De Economist (2025) 173:87–120
https://doi.org/10.1007/s10645-024-09442-6

ORIGINAL PAPER

Employment Effects of Skills Trainings in Sub-Saharan Africa: A Systematic Review of Recent Randomized Controlled Trials

Bernd Beber[1] · **Tabea Lakemann**[2,3] · **Regina Schnars**[2,3] · **Jann Lay**[2,3]

Accepted: 19 September 2024 / Published online: 8 October 2024

Abstract
This study provides a comprehensive systematic review of recent randomized controlled trials (RCTs) to evaluate the employment effects of skills training programs in sub-Saharan Africa. The review focuses on studies conducted between 2019 and 2024, a period marked by a significant increase in the number of RCTs of training interventions in this region, and we thus fill a gap left by earlier reviews that did not reflect this recent surge in experimental studies. We employ the standard SPIDER approach for defining search terms and the PRISMA procedure for search and selection to systematically analyze the impact of these training programs on employment outcomes. The findings reveal a shift towards a more optimistic assessment compared to previous analyses, suggesting that many recent skills training programs do contribute to improving employment-related outcomes.

Keywords Systematic review · Skills training · Randomized controlled trials · Sub-Saharan Africa

JEL Classification J24 · O15 · C93 · I25

1 Introduction

Skills trainings that target individuals or small businesses are an important element of contemporary development assistance, and they are a frequent feature of development cooperation in sub-Saharan Africa. The principal reason for this emphasis on skills development is the idea that a trained (and retrained) workforce is more

✉ Bernd Beber
bernd.beber@rwi-essen.de

[1] RWI – Leibniz Institute for Economic Research, Essen, Germany

[2] German Institute for Global and Area Studies (GIGA), Hamburg, Germany

[3] University of Göttingen, Göttingen, Germany

productive and can help developing countries compete and grow economically, especially in an era of constant technological change and an increasingly global market for labor.[1]

Despite their prominence in sub-Saharan Africa, skills trainings in this part of the world were rarely evaluated with randomized controlled trials (RCTs) even a decade ago, a fact noted and lamented by earlier systematic reviews. However, this has changed drastically in the last few years, and this systematic review serves to summarize key insights from these recent RCTs and identify study gaps that remain.

To our knowledge this is the first systematic review specifically of recent RCTs conducted in this research field in sub-Saharan Africa. We focus on studies published in the last half-decade, because several systematic reviews and meta-analyses were conducted in 2019 and before, prior to the recent surge in experimental studies implemented in sub-Saharan Africa. We will refer extensively to this prior literature throughout this article, highlighting differences and new directions.

This paper focuses on employment outcomes that could in principle be attributed to skills trainings and related development interventions, and hence speaks to Sustainable Development Goal (SDG) 8. SDG 8 aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. One way in which skills trainings are often seen as contributing to these objectives follows a straightforward logic: Trainings lead to more productivity, which leads to more growth and better jobs. But historically many trainings have not fulfilled this promise, and we suggest—as have other reviews—that high-quality and often multipronged programs that are responsive to market demand perform better. Unlike many previous reviews, we see signs for cautious optimism: Among recent rigorously evaluated trainings in sub-Saharan Africa, positive effects on employment-related outcomes are relatively common, perhaps in part because of differences and improvements in program siting, conception, and delivery. In this sense we believe our systematic review contributes to our understanding of how skills training can help fuel progress towards achieving SDG 8, in addition to earlier review studies.

Methodologically, we use two standard tools of systematic reviews: the SPIDER tool for defining search terms and the PRISMA procedure for search and selection. Our systematic search is conducted across three databases: Web of Science (WoS) and the Bielefeld Academic Search Engine (BASE) as principal sources, and Google Scholar as a supplementary source to ensure comprehensive coverage. The screening process resulted in the selection of 33 reports and peer-reviewed studies, covering research from fourteen countries within the region, from an initial pool of 2905 records.

