training for their technicians, while Pharmaceutical companies place more importance on induction and informal training rather than non-formal training. These patterns suggest that in some industries other

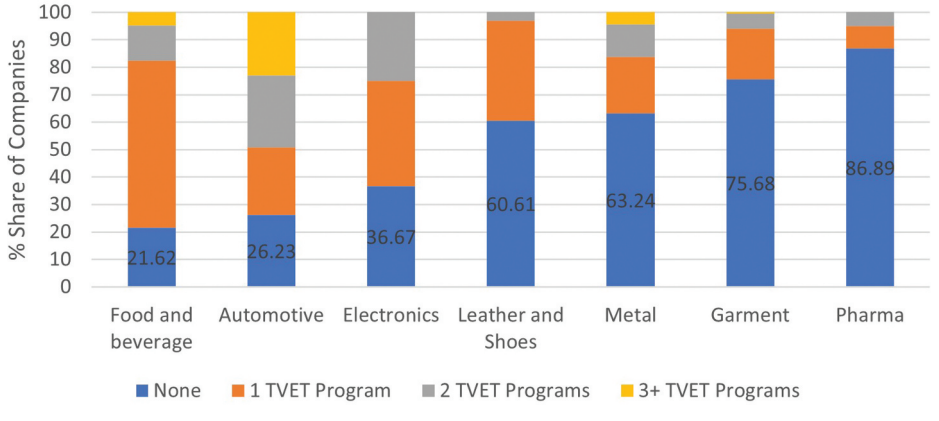

Figure 7. Number of formal TVET programs used for in-employment training of operators (by industry).

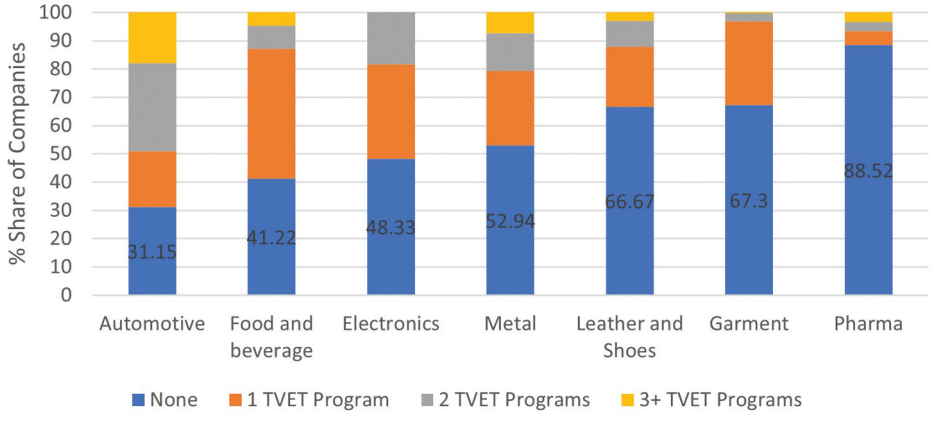

Figure 8. Number of formal TVET programs used for in-employment training of technicians (by industry).

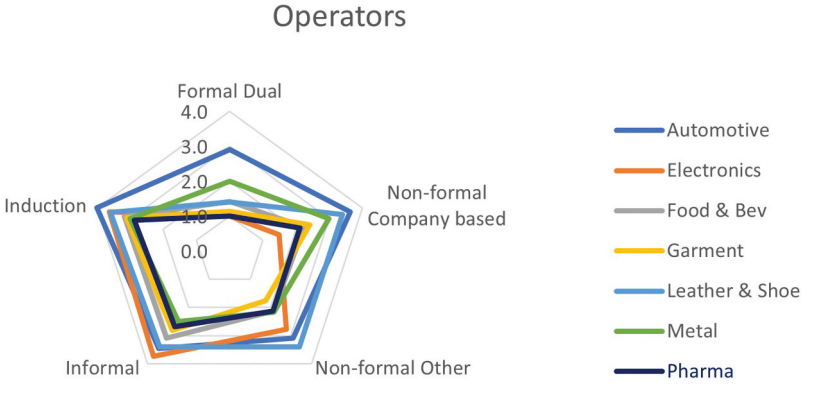

Figure 9. Training strategies for production workers (by industry).

