



Article

Meeting in the Middle: TVET Programs' Education–Employment Linkage at Different Stages of Development

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Abstract: Technical and vocational education and training (TVET) programs are most successful at supporting youth labor markets when they combine education and employment. Education–employment linkage theory describes this combination in terms of power-sharing between actors from the education system and their counterparts in the employment system over key processes in the curriculum value chain of curriculum design, curriculum application (program delivery), and curriculum updating. The Education–Employment Linkage Index measures linkage for every function in a TVET program where actors from the two systems interact, aggregating those into processes and phases and eventually an index score. We apply this index to the largest upper-secondary TVET programs in Benin, Chile, Costa Rica, and Nepal. We find that Benin has relatively high education–employment linkage, while the other three countries score very low. Benin's situation is unique because its TVET program is moving from employer-led to linked, rather than the typical employer integration into an education-based program. Other countries with large informal economies, low formal education and training rates, and existing non-formal employer-led training may be able to implement similar approaches.

Keywords: vocational education and training; VET; TVET; education–employment linkage; development



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1. Introduction

Young people's successful transition onto the labor market is one of the main criteria for assessing the success of technical and vocational education and training (TVET) programs (e.g., Ludwig-Mayerhofer et al. 2019; Deitmer et al. 2013; Eichhorst et al. 2015). Successfully linking education and employment within TVET programs appears to contribute to better youth labor market outcomes (Bolli et al. 2018, 2021). Common approaches to connecting education and employment include apprenticeship models (Wolter and Ryan 2011), industry–school partnerships (Flynn et al. 2016), and more systemic public–private partnerships in developed (e.g., Pillay et al. 2017; Remington 2018) and developing (e.g., Dundar et al. 2017; Kohli et al. 2015) contexts.

The variation in TVET institutions makes it difficult to compare their success at combining education and employment (Hadjivassiliou 2017). However, Rageth and Renold (2020) used systems theory to formulate a methodological approach to education–employment linkage, which assesses power sharing between actors from the education and employment systems, measurable at all points where actors from both systems come into contact. Linkage is highest when actors share decision power and low when actors from either side hold sway (Figure 1). Bolli et al. (2018) developed a measurement tool, the Education–Employment Linkage Index (EELI), that applies this approach empirically, using a survey

that targets education system actors and experts to assess power-sharing in a TVET program at every point where the education and employment systems can interact.

Initial evidence suggests that scores on the EELI correlate with youth labor market outcomes. This is because high levels of linkage ensure both rigorous curriculum and graduates who are prepared to meet the need of the labor market. Indeed, [Bolli et al. \(2021\)](#) show that education systems where students spend a significant amount of time in companies—necessitating a high level of cooperation between educational and employer actors—outperform systems where education takes place only in educational institutions on a series of labor market outcomes, from increasing employment opportunities to reducing the number of youth out of education, employment, or training.

Existing studies on education–employment linkage have limited their focus to top performers among developed countries ([Rageth and Renold 2020](#); [Bolli et al. 2018](#); [Renold et al. 2016b](#)). The purpose of this article is to expand this research to countries whose education systems and/or economies are in different stages of development. This is an important contribution to the literature because analyzing education–employment linkage in a broader context will allow for a better understanding of its importance and in what ways it can affect labor market outcomes under different conditions. We, therefore, apply the EELI to four countries at varying stages of economic development: Benin, Chile, Costa Rica, and Nepal. We do so through surveys conducted among TVET experts and education stakeholders in each of the countries, the responses of which are transformed into the index using an empirically derived weighting scheme ([Bolli et al. 2018](#)). The advantage of this approach is that it combines local experience and expertise with an empirically and theoretically-based index, resulting in a reliable, relevant measurement of education–employment linkage in the four countries.

We investigate how large upper-secondary TVET programs in these four countries compare to international scores and look for similarities and differences in the drivers of linkage where they exist. Although these countries' education systems are at various levels of development, the TVET component is comparatively weak in all instances. We, therefore, expect that these programs will have relatively low EELI scores, and that the drivers of linkage may differ across national income levels because of general differences in their education systems' development. All four programs have recently undergone reform in order to improve their education–employment linkage, though from different angles: while three of the four countries sought to integrate employers into education-led programs, Benin took an informal employer-led program and integrated educational actors.

We find that despite efforts to improve cooperation between education and employer actors, Chile, Costa Rica, and Nepal have very low linkage levels. Conversely, Benin scores just above the average scores of international top-performers. Benin's relative success appears to come from its strategy of bringing formal education into an employer-led program that already exists in the informal labor market, while the other countries must bring employers into education-led programs. Two patterns of increasing linkage emerge. Chile, Costa Rica, and Nepal all follow the employer integration approach already observed in other countries—these TVET programs are more education-based and seek to increase linkage by bringing employers on board. In contrast, Benin's education integration approach takes an employer-led training program—an informal apprenticeship model—and adds formal education components to increase linkage. This approach results in higher linkage despite Benin's program being the newest and its economy being the least developed. We discuss the institutional and economic conditions that may enable or require the different approaches and the implications of the education integration approach for TVET development.

2. Theoretical Foundations

In this section, we provide an overview of education–employment linkage, including the three ideal-types of linkage for TVET programs and how linkage can be applied to each of the three phases of the curriculum value chain (C). We then apply the theory to the

developing context more broadly and, finally, the four case studies. We use this discussion to formulate our hypotheses for the empirical analysis.

2.1. Education–Employer Linkage: An Overview

We base this study on the theory of education–employment linkage, as developed by [Rageth and Renold \(2020\)](#) and [Bolli et al. \(2018\)](#). *Linkage* describes the extent to which the processes and institutions governing education are a product of collaboration and power-sharing between education and employment systems. As summarized in Figure 1, linkage is highest when actors from the education and employment systems share power related to a given TVET program. [Bolli et al. \(2018\)](#) show that linkage is correlated with youth labor market outcomes, and [Bolli et al. \(2021\)](#) show that TVET programs with at least 25% of students' time spent in workplace learning causally improve youth labor market outcomes, especially related to job quality, while those with less workplace learning do not.

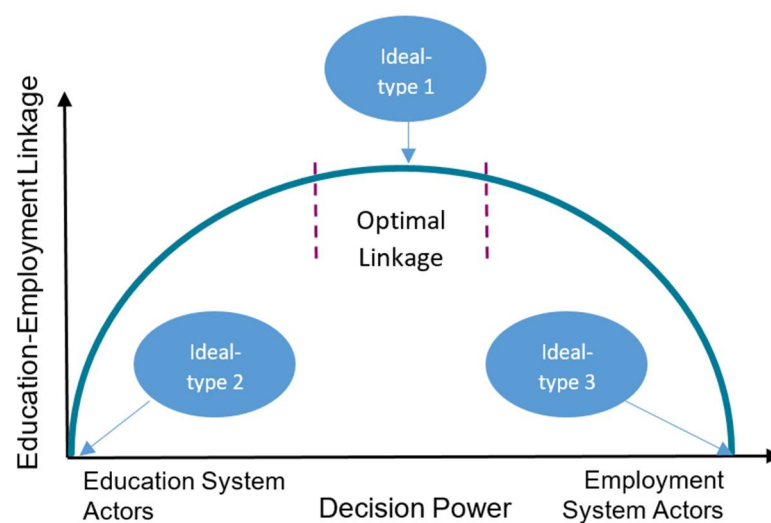


Figure 1. Education–employment linkage as a function of power equilibrium; three ideal-types of TVET programs. Source: [Bolli et al. \(2018\)](#) and [Rageth and Renold \(2020\)](#).