We proceed as follows. We first briefly lay out the principal theory of change associated with training programs in the literature, in which the creation of human capital serves as the link between interventions and outcomes, and which requires high-quality programs, often with multiple components, and responsiveness to

[1] See e.g. the World Banks description of the objective of "jobs-rich economic growth" for its activities around skills and workforce development at https://www.worldbank.org/en/topic/skillsdevelopment.

market demands. We then turn to a description of the methodological approach we take in carrying out this systematic review of RCTs on skills training in sub-Saharan Africa. We present the results of the review, and summarize key insights, while linking back to prior literature and earlier reviews. Finally, we identify a set of research gaps that remain.

2 Demand-Responsive Human Capital Development

The primary way in which skills training programs tend to be linked to improvements in employment and job quality outcomes focuses on human capital development.

At the level of individual workers and potential employees, many programs aim to improve technical (hard) skills, which can be either general (e.g. literacy, basic quantitative or financial reasoning) or specialized (e.g. trade-specific competencies or knowledge concerning production processes). Many programs additionally or alternatively target life (soft) skills such as the ability to communicate effectively and work well with others.

At the entrepreneurial (or firm) level, programs similarly strive to improve technical capacity (e.g. accounting techniques, product development, or marketing) as well as process and soft skills (e.g. decision-making and effective team leadership).[2] A longstanding concern is that "managerial capital" is often missing in developing countries and that suboptimal business practices can help explain the productivity gap between poor and rich countries (Bloom et al., 2010), so this is where business training interventions try to make a difference.

Most trainings have traditionally been classroom-based, but innovation and pluralism in techniques characterize the field today. Today's training programs could feature visits by role models (Lafortune et al., 2018), peer learning (Dalton et al., 2019), or individual coaching sessions (Bardasi et al., 2021). But they all have in common that they claim to increase valuable human capital, which then affects employment-related indicators. In turn this implies a first expectation for effective training programs: They must be of sufficient quality and intensity for skills to be transferred to beneficiaries.

However, this is only the first step. For job outcomes to improve, transferred skills also must be valued in the labor market, and the value of newly created human capital often depends on the specific context in which beneficiaries find themselves. Hence, for interventions to work, implementers and participants must know local markets and respond to market demands in identifying value-generating training opportunities. Market awareness and demand-responsiveness are crucial drivers of program efficacy.

In fact, programs can have negative or no effects on economic outcomes even if they successfully and comprehensively transfer target skills to beneficiaries (e.g. Cho et al., 2013). This can be the case if the value of newly acquired skills fails to

[2] See McKenzie and Woodruff (2014) for an overview.

offset any earnings and career opportunities lost during the duration of the course itself, or if a course induces beneficiaries to switch into a sector that turns out to yield inferior earnings.[3] The latter can easily produce a situation in which a training program can be a success in terms of teaching skills while failing to create value for the individual participant.[4]

These requirements—high program quality and intensity for effective human capital development, and training content that is responsive to market demand—inform our reading of the literature summarized in this systematic review, and we return to this theme when we discuss the results of the included studies.[5]

3 Method

In order to conduct a systematic review of recent studies, we follow two standard sets of procedures: The SPIDER tool for the determination of search phrases (Cooke et al., 2012; Methley et al., 2014), and the PRISMA search and selection procedure for systematic reviews (Page et al., 2021).

The purpose of this paper's systematic search is to review recent randomized controlled trials of skills trainings on employment effects in sub-Sahara Africa, and we derive our search terms accordingly. First, we restrict the sample to the relevant set of countries. Second, the phenomenon of interest is any kind of training, skills development, or vocational education intervention. Third, we limit this search to study designs that are randomized controlled trials or field experiments. Fourth, we are only interested in studies where the outcomes to be evaluated are broadly related to employment. Fifth, we are interested in effects and estimates as the currency of the target research. Qualitative researchers typically use this last element of the SPIDER tool to declare their interest in "qualitative" work, but the alternative term "quantitative" would not ordinarily appear in RCTs, while "estimate" or "effect" would.

We restrict our search to the five-year period from January 1, 2019 to January 1, 2024. A set of well-known reviews was published in 2019 or in the immediately preceding years, with the dearth of RCTs in sub-Saharan Africa a key insight of those reviews. Since then, a substantial number of precisely such RCTs have been published, and we are setting out to review this body of work.