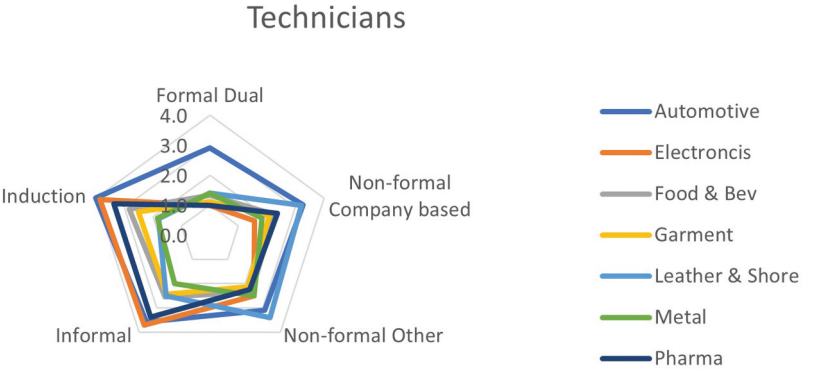

Figure 10. Training strategies for technicians (by industry).

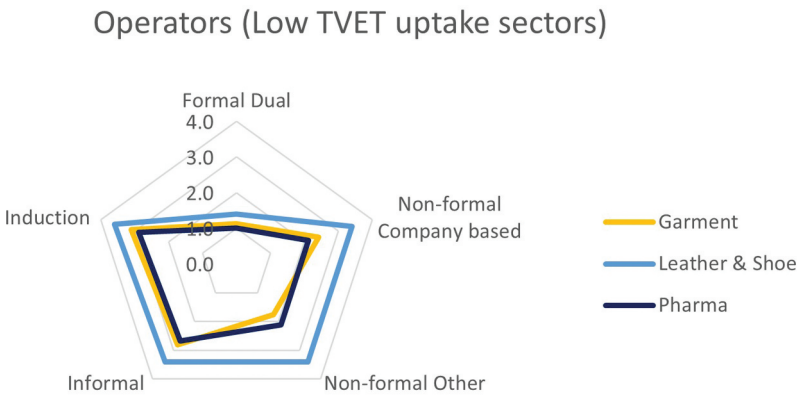

Figure 11. Training strategies for production workers of industries with low TVET uptake.

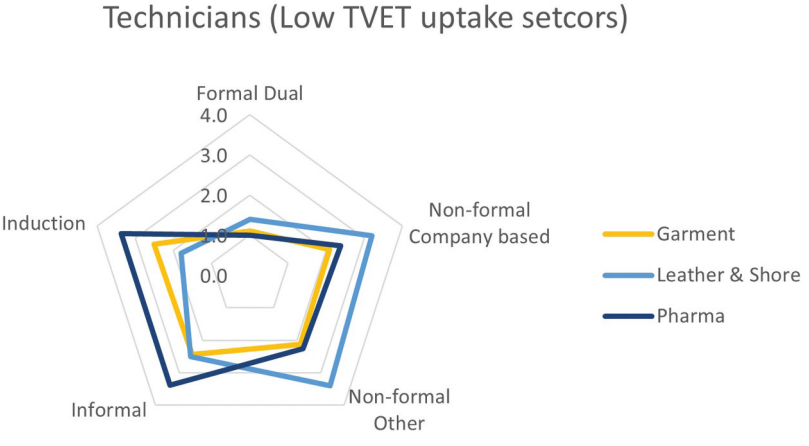

Figure 12. Training strategies for technicians of industries with low TVET uptake.

training strategies are used as substitutes for formal TVET training options when companies train their technicians.

The patterns of training strategies within industries that reflected high TVET uptake in the survey remains similar for how companies described training of operators and technicians in interviews (Figures 13 and 14 below). Our findings suggest that companies which value training, value all forms of training; companies that use formal TVET see other forms of training as complementary for operators and technicians.