[Rageth and Renold \(2020\)](#) identified three ideal-type models for linkage in TVET programs—also shown in Figure 1. First, in high-linkage systems (ideal-type 1), power is generally shared. Dual systems such as those in Austria or Switzerland come closest to approaching this ideal-type. The other two models are low-linkage situations where one system has most or all the power. When the education system has most of the power (ideal-type 2), as is the case in countries such as Korea or Japan, employers have limited influence on curriculum content, program delivery, and curriculum updating. Programs like this are likely to be mismatched to labor market demand, expensive to operate, and outdated. In contrast, when the employment system has most of the power (ideal-type 3), educators have limited influence. Employer-dominated programs may lack general and transferable skills in the curriculum, may not include sufficient theoretical content with the practical content, and may only be updated when one narrow job changes rather than to reflect changes on an occupational level ([Renold et al. 2016a](#)). While some informal employer programs show characteristics of this ideal-type, at a systems level they are more of a theoretical point of comparison.

Linkage may differ not only between education systems, but also within education systems. Within TVET systems, [Renold et al. \(2016a\)](#) distinguished TVET pathways, programs, and curricula. The pathway is all TVET programs at all levels in an education and training system, for example, an upper-secondary dual TVET program as well as multiple levels of postsecondary and tertiary professional education. A TVET program is part of the TVET pathway. Typically, there is one program at each education level, though some jurisdictions have multiple TVET programs at a single level ([Rageth and Renold 2020](#)). There are multiple curricula for the various occupations available within TVET programs. The scope of occupational curricula varies greatly across countries—as an example, Finland’s largest upper-secondary TVET program offers eight fields of study while Estonia’s offers 657 ([Renold et al. 2016a](#)).

Linkage between education and employment actors is measurable at different points of the curriculum value chain (CVC; [Rageth and Renold 2020](#)). The CVC has three distinct phases: design, application, and updating. In curriculum design, the EELI describes three main processes: designing the qualification standards, designing the format of examinations, and involvement quality, which covers how actors from the employment system can access decision-making processes ([Bolli et al. 2018](#)). In curriculum application, the processes are the learning place (classrooms or workplaces), regulations that govern workplace training if it exists, cost sharing between the two systems, the provision of equipment, the provision of teachers, and the examination process. The provision of teachers, equipment, and financial resources is more important in programs that do not have workplace learning, because workplace learning is a substitute for things like industry-experienced teachers and industry-standard equipment in classroom workshops ([Bolli et al. 2018](#)). Finally, in the curriculum updating phase, the two main processes are information gathering and update timing.

Table 1 summarizes the main components of education–employment linkage along a curriculum value chain.

Table 1. Components of education–employment linkage.

Phases	Curriculum Design	Curriculum Application (Program Delivery)	Curriculum Updating
Processes	Qualification Standards	Learning Place Workplace Training Regulation	Information Gathering
	Examination Design	Cost Sharing Equipment Provision	
	Involvement Quality	Teacher Provision Examination	Update Timing

Source: [Bolli et al. \(2018\)](#).

2.2. Developing Contexts

The empirical analysis of this paper focuses on countries at differing levels of development and how we would expect linkage to differ based on the stage of economic development, the structure of the local labor market (particularly in terms of formal versus non-formal employment) and the political philosophy of education oversight (whether power is centralized or divided among education and employment actors). In addition to the general aspects of education–employment linkage outlined above, there are specific issues relevant to education in the developing context. Of particular importance in the developing context is the formality of both the TVET program and the labor market into which it feeds.

Despite their varying levels of economic development, the countries in our sample all have a relatively weak TVET sector. Therefore, we hypothesize (H1) that all four will have low education–employment linkage as measured by the EELI.

Formal, non-formal, and informal learning are different forms of education. However, definitions tend to be fluid and context-dependent (Carron and Carr-Hill 1991; Eshach 2007; DGIZ 2016). In general, formal education and training programs are part of the formal education system, guided by a curriculum, and recognized with a qualification by the country's education authority. They have at least an enacted qualification standard and include mostly classroom learning, though they can simply be examinations. The certifications offered by formal education programs open up further education and training opportunities in the education and training system, making them attractive to students.

Non-formal education or training is a class or course, mostly guided by a curriculum, but not part of the formal education system and not recognized by the education authority. Examples include language classes taken at the community center and many continuing education options. Finally, informal learning is also outside the formally regulated education system but unplanned and unintentional—it is simply knowledge gained from experience. For example, someone who learns a language by talking to others is learning informally (DGIZ 2016). Non-formal and informal education and training are very common and important means of acquiring knowledge and skills in developing contexts (Atchoarena and Delluc 2002; Ahadzie 2009; ILO 2012). By their very nature, non-formal and informal types of education would be expected to have little, if any, linkage with the employment system. Therefore, in this study, we focus on formal programs that are part of the education and training system.

Labor markets can also be formal and informal. The ILO (2012) defines the informal economy broadly, as “all economic activities by workers and economic units that are—in law or in practice—not covered or insufficiently covered by formal arrangements” (p. 25). According to the ILO (2017), “Informal economies . . . are typically characterized by a high incidence of poverty, inequality and vulnerability to decent work deficits.” At the same time, around 60% of the global workforce works in the informal sector (ILO 2018). Moodie et al. (2019) argue that there is a “substantial role of TVET in supporting workers in the informal economy to transition to formal employment” (p. 6). This is particularly important in developing country contexts, where there is a higher concentration of informal employment than in countries at more advanced stages of development. Given that the level of informality in the labor market necessarily impacts the linkage between education and employment systems by affecting the opportunities for linkage between formal institutions, we would expect that higher levels of informality go along with lower levels of linkage.

We explore the dynamics around levels of informality in the labor market, interaction with formal education programs, and differences by stages of development in the four case study countries. We begin with the hypothesis (H2) that the more developed countries will have higher education–employment linkage. We base this hypothesis on the expectation that more developed economies have a higher level of formality, which should, in turn, provide more opportunity for education and employment actors to interact.

3. Data, Method, and Country Context

To measure the degree of linkage between education and employment actors, we use the Education–Employment Index (EELI; Renold et al. 2016a). Although the EELI was initially designed and tested in mostly developed countries, it is designed to be context-agnostic. It looks at power sharing in generic processes where education and employment systems might come into contact without specifying any particular method or institutional arrangement. All TVET systems contain processes and structures that correspond to the generic processes on the curriculum value chain (Rageth and Renold 2020). Therefore, the EELI bases its definition of linkage on power sharing in these generic processes rather than across specific institutions or organizations, so, in theory, it should apply across TVET types or levels of development.