[3] This raises the question why individuals would join such a course or work in a job that matches their newly acquired skills in such a situation in the first place. One possibility is that potential beneficiaries are uncertain about the long-term returns to their labor market decisions and may defer to others such as training providers that they believe to be better-informed (Del Carpio and Guadalupe 2022).

[4] For example, Novella et al. (2018) analyze the Chilean Bono Trabajador Activo (BTA) voucher program, which funded training courses for formally employed individuals. They find that employment probabilities and formal-sector income are lower for those who enrolled in a training opportunity, even years later and especially for those who were willing to change sectors.

[5] Two secondary mechanisms linking skills trainings to employment outcomes that also feature in this literature and later in our review are certification and signaling, and access to formal and informal networks. Both can help beneficiaries be successful on the labor market, even without skills transfers. They generally still require market awareness to know what is needed to compete effectively in the labor market.

Table 1 summarizes the search logic. We deploy our SPIDER search in three engines, and in doing so follow the recommendations by Gusenbauer and Haddaway (2020). First, we use the Web of Science (WoS), which includes the Social Sciences Citation Index (SSCI) in its core collection.[6] Second, we use the Bielefeld Academic Search Engine (BASE).[7] Full-text searches in these two engines, WoS and BASE, are our principal means to identify citations.

Third, we use Google Scholar, as a supplementary source, given its very broad coverage. Google is not suitable as a principal source for the execution of our SPIDER search for two reasons. First, Google does not allow fully articulated Boolean logic, in particular nesting or multiple OR-groups between different AND operators.[8] Second, the extent of Google search results appears to vary with server load, and results are not exactly replicable. It is very unlikely that this would have resulted in a missed relevant article in our case, given that searches always returned results well in excess of those actually relevant, but it is a reason why Google Scholar is not suitable as the principal source for a systematic review.[9]

3.1 Eligibility Criteria

We include any English-language peer-reviewed article or non-refereed policy report or discussion paper in any kind of series, published between 2019 and 2024, that analyzes a randomized controlled trial of a skills development or training intervention aimed at changing employment-related outcomes in a sub-Saharan African country.

We exclude articles that focus on different primary outcomes, such as mental health indicators (Evans et al., 2022), antisocial behavior (Vicente & Vilela, 2022), women's empowerment (Karimli et al., 2021), or social inclusion (Kimou et al., 2022), if the paper does not also discuss employment outcomes. We also exclude studies that focus on lab-in-the-field outcomes (such as competitiveness in the case of Almås et al., 2020) if they do not report outcomes related to actual employment.

In general, our search terms cast a fairly wide net. We do not narrow our search to titles or abstracts or specific job-related outcomes such as income but identify any studies that refer to employment or the workplace anywhere in their full text. Skills

[6] We use the following advanced exact full-text search phrase, cycling through all applicable country names: ALL=("[country]" AND ("training" OR "skills development" OR "vocational education") AND ("randomized control*" OR "field experiment") AND ("employment" OR "job" OR "workplace") AND ("effect*" OR "estimate")).

[7] We use the following search term in BASE's full-text document search: "[country]" AND ("training" OR "skills development" OR "vocational education") AND ("randomized control*" OR "field experiment") AND ("employment" OR "job" OR "workplace") AND ("effect*" OR "estimate").

[8] For Google Scholar, we use the following alternative search term to produce a result that is reasonably specific while at the same time including all text segments shown in Table 1: "[country]" "training" "randomized control*" "employment" "effect*" intitle:"[country]" | intitle:"training" | intitle:"skills development" | intitle:"vocational education" | intitle:"randomized control*" | intitle:"field experiment" | intitle:"e mployment" | intitle:"job" | intitle:"workplace" | intitle:"effect*" | intitle:"estimate".

[9] Note that current Google Scholar searches do not appear to truncate searches at 256 characters, as is widely believed, so this is not an ongoing concern.