The Metal industry had a low uptake of TVET for operators but a higher uptake for technicians. As shown in Figure 15 below, in this sector formal TVET potentially substitutes for other training strategies. We found a higher emphasis on other training strategies including induction and non-formal company-based training followed by informal and other non-formal training for operators. Metal companies reported being more likely

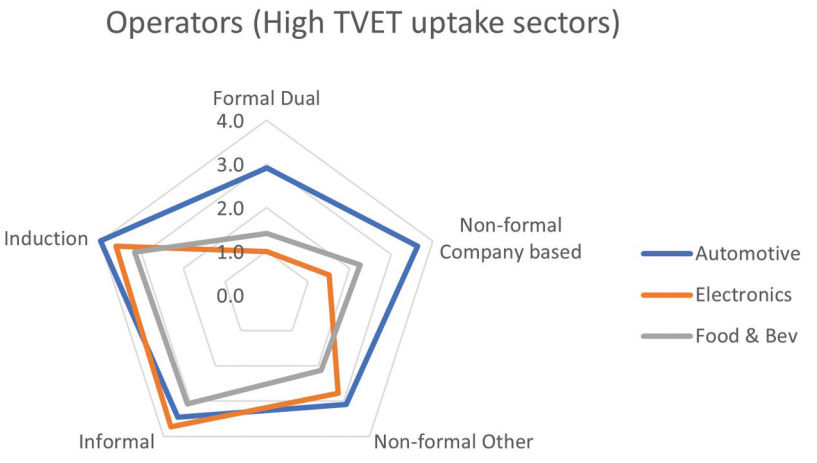

Figure 13. Training strategies for production workers of industries with high TVET uptake.

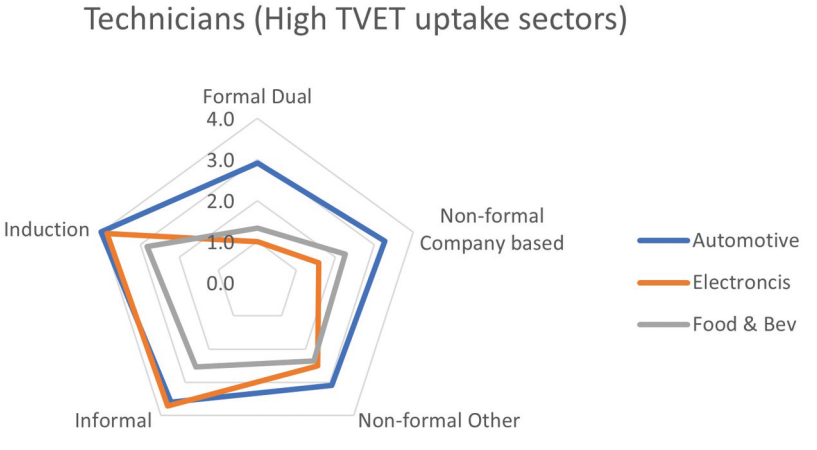

Figure 14. Training strategies for technicians of industries with high TVET uptake.

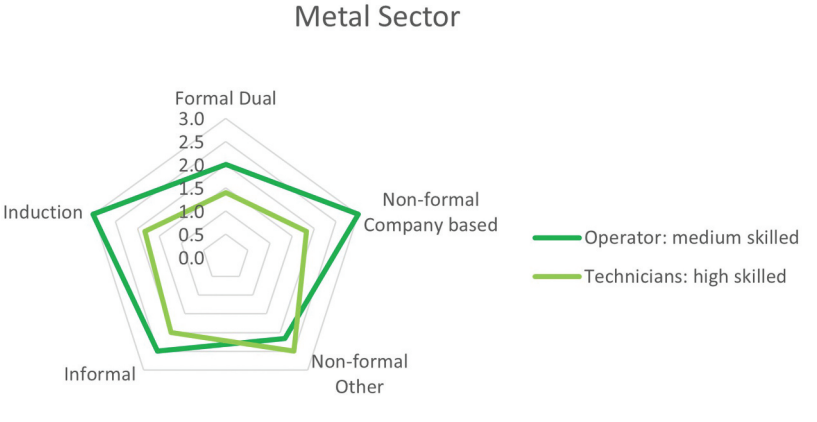

Figure 15. Training strategies for operators and technicians in the Metal industry.

to use TVET qualifications and training for technicians in the survey, and interview data showed less emphasis on other training strategies. Only other non-formal training emerged as important for additional training purposes of their technicians.