We select four case study countries at varying levels of economic development and with varying levels of educational and labor market formality where we implement the

EELI. As part of an ongoing long-term research project,¹ we partnered with in-country researchers in all four countries to carry out intensive literature reviews and asset mapping of each country's TVET pathway (Bankolé et al. 2019; Camacho Calvo et al. 2019; Peralta Rojas et al. 2020 Baral et al. 2019). We also performed statistical reviews on the education systems and specific TVET programs under investigation in this study.

The results of these four case studies are benchmarked against the EELI results in advanced economies as shown in Bolli et al. (2018), as well as the US state of Colorado (Renold et al. 2016b). Together with our research partners, we select a large upper-secondary TVET program in three of the four target countries, all of which have undergone reform with the goal of improving cooperation between education and employment actors. These are Chile's *Enseñanza Media Técnica Profesional* (EMTP), Costa Rica's *Colegios Técnicos y Profesionales* (CTPs), and Nepal's Technical School Leaving Certificate (TSLC). In Benin, we chose the *Certificat de Qualification Professionnelle* (CQP). This program is not the largest upper-secondary TVET program—that would be school-based TVET—but it is growing. We selected CQP on the advice of research partners in Benin to measure the impact of the reform aimed at improving education–employment linkage by integrating education actors into an established, employer-based system.

We collected data on two main aspects of the four TVET programs. First, we used the case studies of each program developed by our research partners so we can describe the programs in detail and frame the results in concrete practices. Second, we distributed a survey (online in all countries except Benin, where survey collectors were used) measuring the EELI to TVET experts from the education, employment, and research sectors in each country. Given the length and complexity of the survey, we focused on respondent quality rather than quantity: our objective was to get the best possible experts rather than a broad sample that might not be able to answer the questions. We worked with in-country experts to select the right respondents and used offline surveys and in-person interview-style surveys to reach experts without internet access.

Table 2 summarizes response numbers and rates by country and group. The overall response rate is 62%, or 71% for government/education respondents, 60% for industry/employment respondents, and 50% for research respondents. Costa Rica has the highest response rate at 80%, followed by Benin (76%, many in-person surveys were required), Nepal (55%), and Chile (38%). In terms of absolute numbers, responses range from 27–55 individuals.

Table 2. Response rates by country and respondent type.

Country	Response Rate (N Respond/N Sample)		Respondent Type (%)		
			Government (Education)	Industry (Employment)	Research
Benin	76%	39/51	85%	67%	57%
Chile	38%	26/69	56%	25%	34%
Costa Rica	80%	55/69	85%	79%	74%
Nepal	55%	27/49	57%	64%	43%
Total	62%	147/238	71%	60%	50%

Total sample numbers in **bold**.

The analytical strategy is straightforward and follows that of Bolli et al. (2018), with the key points covered briefly here. Respondents to the EELI survey are asked to assign a level of linkage between employment and education actors for a series of processes within each phase of the CVC. These responses are transformed into a 1–7-point index, where seven represents high and one represents low linkage.² Each phase of the CVC then has its level of linkage determined through a weighted average of the processes, and, in turn, the weighted average of the three phases defines the EELI overall for a given TVET program.

The weighted averages are created through an empirically derived weighting scheme, also proposed by Bolli et al. (2018). Defining the weights is a two-step process. In the first

step, experts are asked to distribute the percentage importance of education–employment linkage in each of the three CVC phases up to a total of 100%. In the second step, employers are asked to rate linkage in each of the three phases to create a subjective measure of linkage, as opposed to the (semi-)objective measure of linkage obtained from the levels in each process. This subjective linkage score is then used as the dependent variable in a simple linear regression, with the semi-objective ratings of each individual process as the independent variables. The coefficients obtained for each of these processes correspond to the weights assigned to each process, with their values adapted so that negative coefficients are equal to zero and the total of the final weights equals one. From these weighted phase values, the overall EELI is calculated using the average of the distributed importance of each phase.

In the following section, we describe the four countries and the TVET programs in question to contextualize the results in terms of both their economic contexts and types of TVET programs.³

3.1. Benin: CQP Program

The West African nation of Benin has a population of 11.5 million and moved from the low-income to low-middle income category in 2020 (World Bank 2021). Agriculture is the largest source of employment (32.2%), and the country's population skews young—youth aged 10–24 years account for 32% of the total population. The informal sector is the main source of employment, accounting for 65% of all employees (Medina et al. 2016). Vulnerable employment⁴ is also a key issue at 87.7% of employment.

The education system in Benin consists of pre-primary education from age 2.5 to 5 years and primary education from 6 to 12 years. After primary education, students can pursue general secondary schooling from ages 12–18. Formal secondary education includes general and technical programs, with the general route comprising a four-year lower secondary program then a three-year upper secondary program, and the technical route comprising two three-year programs for lower and upper secondary education. Students are eligible for university after either secondary education route (KOF 2017).

Benin adopted a new Education Act in 2003 (modified in 2005), which sets two main priorities: that every child in Benin should complete primary education, and that the main secondary pathway should be TVET. Educational attainment is currently low, with 85% of boys and 81% of girls starting primary, and 69% and 57%, respectively, finishing primary education. Many students do not enter secondary education, with 62% of boys and 49% of girls starting, and 39% and 23%, respectively, finishing secondary education. Only 15% of males and 6% of females attain tertiary education.

Alongside the formal education system, those who complete primary education can attend a formal three-year dual apprenticeship (CQP program), which is the program in question in Benin for this analysis. Those who do not complete primary education can still access the CQP through a remedial apprenticeship of three to five years. The CQP was introduced at the beginning of the 2000s and therefore is a relatively new program established as part of reform efforts with the mission of adding a formal education component to informal apprenticeships, as they are typical in many West African countries. Approximately 3500 students were enrolled in the CQP in 2013 (KOF 2017), compared to a total secondary-level population of 896,800, of which 29,300 were enrolled in TVET in the same year. For comparability, the informal apprenticeship accounts for about 200,000 individuals annually. Therefore, although small, CQP nevertheless accounts for approximately 10% of total TVET enrollment.

CQP is available in 13 artisan occupations and lasts for 3 years. Students spend one day a week in the classroom, and four or five in their workplaces. Students must have apprenticeship contracts with a “master” artisan and be at least 14 years old. Though the program does not require that participants have completed all education up to that age, they must have completed the fifth year of primary school, passed an entry test, and meet French literacy standards. The program is regularly oversubscribed, with more applicants

than places. Currently, there is no formal education or training progression route for CQP graduates.

The government oversees and partly funds the program through the Ministry of Secondary School and TVET (MESTFP) and Ministry of Labor, plus sector-specific ministries when relevant. The private sector is involved through the National Union of Chambers (UCIMB), and the Benin National Confederation of Artisans (CNAB). Training providers include public and private vocational training centers, as well as artisans in informal-sector workshops. Finally, foreign donors are involved in funding, supporting, and developing the program. Trainees must cover 5–10% of the program costs but the Fund for the Development of Continuing Vocational Training and Learning (FODEFCA) provides scholarships to students.