Table 1 SPIDER specification

SPIDER tool	Search terms
Sample	Angola OR Benin OR Botswana OR "Burkina Faso" OR Burundi OR Cameroon OR "Cape Verde" OR "Central African Republic" OR Chad OR Comoros OR Congo OR "Côte d'Ivoire" OR "Ivory Coast" OR Djibouti OR Eritrea OR Eswatini OR Swaziland OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR Kenya OR Lesotho OR Liberia OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Mozambique OR Namibia OR Niger OR Nigeria OR Rwanda OR "Sao Tome" OR Senegal OR Seychelles OR "Sierra Leone" OR Somalia OR "South Africa" OR "South Sudan" OR Sudan OR Tanzania OR Togo OR Uganda OR Zambia OR Zimbabwe
Phenomenon of **I**nterest	"training" OR "skills development" OR "vocational education"
Design	"randomized control*" OR "field experiment"
Evaluation	"employment" OR "job" OR "workplace"
Research Type	"effect*" OR "estimate"
SPIDER search: S AND P of I AND D AND E AND R[a]	

[a]While a typical SPIDER search will only require (D OR E), we require both D and E in order to limit searches to randomized controlled trials

trainings need not focus on technical skills, but can involve, e.g., soft skills such as self-efficacy or a "growth mindset" (Morris et al., 2023). We do require trainings to involve some kind of skill transfer, so exclude exercises like a "self-training intervention " (Demerouti, 2023). We also exclude "teaching" interventions if the treatment consists purely of an instance of information provision, such as a presentation of legal facts (Aberra & Chemin, 2023; Bertrand & Crépon, 2021).

3.2 Screening, Selection, and Cross-Verification

Figure 1 shows the PRISMA search procedure. We first retrieve 2905 records with the SPIDER-based electronic search.[10] These were screened based on their titles and abstracts / executive summaries to remove irrelevant or duplicate records.[11] A total of 44 articles were left and read in more detail, of which 28 studies matched the inclusion criteria and objectives of this review. This includes 17 peer-reviewed articles, and 11 discussion papers or technical reports.

[10] Google Scholar produced 2841, WoS 36, and BASE 28 records to be examined. This is not uncommon. Google Scholar is highly sensitive and inclusive but can lack precision and therefore requires more extensive manual filtering than WoS and BASE (Giustini and Kamel Boulos 2013).

[11] Records were retrieved and screened by one coauthor, screening results reviewed by a second coauthor, and each of the remaining full-text articles was inspected and assessed for eligibility by at least two coauthors.

Additionally, and to minimize the chance that we omit relevant studies that are insensitive to our search specification, we cross-verified our results against three related collections of studies, each of which partially overlaps with our review in temporal or thematic scope.[12] This process yielded six additional articles, as indicated in Fig. 1.

The final set of studies covers interventions in fourteen different countries: Uganda (7 studies), Rwanda (5), Tanzania (4), Ethiopia (4), Togo (2), Nigeria (2), Liberia (2), Côte d'Ivoire (1), Ghana (1), Kenya (1), Senegal (1), South Africa (1), Sierra Leone (1), and Mozambique (1).

Table 2 summarizes key features of the studies that meet our inclusion criteria and are RCTs of skills training interventions targeting employment outcomes in sub-Sahara Africa. We show key sample characteristics, a brief description of the intervention, summarize outcomes and main effects, and indicate heterogeneous effects that the study may report.

The included articles cover a wide range of programs and contexts, but with notable areas of concentration:

- *Regional distribution* Our list includes 21 studies that were implemented in East Africa, 10 in West Africa, 2 in Southern Africa, and none in any Central African countries—an obvious gap in the evidence base.
- *Target populations* Most commonly studies focus on youths (19 articles), and in particular youths that are described as disadvantaged in one form or another (10) and youths in urban areas only (8). A second large set of studies works with business owners/entrepreneurs or small- and medium-sized firms (13). Trainings for non-youth workers are rarely studied, as are trainings for individuals that are highly educated already (such as coding programs for university graduates).
- *Intervention types* Technical/vocational training programs (12 studies) or apprenticeship programs (3) are the modal intervention for youths and other workers, as are business trainings for entrepreneurs/firms (12). Life skills/soft skills modules feature in 13 studies, often in tandem with other training components. Other complementary elements such as cash grants (4), financial literacy courses (4), networking/mentorship opportunities (2), digital skills instruction (2), or job placement outside of apprenticeships (2) are relatively less common. Teacher trainings and instructions on collective bargaining/labor law are the focus of one study each.