Differences by countries in reported use of formal TVET qualifications in training as well as other training strategies

When we look at differences across countries (Figures 16 and 17), we see that companies in Vietnam, Laos, and South Africa were the most likely to report using formal TVET qualifications for training. Companies in Bangladesh, Cambodia and Ethiopia are least likely to use TVET programs to train, although there are some anomalies in Ethiopia. However, companies in South Africa and Ethiopia show inverse relationships – formal qualifications are used either to hire or to train.

Ethiopian company informants suggested that formal training for employees in institutional settings is for new entrants, especially at higher levels in all three sectors, and at mid-level in both the Metal and Shoe and Leather industry. In Laos, company respondents suggested that formal vocational programmes for employees are primarily targeted at new entrants to the workforce, such as recent graduates and school leavers, with little attention paid to formal training for other employees.

A larger share of companies operating in Laos and Vietnam and industries including Automotive, Electronics and Food and Beverage seem to rely on formal qualifications and programmes when hiring and training operators and technicians, while most companies in Bangladesh and Cambodia and companies in the Leather and Shoe sector, as well as garment and Pharma industries are less likely to utilise formal TVET.

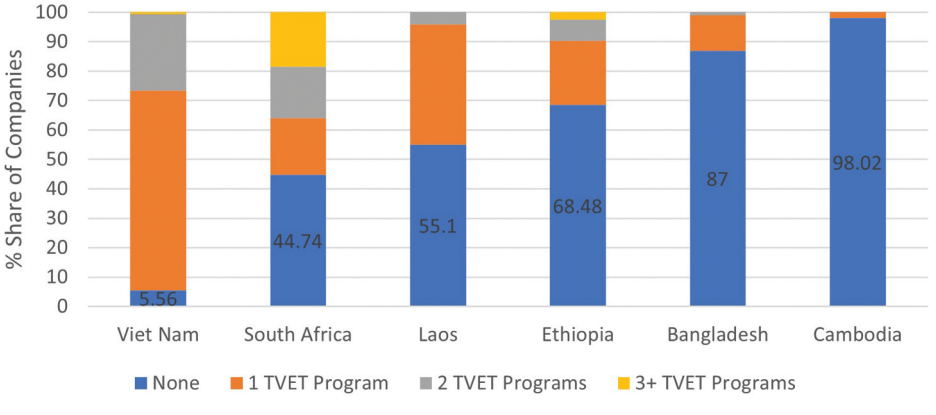

Figure 16. Number of formal TVET programs used for in-employment training of operators (by country).

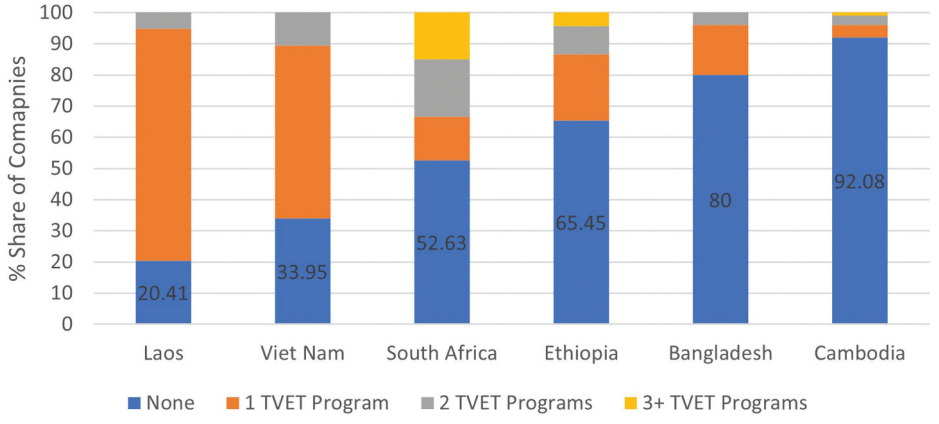

Figure 17. Number of formal TVET programs used for in-employment training of technicians (by country).