3.2. Chile: EMTP Program

Chile is a fast-developing South American market, classified as a high-income country since 2012 (UN 2014). Its largest employment sector is the service sector, which accounts for 69.2% of total employment. Informal employment accounts for one-fifth of employees (ILO 2018). Historically underdeveloped in Chile, TVET has recently become a government priority with a 2018 National TVET Strategy⁵ at the forefront. The strategy brings TVET back into the national public policy discussion, recognizes the demand for TVET from students and the private sector, and calls for the development of a TVET system in Chile.

The Chilean education system begins with up to five years of non-compulsory pre-primary education, then compulsory primary education from ages six to 13, divided into four-year cycles. Secondary education is also compulsory, running from ages 14–18 in two two-year cycles. In the second cycle, students can choose between a general curriculum leading to tertiary education, or vocational education (EMTP), which can also lead to university. Postsecondary education is carried out by universities, professional institutes, or technical training centers.

Among all upper-secondary students, 40–45% choose EMTP. It is school-based, with curricula for 15 sectors and 35 specialties. The program lasts two years, students spend roughly 10% of their time in the workplace, and approximately half of the program content is occupation-specific. EMTP students must have completed primary school and are usually 16–18 years old with some older students due to repetition. EMTP graduates can progress through the education and training system post-graduation (KOF 2015a).

EMTP is state-funded, with municipal and voucher schools receiving per-capita subsidies with adjustments for certain specialties and student characteristics.

3.3. Costa Rica: CTPs

Costa Rica is a small Central American upper-middle-income market, with a population of 4.8 million. The service sector is its major employer, accounting for 66.9% of employment (KOF 2015b). Youth unemployment is relatively high at 21% (World Bank 2018) and informal employment accounts for one-third of employees (ILO 2018).

The Costa Rican education system consists of pre-primary education (age 5–6), primary education (6–12), lower secondary education (12–15), diversified education (15–18), and post-secondary or higher education. Pre-primary, primary, and lower secondary education are compulsory. Diversified education lasts 2–3 years and consists of three branches: academic, technical, and artistic.

The technical branch accounts for 19% of all upper-secondary enrollment and is Costa Rica's main formal TVET program. It comprises 56 specialties and lasts 3 years. It is fully school-based, taking place mainly in technical colleges, the CTPs. Students have a required practice period before graduation, accounting for 11% of the total program duration. In addition, some colleges or specializations require internships, but those are usually very limited. The program is entirely occupation-specific. Every CTP has its own entry requirements, including completion of ninth grade. From the CTPs, students

can pursue postsecondary TVET or attend non-formal TVET programs at various levels through the National Institute for Apprenticeships.

CTPs are governed and financed primarily by the Ministry of Public Education. Under the Ministry, the Directorate of Technical Education and Entrepreneurial Skills is responsible for professional technical education and diversified technical education. Higher education institutions consult on curriculum and standards, as do advisory bodies that represent the education, trade union, and employment sectors.

3.4. Nepal: TSLC Program

Nepal has a large informal employment sector, accounting for 60% of employees (ILO 2018). Like Benin, Nepal moved from the low-income to the lower-middle income category in 2020 (World Bank 2021). Nepal promulgated a new constitution in 2015 that affects its fundamental governance structure, adding a province level between local and central governments (Renold and Caves 2017). Its education system, like every other system, is expected to undergo a dramatic change with the upcoming passage of a new legal framework for TVET including regulation for a National Qualifications Framework (Caves and Renold 2019). At present, the system includes pre-primary education starting at age three or four, then primary education from five to nine years of age. Lower secondary education lasts from ages 10–12, followed by upper secondary at ages 13–14 (KOF 2015c).

At the end of upper secondary, students choose between the general School Leaving Certificate (SLC) pathway or the Technical School Leaving Certificate (TSLC), a 2-year TVET program. Those with the SLC can go on to pre-tertiary education, then potentially tertiary education. The level of compulsory schools is in flux, having transitioned very quickly from none to three, five, and possibly eight grades. A new National Vocational Qualification Framework and the expected new legal framework for TVET at federal, province, and local levels will clarify this issue.

The TSLC usually lasts two years and leads to a technical diploma, but specific programs vary greatly. For example, another way to earn the TSLC is to complete the SLC and then a short-cycle version of the TSLC. TSLC represents about 25% of total upper secondary enrollment, and offers 24 occupational qualifications. Curricula are about 80% occupation-specific. The program is generally school-based, with some workplace learning near the end of the program for a total of 15–20% workplace time. After the program, graduates can go on to three-year diploma courses in certain professional fields like agriculture, engineering, healthcare, and tourism.

Under the old constitutional regime and during the transition phase towards the new legal framework based on the new constitution, TVET governance is completely under the umbrella of the Council for Technical Education and Vocational Training (CTEVT), a semi-independent government apex body for all TVET programs. CTEVT controls program design, implementation, and quality. However, 14 ministries are historically involved in TVET, including the Ministries of Education, Labor, Agriculture, and others. CTEVT has some employer advisors in its administration. Technical schools and on-the-job training providers also play a role in the system (Renold and Caves 2017; Renold et al. 2018b).

Financing for TSLC comes mainly from the state, but also from pupils' tuition fees and industry itself. Public technical institutions and public schools offering TVET are funded through the government budget, but private training providers typically rely on student fees. TSLC programs can have considerably different training costs across institutions, both in terms of gross costs and costs to the student (Parajuli et al. 2020).

4. Results

Figure 2 shows the overall index scores for the four countries we studied in comparison to all countries studied using EELI thus far (Renold et al. 2016a; Renold et al. 2018a; Renold et al. 2016b). All items, and the total index, are scored on the same one-to-seven-point scale. Higher scores indicate a greater balance of power across the education and employment systems, so higher-scoring systems are closer to the high-linkage ideal-type 1.

Chile and Costa Rica, the upper and upper-middle-income countries, score low relative to the field at 1.4 and 2.0, respectively, on the one-to-seven-point scale. Nepal scores slightly higher at 2.5, and Benin scores the highest of these countries at 3.7, and is the only one above the overall average.

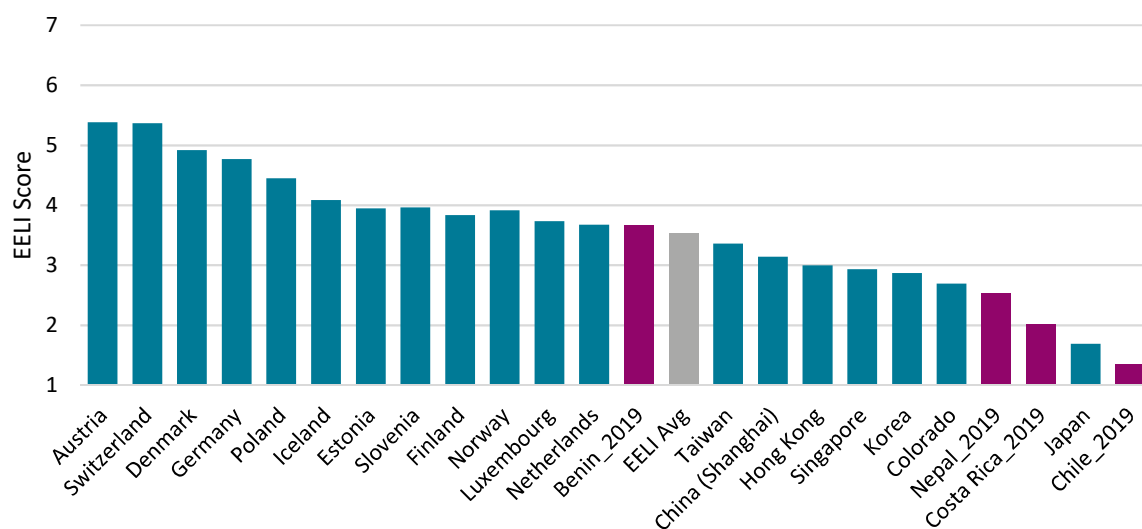


Figure 2. Results in the international context. Source: Own depiction.