[12] First, Kemper et al. (2022) review a total of 89 experimental and quasi-experimental studies on "vocational training" from 1990–2020, which overlaps in part with our temporal scope. We find that for sub-Saharan Africa and the relevant years 2019 and 2020, two articles are included in both their and our sets of studies, one study is included only in their review, and seven studies are included only in our search output, given our broader focus on skills trainings. Second, J-PAL (2023) provides an overview of 28 studies on apprenticeships and vocational training programs, six of which fall within our temporal and geographic scope, including three additional studies not yet included here (and again with a larger number of studies that we retrieved not included in the J-PAL overview). Third, we compare our list to relevant studies cited in Carranza and McKenzie (2024) recent overview article on job trainings in developing countries, which yielded one additional article to include, for a total of five additional studies.

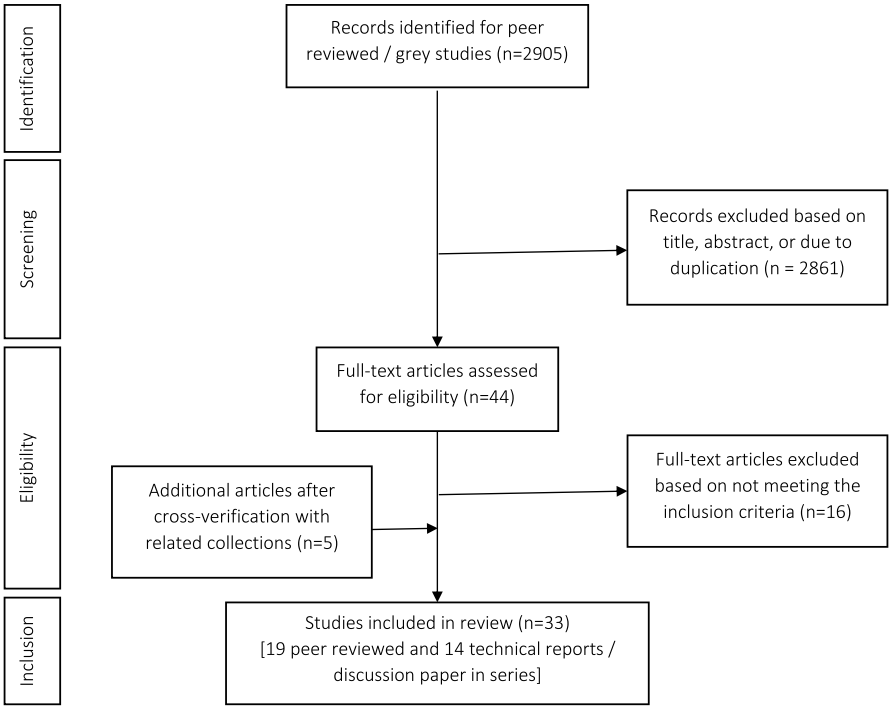

Fig. 1 PRISMA flowchart of search procedure

- *Study outcomes* Income/earnings are the most common metric of program effectiveness, together with participant's employment status and hours worked. These are followed by investments/savings/assets, entrepreneurship/self-employment, performance/productivity, life satisfaction/physical or psychosocial wellbeing, and aspirations/self-efficacy. Infrequently studied outcomes include job search behavior, consumption, fertility, and unionization levels. At the business level, studies tend to focus on revenue and profits, management practices, and firm survival. Notably few studies consider the number of workers employed by a business.

4 Empirical Evidence

4.1 Primary Results

We now turn to a description of effect estimates, first with an overall assessment, followed by a more detailed discussion of the intervention type that appears most promising—high-quality, multipronged programs that are responsive to local demand—and important effect heterogeneities. In each case, we will relate results from this