We also observe a range of different training patterns at the country level. In general, the picture which emerges is of companies using different types of on-the-job training as a substitute for formal TVET programmes, which differs from the industry variances where this was complementary. As outlined in the previous section, companies in Vietnam and Laos reported more use of formal TVET qualifications to train operators and technicians, compared to companies operating in Cambodia and Bangladesh. Figures 18 and 19 show low levels of additional training for both occupational levels in Laos and Vietnam.

Conversely, where companies had reported increasingly lower use of formal TVET qualifications for training, the importance of other training methods increases (Figures 20 and 21 below).

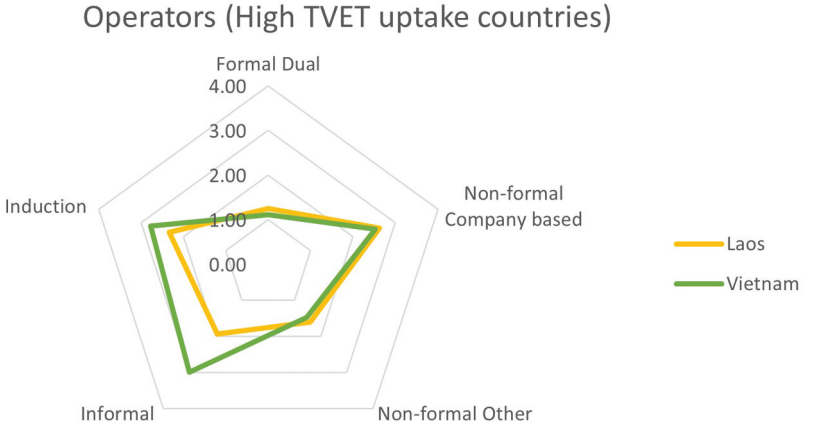

Figure 18. Training strategies for production workers in high TVET uptake countries.

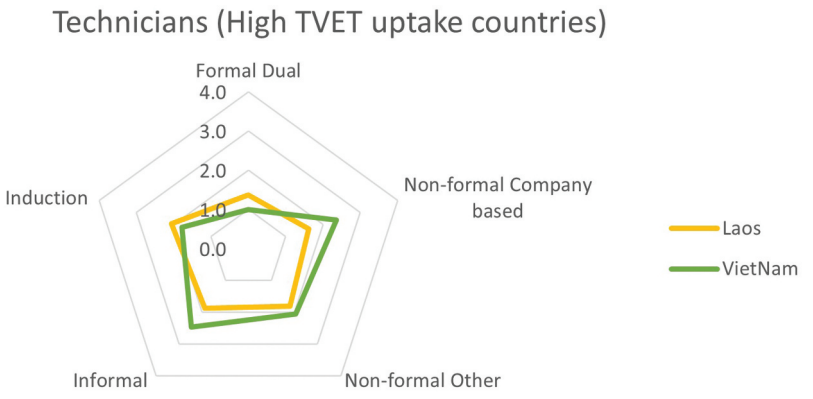

Figure 19. Training strategies for technicians in high TVET uptake countries.

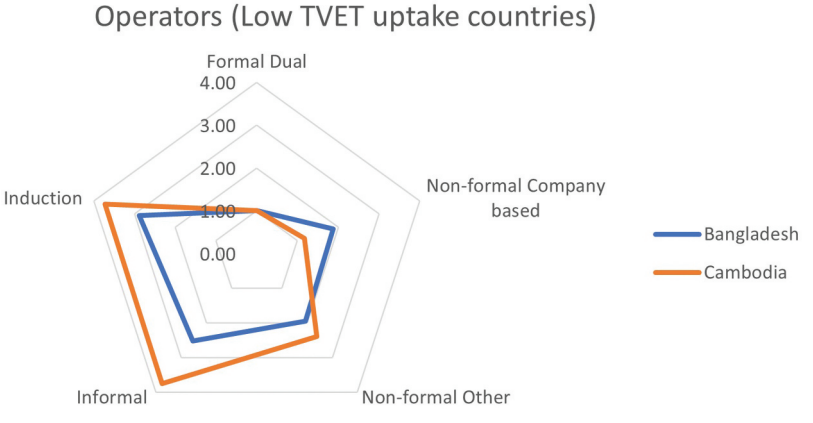

Figure 20. Training strategies for production workers in low TVET uptake countries.