4.1. Cross-Country Comparison

Table 3 shows all four countries' scores for each feature, process, and phase of education–employment linkage, as well as the weights for each and the overall average. Benin's high score is mainly a result of the application phase (4.2) and design phase (3.6). Benin's score in the design phase matches the EELI average of all studied countries and its application-phase score is higher than the average, making it the only country studied here to have any score at or above that benchmark. Benin's high score in the application phase is mainly driven by its high score in the learning place process (5.3).

Chile's lowest-scoring phase is design at 1.0, followed by updating at 1.3, and application at 1.8. All of these scores indicate that employers have almost no power over VET, and the score in the design phase indicates that curriculum development is essentially an education-system action with no decision power for employers. The design phase has the greatest weight of all three phases at 41.9%, so this is particularly important.

Costa Rica's lowest score comes from the updating phase at 1.6, followed by design at 2.0, and application at 2.4. Although employers have some small roles in curriculum design, there is almost no role for them in updating the VET curriculum. This makes it unlikely that the program will stay up to date, jeopardizing graduates' transitions to the labor market.

In Nepal, the lowest phase score is curriculum updating at 1.5, followed by design at 2.6, and application at 3.1. Employers have a stronger role in Nepal than the two middle-income countries, but are still relatively weak.

Table 3. Results for index, dimension, process, and feature including weighting scheme.

Index	Weight **			EELI Scores ***				
	Phase	Process	Feature	Benin	Chile	Costa Rica	Nepal	<i>EELI Average</i>
Overall Index				3.7	1.4	2.0	2.5	3.5
Design	41.9			3.6	1.0	2.0	2.6	3.6
Qualification Standards		15.8		2.8	1.0	1.5	2.5	3.1
Standards: Involvement			15.8	3.1	1.0	1.7	2.4	3.3
Standards: Decision Power			0	2.5	1.0	1.3	2.5	2.9
Examination Design		11.8		3.0	1.0	1.1	1.8	2.8
Examination: Involvement			11.8	3.2	1.0	1.1	1.9	3.0
Examination: Decision Power			0	2.9	1.0	1.1	1.7	2.7
Involvement Quality		14.3		3.3	1.1	1.7	2.4	4.4
Career vs. Occupation vs. Job			0	1.0	1.2	1.0	1.0	4.7
Firms vs. Employer Associations			4	4.4	*	5.8	5.1	5.0
Represented Firm Share			0.1	3.7	1.0	1.8	2.8	4.5
Legal Def. of Involvement			10.2	4.4	1.0	1.9	2.8	4.2
Application	34.4			4.2	1.8	2.4	3.1	3.4
Learning Place		13.2		5.3	2.1	3.0	3.1	3.5
Classroom vs. Workplace Share			13.2	5.0	1.8	2.6	3.1	3.2
Legal Def. of Share			0	5.8	4.3	3.8	3.8	4.2
Site Visits				1.5	1.8	2.3	1.8	1.8
Counseling				1.5	1.4	1.8	1.5	1.7
Workplace Training Regulation		8.6		3.9	3.3	2.3	4.6	4.5
Work Contract			1.7	4.1	3.6	2.5	5.0	5.3
Curriculum: Existence			0	3.2	4.4	2.8	6.3	5.8
Curriculum: Implementation			6.9	3.5	2.9	4.0	4.4	5.0
Trainer: Existence			0	4.2	2.7	1.3	5.2	4.7
Trainer: Number			0	4.6	7.0	1.0	5.4	3.8
Trainer: Training			0	6.1	7.0	7.0	4.5	5.3
Trainer: Continuous Training			0	6.1	1.0	7.0	3.5	3.4
Cost Sharing		1.5		2.3	1.9	2.3	2.1	2.6
Classroom Education Costs			1.5	1.9	1.4	1.2	1.7	1.4
Workplace Training Costs			0	2.7	4.0	3.7	2.5	4.2
Equipment Provision		0		1.9	2.4	2.2	2.1	3.0
Equipment Provision			0	1.8	1.9	1.8	1.9	2.3
Equipment Quality			0	4.7	4.3	4.6	4.2	5.5
Teacher Provision		3.2		4.7	1.1	1.0	1.8	2.0
Teacher Provision			3.2	2.8	1.1	1.1	1.6	1.6
Teacher Training			0	7.0	*	1.0	3.6	3.5
Continuous Training			0	6.8	*	1.0	3.6	3.2
Examination		8		3.7	1.2	1.6	3.6	3.2
Practical Share of Examination			0	5.2	1.6	2.0	4.1	3.9
Examination: Location			0.3	1.9	1.0	1.8	3.6	2.4
Examination: External			0	*	*	0.0	7.0	5.9
Supervision								
Examination: Employer Expert			7.7	4.0	1.0	1.3	2.4	3.5
Updating	23.7			3.0	1.3	1.6	1.5	3.5
Information Gathering		1.2		4.2	3.2	4.9	5.4	5.7
Employer Surveys			0.7	4.6	3.2	5.3	5.4	5.5
Labor Force Surveys			0.5	3.9	3.2	4.7	5.1	5.8
Update Timing		22.5		3.2	1.2	1.4	1.3	3.0
Update Involvement			15.7	2.6	1.2	1.4	1.3	2.7
Legal Def. Update Involvement			6.7	3.7	1.1	1.4	1.3	3.1

* Missing values mean respondents did not provide answers to these questions. ** Features weights are shown as percentages. *** EELI scores are shown on a 1-to-7-point scale. Numbers in *italics* represent the average EELI score of all countries in Figure 2. Numbers in **bold** represent the overall country EELI scores, and the overall scores for each phase respectively.

Figure 3 shows the process level, just below the more comprehensive phase level. Benin is the highest in all design-phase processes, and Chile is the lowest. The most important process in the design phase is setting qualification standards (15.8% of total weight). In this area, Chile scores a no-linkage 1.0 because curricula are completely determined by education-system actors. Although the qualification-standard-setting process is controlled by the ministry of education in Costa Rica and Nepal, both score slightly better because the leading TVET governance organizations for both have employer advisors. Benin's

qualification standards are set more collaboratively because the CQP is a formalization of existing traditional apprenticeships.