Table 2 Features of included studies

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Agarwal et al. (2023)	Tanzania	151 entrepreneurs in the agribusiness sector	Evidence-based training that emphasizes systematic testing versus theory-and-evidence-based training that encourages development of a theory-of-value to guide decision-making	Higher revenues and profits in the theory-and-evidence-based condition, no significant difference in terms of project termination rates	Effects for startups more significant than for established companies
Alcid et al. (2023)	Rwanda	400 underemployed youths, in two districts	Training including networking, mentorship, entrepreneurship, technical skills, and soft social skills	Short-term positive impacts on work readiness and networking, but not on employment status or income. No significant medium-term effects	None reported
Alfonsi et al. (2020)	Uganda	1714 disadvantaged men and women aged 18–25, and 1538 small- and medium-sized firms	Six months of vocational training or six months of firm-provided training, with firms randomly matched to workers	Large improvements in sector-specific skills and higher employment rates with both training types, but monthly earnings averaged across waves increased only with vocational training. Long-term benefits of vocational training attributed to certification effect	None reported
Allemand et al. (2023)	Senegal	386 workers employed by a company constructing an express train in Dakar	Two-hour in-person conscientiousness skills training, followed by eight weekly phone call reminders	Treated workers more likely to retain their job, with substantially higher monthly earnings	None reported

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Alzua et al. (2020)	Uganda	555 men and women aged 18–35 who own a business, across six Ugandan districts	Credit counseling and business management soft skills	Reduced demand for credit due to increased risk awareness, and significant increases in bank account ownership and asset investment	None reported
Anderson and McKenzie (2022)	Nigeria	753 SMEs in five targeted sectors that registered for the Growth and Employment Project (GEM)	Four types: Support for insourcing, outsourcing, business training, or consulting	Insourcing and outsourcing: Significant improvements in business practices, especially marketing and sales. Outsourcing: Increased sales and profits. Training: No significant impact on business practices or firm growth. Consulting: Improved business practices, weak effect on firm growth	None reported
Araar et al. (2019)	Ethiopia	1445 MSEs recruited from the Addis Ababa development bureau's database	Credit, business training, and a combination of both	Credit, business training, and their combination positively affect monthly revenue, with combination showing most significant impact	Effects driven by male-owned MSEs, none for women-owned MSEs

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Atkin et al. (2021)	Kenya	1115 individuals aged 18–35, proficient in English and with high school certificate, from low-income settlements in Nairobi	Classroom-based ten-day digital skills training program, or training program combined with formal job placement at a digital services provider	Training and job placement: Substantially higher earnings, lower unemployment, more savings, and increased life satisfaction compared to the control group. Training only: Slight initial negative impact on earnings and employment	Overall stronger positive effects for women, but men in training-only condition recover more quickly from initial negative effects
Bandiera et al. (2023)	Uganda	1400 disadvantaged youth applicants, 1281 firms in eight sectors in 15 urban labor markets	Six months of sector-specific vocational training, or vocational training combined with being matched to a firm, or matching only	Vocational training increased likelihood of employment, especially in regular jobs and advantageous sectors, raised earnings, and improved sorting into high-quality positions. Matching increased employment and self-employment, but when combined with vocational training, produced worse outcomes than training alone	Long-run labor outcome index shows no heterogeneity by cognitive ability or self-evaluation

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Bandiera et al. (2020)	Uganda	Nearly 5000 adolescent girls	Vocational training, and information on sex, reproduction, and marriage	Significant increase in economic empowerment, with more income-generating activities, and control over the body, with decreases in pregnancy, early marriage, and involuntary sex. Short-term but limited long-term effects on aspirations for gender roles and lifetime opportunities	Effects largely homogeneous, when estimating impacts for urban versus rural, rich versus poor, or older versus younger subjects
Bardasi et al. (2021)	Tanzania	821 female entrepreneurs	Basic training: In-class sessions on managerial, technical skills. Enhanced training added visits from coaches and individual support services	Basic training: No significant impact on business practices or performance. Enhanced training: Increased adoption of new business practices, no significant effect on average revenues or profits	Significant positive impacts on revenues and household assets for more experienced entrepreneurs. Revenue decreases after basic program in lowest quartile of experience
Beaman et al. (2021)	Liberia	2400 out-of-school youth aged 15–25 with limited formal work experience in Montserrado County	Mercy Corps's Sport for Change (SFC) program, which involved sports groups and a complementary life skills training curriculum	Significant positive effect on labor force index comprising labor supply and earnings. Limited evidence of effects on psychosocial outcomes	Higher labor benefits for more marginalized groups (young, uneducated, female, without vocational training)