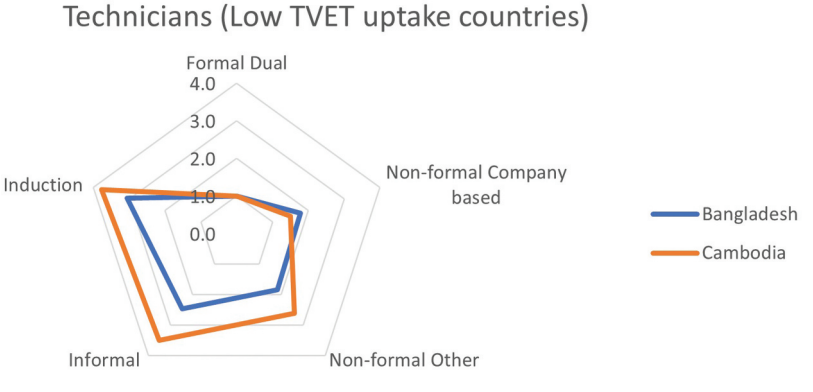

Figure 21. Training strategies for technicians in low TVET uptake countries.

Company respondents in Cambodia described informal in-house training as a major skill transfer mechanism in response to skills requirements; high and mid-level employees including managers, supervisors, and some experienced team leaders were the key players in ensuring that this training happens. Most general workers and operators are offered informal in-house training and learning only. Companies also reported providing informal on-the-job training to keep their staff up-to-date with the trends or any change of customers' preferences by hiring technicians and experts from technical schools to provide additional training for their employees:

> We trained all of them and grouped them into different lines for the team leader to start operating those new lines. We could not have 20-30-40 operators for the team leader to train at one time. (CE1BD4F hr)

> They [machinists] have more responsibility. Since we divided them into single and twin-needle sewing-machines, we [they] will do what we instruct them. (CGSZYY pro)

South African and Ethiopian companies (Figure 22 below) were more evenly split between reporting using and not using TVET qualifications in the interviews. Companies operating in these two countries seem to use a wider range of other training strategies complementary to the use of TVET.

Interviews in South Africa confirmed significant training taking place in Automotive companies, and in some Food and Beverages companies. While training for operators is not accredited and formal in the sense of qualifications being awarded, training in these two sectors is well structured and modularised within the automotive car assembly sub-sector and the sugar sub-sector of the Food and Beverages industry, while in Garments is less structured and focuses mainly on the job training. The complexity of technology and capital intensiveness of the company and or sub-sector seemed to be a major influence on whether training for operators is formal or informal. Company Sf2C947C says the following about training for operators:

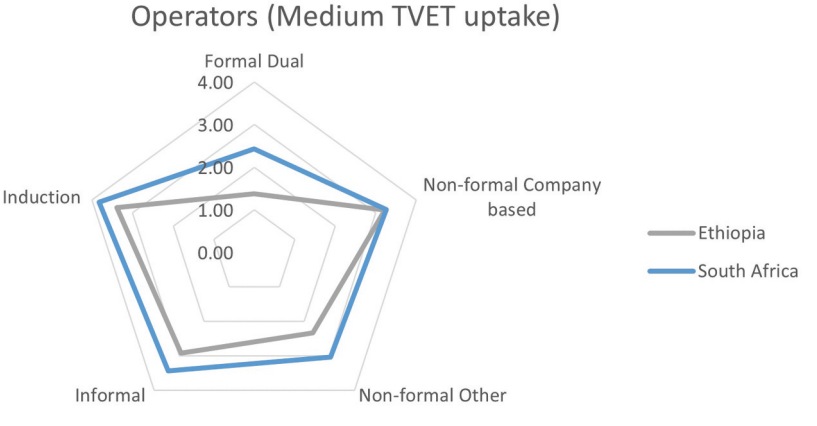

Figure 22. Training strategies for production workers in South Africa and Ethiopia.