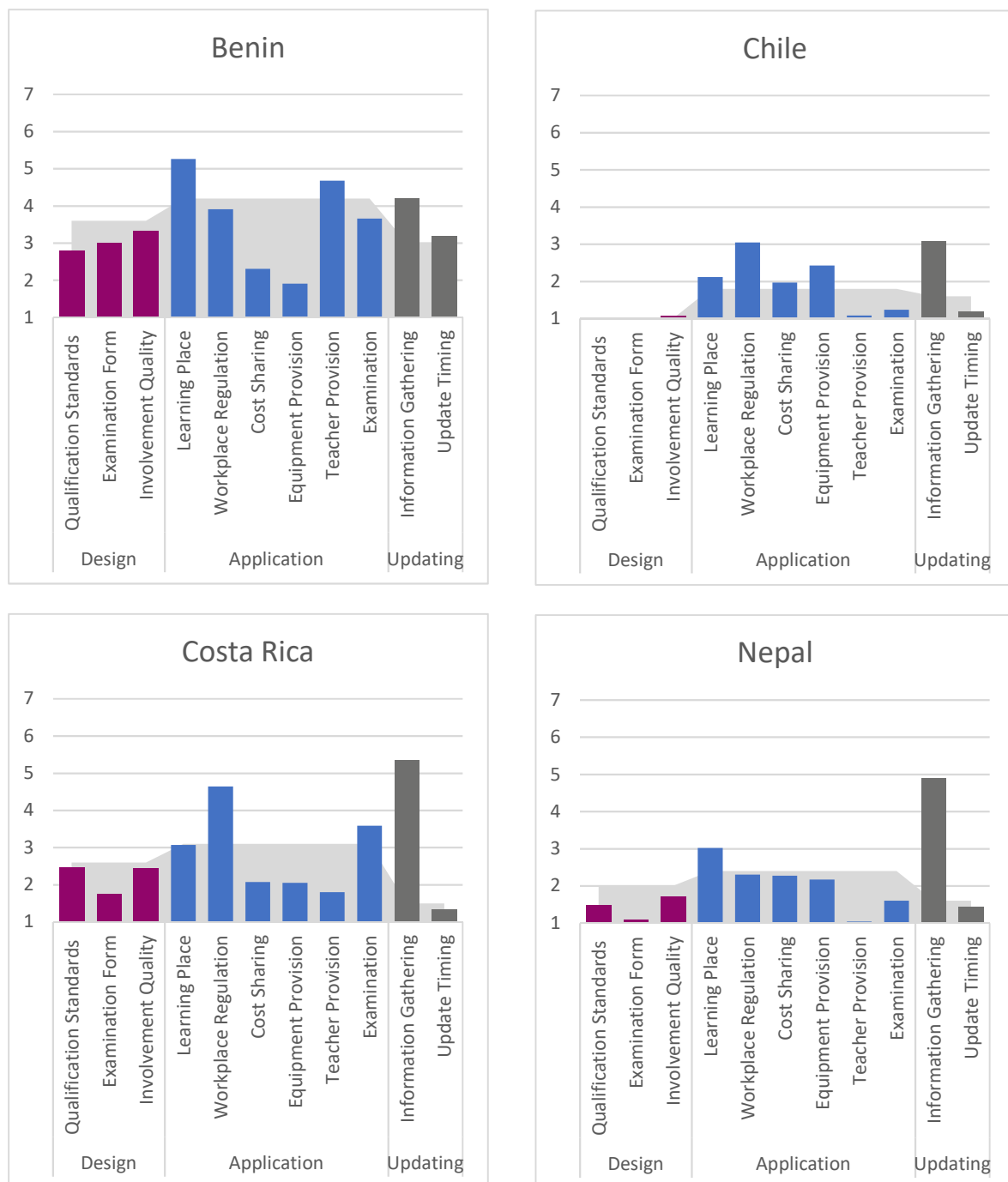


Figure 3. Process-level results by country. Notes: Higher scores represent more employer power. Shaded grey fields represent phase-level averages. Columns in pink represent design-phase processes, in blue the application phase, and updating in dark grey.

In the curriculum application phase, the most important process is the learning place (13.2%), or how much time students spend on workplace learning as opposed to school-based instruction. Chile, Nepal, and Costa Rica all score near 3.0 because all programs are school-based with some minor practical-experience requirements. Benin scores very high (5.3) because its program is dual work and school-based. When TVET programs are school-based, workplace regulations are less important while cost-sharing, equipment

provision, and teacher provision are more important. However, workplace regulations are strong in Costa Rica and Chile, and both school-based programs score low in the other processes. With very limited workplace training, regulations only reduce already-low linkage even further.

Finally, the most important process of the updating phase is that employers have the power to trigger a curriculum update (update timing, 22.5%). In Chile, Costa Rica, and Nepal, this score is very low. In Benin, update timing scores 3.2, meaning employers do have some formal input concerning when curricula should be updated. Although information gathering—the process of collecting labor market and outcome data to assess a curriculum’s effectiveness—is not very important (1.2%), all four countries have high or relatively high scores for that process. In fact, information gathering is the highest-scoring process in Chile, Costa Rica, and Nepal.

Two clear patterns emerge in these results. Benin, with its dual TVET program, has relatively high scores, especially in important processes. In Chile, Costa Rica, and Nepal, the TVET programs are school-based and the more important processes have low scores while higher scores come from less-important processes like information gathering and workplace training regulation—especially unimportant given the dearth of workplace training. As a result, Benin has high education–employment linkage while the other three countries have very low linkage.

4.2. Subjective Linkage Measurement

To understand the origin of all four countries’ EELI scores and to explore linkage in the four programs, we now examine subjective linkage measurements and discuss the possible institutional differences that may lead to the differences in programs’ linkage levels. Although the EELI measures linkage in a wide variety of processes and is correlated with youth labor market outcomes, it may miss some important aspects of linkage—especially in these new contexts.

To address this possibility of missing variables, we can examine an additional data point. In addition to collecting data on the features of linkage that are aggregated into the EELI’s processes and dimensions, the EELI survey asks respondents to report how much power they think the education and employment systems have over each phase of curriculum design, application, and updating. We can construct a subjective index score using the weighted average of these directly measured phase scores as opposed to the index, in which the phases are built from feature scores. The weighted average in the subjective scoring system uses the same phase weights as Table 3. Table 4 compares the EELI to the subjective dimension and overall index scores.

Table 4. EELI dimensions and scores compared to the subjective dimensions and scores.

Country	EELI					Subjective Scores		
	Index	Design	Application	Updating	Overall	Design	Application	Updating
Benin	3.7	3.6	4.2	3	3.0	3.2	3.2	2.3
Chile	1.4	1	1.8	1.3	1.8	2.0	2.0	1.5
Costa Rica	2	2	2.4	1.6	2.3	2.7	2.0	2.1
Nepal	2.5	2.6	3.1	1.5	3.0	3.5	2.9	2.1

Numbers in **bold** represent the total EELI score or the total subjective score.

The subjective scores use the same 1–7-point scale as the index. The subjective and standard scores are quite close, all within one point and usually much closer. This reinforces both scores, indicating that they are both measuring some signal despite the noise of measurement error in both. The overall pattern holds, although Benin’s overall linkage falls slightly and Nepal’s rises slightly so they are tied for the highest score at 3.0. Chile’s subjective linkage is slightly higher than its index score (1.8) and so is Costa Rica’s (2.3). All of Benin’s phase-level scores are lower subjectively than in the index, and all of Chile’s

are higher. In contrast, Costa Rica and Nepal's overall, design-phase, and updating-phase scores are higher while their application-phase scores are lower. All countries' subjective values are more consistent across phases than the EELI scores, with lower ranges.