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Bjorvatn et al. (2020)	Tanzania	Over 2000 students aged 15–25 at secondary schools in Dar es Salaam	Incentives to watch edutainment show focused on entrepreneurship, business skills, and financial literacy	Suggestive evidence of increased interest in entrepreneurship, no strong evidence of increased business ownership. Strong negative effect on educational outcomes (school performance and continuation rates)	Interest in entrepreneurship rises particularly among female students
Blattman et al. (2020)	Uganda	Long-term follow-up to a study with over 12,000 poor, young subjects in small towns and villages	One-time cash grants of $400 per person for training and assets to set up a skilled trades business	After nine years, little sustained effect on work hours or income, but lasting impacts on durable assets and skilled trades. No significant long-term effects on health, education, or fertility	No major heterogeneities
Blalock et al. (2022)	Ethiopia	95 under- or unemployed youths in southwestern city of Jimma recruited to collect animal bones	One-day entrepreneurship training program, with noted challenges concerning trial implementation	Increase in performance and worker participation in supply chain, with more purchases from non-permitted individuals, which is interpreted as an entrepreneurial response	None reported

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Blimpo and Pugatch (2021)	Rwanda	207 schools teaching a government upper secondary entrepreneurship course	Intensive teacher training, peer exchanges in each term, and biannual NGO support, compared to default government training	Increased active instruction by teachers, but no improvement in academic outcomes or skills. Increase in students' business participation, but no income effect and decline in wage employment	No major differences across genders. Student business involvement less responsive when teacher already qualified, more responsive for poor students
Brudevold-Newman and Ubfal (2023)	Rwanda	900 recent graduates from tertiary education	Two-week intensive soft skills training program focusing on effective communication, networking, interpersonal and intrapersonal skills	Significant short-term increases in employment, income, and hours. Diminishing effects over time. Persistent increase in job search and networking activities, but no significant impact on transitioning into formal employment	No significant gender differences
Carnicelli et al. (2022)	Mozambique	974 workers across 3 provinces in 251 unionized firms without prior training	Two-day training on labor law, recruiting new members, union organization, negotiation skills	Improved knowledge on covered topics, increased salaries and hours, reduced work without pay, no effect on unionization levels	None reported

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Chioda et al. (2021)	Uganda	4400 high school students at the end of secondary education, from 200 schools across Uganda	Hard-skills mini-MBA (ca. 75% hard skills, 25% soft skills), compared to soft skills program (ca. 25% hard skills, 75% soft skills), and control	Large increase in earnings for both types of trainings, higher likelihood of enterprise start and survival. Soft skills training linked to improvements in self-efficacy, persuasion, negotiation	None reported
Crawford et al. (2021)	Nigeria	About 4000 marginalized youths in the northern states of Kaduna, Kano, Katsina, and Jigawa	Mafita program, with either apprenticeships with master craft persons or vocational/technical training (including literacy, numeracy, and business-related soft skills trainings) at skills development centers	Apprenticeships: Increased self-employment, wage employment, business profits, attempts to start business, job search behavior, household assets, consumption. No significant effect on literacy, numeracy, or non-material outcomes. Skills development centers: Similar increases in employment, productivity, entrepreneurship behavior, consumption, household assets. No significant effect on literacy, numeracy. Mixed evidence on non-material outcomes, with higher subjective well-being, attitudes on female empowerment	For women, large increases in self-employment and income, and small increases in self-esteem, professional networks (for women in apprenticeships) or subjective well-being (for women in skills development centers)

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Crépon and Premand (2019)	Côte d'Ivoire	1842 youths aged 18–24 and 731 firms in seven urban areas	Formal apprenticeships with a monthly subsidy of 30,000 FCFA, dual training with on-the-job and theoretical components, and certification	Short-term effects on youths: No significant impact on total income, with decrease in labor earnings offset by subsidy. Medium-term effects on youths: Increase in total earnings, higher involvement in complex tasks, increased certification. Firm effects: Limited substitution, so subsidized formal apprentice implies ¾ of a new position	None reported
Dammert and Nansamba (2023)	Liberia	About 570 entrepreneurs with small businesses	Standard business training, interpersonal skills training, or both	Either training led to better customer service, improved business performance, fewer customers lost. No additional gains from combined training. No impact on customer satisfaction	None reported
Dimitriadis and Koning (2022)	Togo	About 300 entrepreneurs in Lomé, with businesses having been in operation for at least one year	Two-hour social skills training as part of a two-day marketing program	Increased monthly profits, value-generating partner interactions, collaborative perceptions, information exchange, relationships formed. Lower ethnic concentration in new relationships formed	None reported