> Mostly we provide operator training, it is modularized to provide theory, and they are specific, in that there are modules for pump operators, mobile modules to operate cranes, basic and advanced maintenance modules.

Company SA9B7 puts it a little bit differently:

> Externally, we take people sitting at home and bring them here to upskill them in a three-year programme and practicals, and they get the trade certificates. The target market for this training programme is assemblers (operators), because they are unskilled, so we equip, train and skill them. We don't necessarily train at higher level, because they come qualified, we only train them on robotics and Kuka training programmes.

However, the formal training that they report using is not, in the main, public TVET.

Similarly in Ethiopia, where companies do not have internal capacity for training, they report partnering with specific industry-based providers. For example, one company (eg8ec1), said it 'engages ETIDI [Ethiopian Textile Industry Development Institute] every year to provide training specific to needs'.

In sum, our findings suggest an interesting and complex mix of approaches to vocational skills development, including some use of public TVET, some use of formal private TVET, and some informal and non-formal training. Company respondents do not categorise training in these terms, and in general, the terms did not provide a language that enabled a straightforward conversation about training strategies.

Discussion and implications for policy and further research

As discussed above, it is well established in the literature that formal TVET systems in LMICs tend to be small and have weak linkages with industry. The findings of our study do not contradict this but do offer some nuance and a more complex picture in terms of the take up of formal TVET qualifications.

One consistent trend is a greater emphasis on TVET at higher levels. This is important because historically much vocational provision has been at senior secondary levels, focused often on production workers and machine operators. This is seen in much recent policy emphasis in the context of rising youth unemployment in many countries internationally. Our research supports previous research suggesting that TVET in LMICs should not be seen as a mass education solution, nor as key to solving skills mismatches and facilitating and supporting educational expansion for mass employment (Allais 2022; Maurer 2012; Maurer, Haolader, and Shimu 2023; McGrath et al. 2019). This is consistent with the finding that companies do not report skills shortages at this level; they mainly

reported them at technician level – where there are small numbers of jobs available.

In some cases, formal TVET appears to be part of a broader training regime of companies. In terms of other vocational skills development strategies in companies, our study suggests that companies which take training seriously appear to do so across different types of training. The implication is that while policy focus tends to be on national systems of formal provision, there needs to be more sectoral flexibility, and analysis of, and support for the relationship of formal provision to various types of on-the-job training. This recognises that what is needed in different sectors and industries varies dramatically, and TVET policies, plans, and provision needs to be more nuanced and disaggregated accordingly. TVET needs stronger engagement with dynamics of specific industrial sectors, and more active and direct engagement at a workplace level with companies, and located in their broader vocational skills development strategies.

It is also clear that better policy interventions require more representative and nuanced data from companies in LMIC, especially disaggregated at occupational level and industry, and by different types of training. But, as is clear from the discussion, the data was messier and more complex than anticipated. This was particularly pronounced in South Africa, but also the case in the other countries. Smith's and Smith (2023) argument for developing better categories and ways of understanding on-the-job training, discussed above, seems even more necessary in the LMIC context. We encountered difficulties at every stage: in the contextual studies, we could not find information which we had imagined would be available. In the survey, although we asked employers to list formal TVET qualifications, they listed general education (school qualifications), as well as short on-the-job training such as induction training and health and safety training. Interview data, with the same companies that had been surveyed, provided different and at points contradictory information. The implication is that there is no way of easily testing the roles that TVET qualifications play, and also, that the idea of 'employer-led' vocational education that is glibly prescribed in many policy documents is enormously complex. A focus on definitions may not be the most fruitful approach, as, while there is clearly huge scope for debating and refining terms and definitions in the research community, this would have no impact on how people in industry conceive of and plan training. Instead, what is needed is more research that remains open to understanding the full range of vocational skills development strategies and their relationships to each other. While quantitative research is important, this research has starkly illustrated how important, and yet difficult, it is to develop the appropriate constructs to test relationships in this field.