To examine the subjective responses more closely, Figure 4 shows histograms of phase-level subjective responses by country. As usual, education power is on the left, employer power is on the right, and shared power is in the middle. The bars show the distribution of responses.

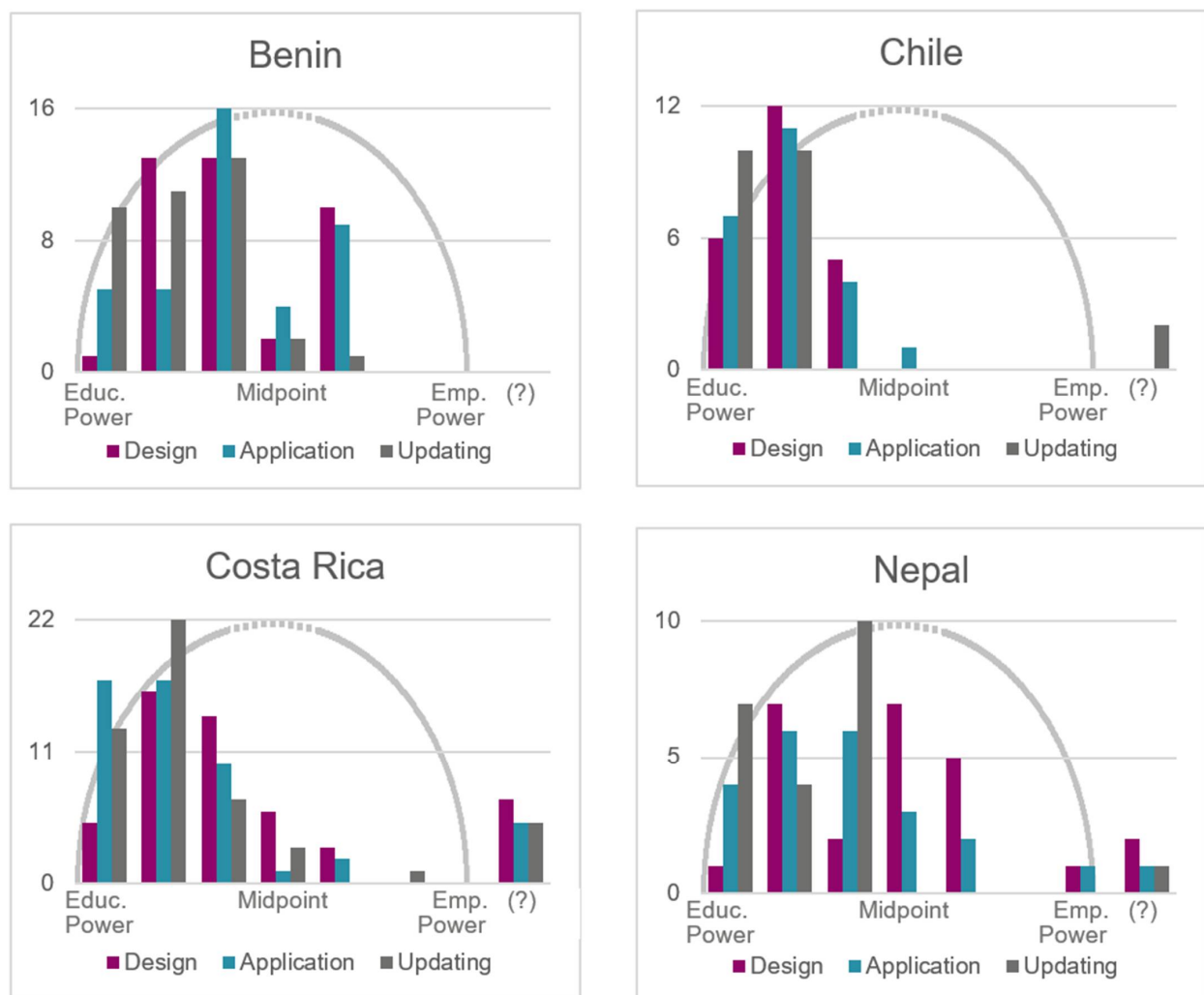


Figure 4. Subjective linkage by phase and country. Notes: Figures are histograms of subjective linkage by phase. Responses range from “They [employers] have no power” on the left to “They [educators and employers] share power equally” at the midpoint and “They [employers] have all power” on the right, with the (?) showing “I don’t know” responses. The curve behind each histogram represents linkage theory, with higher linkage at the midpoint, or power sharing. The dotted line at the top of the curve represents the theoretically defined range of optimum linkage.

As demonstrated by the figure, none of the programs evaluated here are employer-dominated. Like other formal TVET programs, the power balance of these programs skews toward education-system actors to varying degrees.

Chile and Costa Rica show the same pattern for their school-based TVET programs, such that most—but not quite all—of the decision-making power over these two programs lies with education-system actors in the view of the experts. These are both established school-based programs, which accounts for both the education-heavy power balance and general agreement among respondents. Benin and Nepal show wider distributions of

power-balance assessments, with Benin's mostly concentrated just to the education side of the midpoint and Nepal's more diffused.

Nepal's TSLC program is well established, but its duration, delivery method, and actor engagement vary across industries and occupations. Nepal is the only country where respondents report employers having all the power in any phase, but in both cases it is an employment-system actor reporting that employers have all the power in either design or application, but no power in the other two phases. These reports of employers' power in one area and powerlessness in the others may reflect within-program differences, political considerations, or frustration with low linkage in some areas.

It is somewhat surprising to see Benin's CQP program reported to have mainly education-system actors holding power. The program has grown out of traditional apprenticeships, where employers have complete control, and is not very old. It would be interesting to further investigate how new occupations' linkage changes as they transition from traditional apprenticeship to CQP, and whether there is an oscillation-then-stabilization effect, a rapid switch from employer to educator power, or some other phenomenon. However, Benin's CQP has the highest linkage overall and the most subjective responses indicating employer power, regardless of being more education-driven than expected.

4.3. Factors Leading to Higher Linkage

Some key questions include how Benin came to have the highest linkage, despite its earlier development stage than Chile and Costa Rica and small formal employment sector, and why Nepal is not more comparable with its similar development and economic status.

Benin's CQP program is an example of moving from the employer-power side of education–employment linkage toward power-sharing, instead of the usual case of an education program moving toward linkage by bringing employers into the program. This creates a novel situation in education–employment linkage research where the development of the program has relied on education integration rather than employer integration. When it is possible, integrating education into existing employer-driven programs may be a faster path to high-linkage TVET programs than integrating employers into education-driven programs because employers' demand for training makes them more willing to change than educators, from whom training is being demanded.

Benin's large informal economy and low rate of formal education and training may be a factor in its ability to convert an employer-driven program into a high-linkage program. Because they have smaller informal economies, Chile and Costa Rica do not have as much traditional or non-formal apprenticeship education and may have more demand for formal education and training from formal-sector employers. With more students enrolled in formal education and training, the upper-middle-income countries also have less demand from students and employers for non-formal training, especially at the upper-secondary level. However, Nepal and Benin share the general characteristic of large informal economies and relatively low formal education and training rates, but have different linkage levels in their TVET programs. Therefore, there must be more factors at play.

Nepal's formal TVET sector had a head start on Benin's, where some development agencies became active in the late 1990s and the CQP was established in the mid-2000s (Bankolé and Nouatin 2020). TVET in Nepal began with donor programs in the 1980s,⁶ and has undergone various reforms and expansions since that time. However, despite increases in the rates of formal primary and secondary education attainment, there are diminishing increases in wage employment (Bolli et al. 2019). This suggests that workers in the informal economy have education and training credentials from formal programs. The combination of a longstanding—if somewhat weak—TVET sector and demand for formal education and training by the informal economy indicates that there may be little demand from employers to develop formal training programs, since they can passively “consume” educated workers. In that case, the opportunity for converting employer-led programs into high-linkage programs may not be present.

Benin's education integration approach may thus be possible when a country has a large informal economy, low formal education and training rate, and—unlike Nepal—high demand from employers for increased or improved formal education and training. With those three ingredients—informal economy and low formal education and training rate, and demand from employers—the most expedient approach to high-linkage TVET programs appears to be education integration, rather than the supply-driven and more institutionally delicate introduction of employer power into education-controlled spaces.

This is not to say that the process of formalizing CQP in Benin has been easy or problem-free. The process is still underway and has already dealt with challenges. The quality of training remains patchy, varying by occupation. While FODEFCA is charged with quality control, a lack of resources means checks are sporadic, and allegations of corruption amongst FODEFCA staff have hurt the reputation of the program (David-Gnahoui and Akouete-Hounsinou 2015). Moreover, no data is kept on the labor market progress of participants having completed the program, making impact assessment difficult (Bankolé et al. 2019). In short, the CQP remains in development and while it scores well in linkage it still has some way to go before becoming an established mainstream TVET program.

5. Conclusions

These results confirm our expectation that education–employment linkage is weaker overall in our sample of countries with relatively weak TVET systems than it is in the sample of top performers (H1). However, the lower scores are not driven by income level, contrary to what we may have expected (H2). The upper-middle and high-income countries have the weakest linkage, with the low-income countries faring better. Benin especially scores well, above the overall average.

We posit that Benin's success lies in the development of its CQP program from traditional employer-led apprenticeships into a high-linkage formal TVET program. This is the reverse of the education-to-employment trajectory that we typically observe, and that the other programs follow. This seems to be possible in contexts with larger informal labor markets in which employers are coordinated and committed to improving the skills of the next generation of talent, low enrollment in formal education and training at the upper secondary level, and high demand for more training from employers. Nepal has a relatively low enrollment rate in education and training and a large informal economy, its long history of formal, school-based TVET may reduce employer demand for new and improved education and training. For Chile and Costa Rica, more formal economies and high enrollment in formal education and training mean that those countries, like Nepal, need to integrate employers into their existing school-based education programs to achieve linkage. This may prove to be difficult where employment programs have been established with little to no employer input.

Education–employment linkage in TVET programs appears to be linked to better youth labor market outcomes and school-to-work transitions (Bulli et al. 2018). In most countries where education–employment linkage has been measured, the education system has most of the power and moving towards optimal linkage means giving employers more power. However, the results presented here demonstrate an alternative where movement instead goes from employment-system power towards including education-system actors to meet the demand for quality education and training.

Developing countries that do not have strong TVET systems but do have a strong demand for training from employers may be able to “skip ahead” by formalizing traditional non-formal apprenticeships into TVET programs. Those with established education systems may have to work harder to re-establish links to the employment system in TVET because young people are already enrolled in formal programs and employers expect education to provide skills they require for the labor market. When possible, the education-integration approach to increasing linkage by targeting employer-led programs is a major opportunity for low-income countries with large informal economies, low formal education and training rates, and demand for education and training among employers.

Limitations and Outlook

This study examines one TVET program in each country, not their education and training systems as a whole. Our sample is carefully targeted, selected with in-country experts, and has exceptionally high response rates thanks to embedded advocates and in-person survey methods when necessary. However, the sample of EELI studies is always necessarily small, because there are only a small number of TVET experts in any country who understand the system and the program well enough to respond to the survey. Therefore, results may be biased due to expert selection, non-response among the small fraction that did not answer the survey, and expert-level rather than ground-level perspectives.

Although the EELI allows us to closely examine the functions, processes, and dimensions of linkage, it does not assess the specific institutions involved in TVET. One crucial actor that may explain Benin's success at turning demand for training into a successful program is the industry association. Benin's existing non-formal apprenticeships already had an ecosystem that included informal industry associations for each occupation, ensuring some degree of consistency and quality in training regardless of formality. Without those associations, or when government institutions crowd out industry institutions by attempting to carry out their functions, it may be much more difficult to build a high-linkage TVET program. This institutional point of view may explain linkage differences across countries, but institutions are much more difficult to assess than equivalent functions. Future research is necessary to understand the institutions of TVET across contexts.

The EELI is a snapshot and describes the state of cooperation at the time of measurement. Therefore, it serves only as a diagnostic tool for reform leaders in order to obtain more effective clues as to which measures can be initiated in an evidence-based and targeted manner. Because any good reform plan is only effective if it succeeds in permanently installing social institutions (Renold et al. 2019), more research is necessary to understand those institutions. In developing contexts this research should be updated regularly to examine both the impact of previous linkage and scope for improvement. This paper may be considered the beginning of such a process for the four case study countries.

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Conflicts of Interest: The authors declare no conflict of interest.

Notes

- ¹ This project is part of an ongoing SNSF-funded *Research for Development* project. See <https://r4d.tvet4income.ethz.ch/> for more information.
- ² The individual features and processes are shown in Table 3.

- ³ Program summaries are based on the case studies collected with in-country researchers for Benin (Bankolé et al. 2019), Chile (Peralta Rojas et al. 2020), Costa Rica (Camacho Calvo et al. 2019), and Nepal (Baral et al. 2019). We also rely on Education Systems Factbooks (KOF 2015a, 2015b, 2015c, 2017) and data from international organizations like the World Bank and OECD. These summaries include a very short context overview, a description of the education system in general, and the general framework of the selected program in particular. We also discuss the governance and funding of the selected program.
- ⁴ The ILO (2009) created this category of workers to cover contract (own-account) workers and those people working for a family member of the same household, who generally do not have an official long-term working relationship or access to employment-related benefits. This is a particularly useful measure for countries with high levels of informal employment, as unemployment rates are less useful in these contexts.
- ⁵ See <http://www.tvetchile.org/wp-content/uploads/2018/03/Estrategia-Nacional-de-Formaci%C3%B3n-T%C3%A9cnica-Profesional-febrero-2018.pdf> (accessed on 15 June 2019).
- ⁶ See <http://ctevt.org.np/page.php?pagecat=7> (accessed on 15 June 2019).

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