Notes

1. The full country contextual studies can be read at https://phzh.ch/en/Research/skills-for-industry/.
2. In this paper, we reflect on the methodological challenges from the point of view of defining different types of vocational skills development; a forthcoming paper discusses the complexity of the methodology of the study as a whole, and the challenges of this kind of research in LMICs countries.
3. An aspect that was explored in the survey.
4. See https://uis.unesco.org/en/glossary for definitions.
5. University of the Witwatersrand Protocol number H18/08/02.
6. Appendix 3 provides two tables with a bird's eye glance at the uptake of formal TVET qualifications for hiring and training by industry (Table 3) and country (Table 4).
7. A forthcoming paper reports on company-level characteristics, and the extent to which they determine uptake; for our purposes here we simply mention that they played less role than country and industry factors.

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APPENDICES

Appendix 1: extract from the survey with questions on TVET qualifications

As part of the company survey, employers were asked the following two questions, for the five different occupations levels mentioned above:

during the hiring process: 'Please indicate the 3 most frequent formal training programmes from which your [workers in occupational level] have graduated before joining your establishment in the last 5 years. Please give the title of the programme and the name of the provider.'

as part of the training strategy of the workforce: 'Please indicate the 3 most frequent formal training programmes, which some of your [workers in occupational level] have undergone in the last 5 years after joining your establishment. Please give the title of the programme and the name of the provider.'

Appendix 2: Working Definitions of Types of In-House Training

(1) Formal dual or apprenticeship programmes: programmes offered against national qualification with a significant workplace component and a strong education institution component (noting that this could be a public or private institution, and that private institutions could include dedicated training centres run by companies).
(2) Non-formal company-based training: Short or longer skills programmes that may lead to national credits or industry certification/recognition or company certification/recognition. They are structured and intentional and often a prerequisite for working independently in the workplace. These could be aimed primarily at new entrants but could also be aimed at existing workers.
(3) Orientation/induction programmes that provide an overall introduction to the workplace, including health and safety issues. Aimed at new entrants. Nonformal because structured and intentional.
(4) Informal on-the-job training: Training by supervisor or team member on new work-task. Could be new entrants or existing workers. Could be 'how to use the new machine'. Specific training, often from suppliers, linked to new technology/equipment. Intentional, not certified, but could be formally recognised within a company, and probably a prerequisite for certain tasks. Aimed at existing workforce. Mainly informal.
(5) Non formal other training: training directly aimed at the needs of the industry, and brought in by the industry, but offered by an outside body such as an NGO or industry association.

Appendix 3:

Tables 3 and 4 below provide a bird's eye glance at the uptake of formal TVET qualifications for hiring and training by industry (Table 3) and country (Table 4). The tables give a picture of the share (low, medium, or high) of companies per sector or country that report use of TVET qualifications/programmes.

Table 3. Uptake of Formal TVET qualifications and programmes for hiring and training (by industry).

	Operator		Technician	
	Hiring	Upskilling	Hiring	Upskilling
Automotive	(M)	H	H	H
Electronics	H	(H)	H	M
Food & Bev	H	H	H	M
Garment	L	L	(H)	L
Leather & shoe	L	(L)	H	L
Metal	H	L	H	M
Pharma	L	L	M	L

H: ≥60% uptake; M: between 40–60% uptake; L: <40% uptake, brackets indicate close to thresholds

Table 4. Uptake of Formal TVET qualifications and programmes for hiring and training (by country).

	Operator		Technician	
	Hiring	Upskilling	Hiring	Upskilling
Bangladesh	L	L	H	L
Cambodia	L	L	M	L
Ethiopia	(M)	L	H	L
Laos	M	M	H	H
South Africa	L	M	H	M
Viet Nam	H	H	H	H

H: ≥60% uptake; M: between 40–60% uptake; L: <40% uptake, brackets indicate close to thresholds