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Hardy et al. (2019)	Ghana	3928 youth program applicants aged 15–30 across 32 districts and all regions	Access to apprenticeships with small informal sector firms in trades such as garment making, cosmetology, carpentry, welding, and masonry	Modest increases in probability of starting and completing an apprenticeship, in training durations, and in shifts from wage work to self-employment. No significant short-run increase in self-employment profits	Effects vary by gender and trade, e.g., women in cosmetology more responsive than men in construction. Higher earnings associated with more experienced or profitable trainers
Hirvonen et al. (2023)	Ethiopia	Beneficiaries of the Productive Safety Net Program (PSNP)	Graduation programming that includes financial literacy training, promotion of new income generation activities, nutrition interventions and consumption support	Not reported, focuses on effects conditional on drought	Program moderated drought effects, protected against nutritional deficits, with savings as mechanism
Lafortune et al. (2022)	Rwanda	Students at 159 high schools	Six-week gamified online entrepreneurship training	Significant increases in business ownership, participation in school business clubs, employment, earnings, and hours worked	Similar effects by gender, stronger effects for public schools

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
McIntosh and Zeitlin (2022)	Rwanda	1848 underemployed men and women aged 15–30 years in the districts of Rwamagana, Muhanga, and Nyamagabe	Workforce training program, cash transfers of varying amounts, or a combination of training and cash transfer	Training: Increased hours, assets, savings, subjective well-being, and business knowledge. Cost-equivalent cash: Also increased hours, assets, savings, subjective well-being, plus consumption, income, wealth. Minimal additional benefits with higher transfer amounts. Combined program: No compelling evidence of complementarity	Limited evidence of heterogeneity, and impacts largely similar across genders, baseline consumption levels, and local labor market conditions
Mensmann and Frese (2019)	Togo	912 non-agricultural entrepreneurs in Lomé, with fewer than 50 employees	Personal initiative training	Personal initiative increased post-training but decreased over time. No significant effect on well-being	Personal initiative gains over time contingent on "need for cognition"
Morris et al. (2023)	Tanzania	165 entrepreneurs, recruited through a government agency for entrepreneurship training	"Growth mindset" psychological training in addition to technical skills training, compared to technical skills training only	Growth mindset training resulted in significantly higher entrepreneurial self-efficacy and greater number of entrepreneurial actions	None reported
Nkonya et al. (2019)	Uganda	1235 individuals from farmer groups across 9 districts	Full- or half-dose of Creative Capacity Building (CCB) trainings, focused on harnessing indigenous knowledge in technology innovation processes	Training increased economic output and improved tool repair capacity, but no robust positive effect on household income and no effect on household assets	None reported

Table 2 (continued)

Reference	Country	Sample	Intervention	Outcomes and main effects	Heterogeneous effects
Rosas et al. (2022)	Sierra Leone	More than 3000 urban youths aged 15–35, with at least some secondary education	Technical/business skills training, in combination with cash injections	Improved employment and entrepreneurship opportunities, and protected household consumption and investments against the backdrop of the Ebola crisis	Positive entrepreneurship, labor impacts with high initial non-cognitive skills. Improved skills, consumption, but not savings with low non-cognitive skills
Tarekegne et al. (2023)	Ethiopia	440 smallholder farmers	Three-week training program focusing either on a high- or a low-intensity version of the Comprehensive Competence-Based Training (CCBT)	High-level training led to greater improvement in both competence development and agricultural performance, including higher yield gains	None reported
Wheeler et al. (2022)	South Africa	1638 young, disadvantaged individuals seeking work, recruited from existing job readiness programs in large South African cities	Four hours of LinkedIn training during their job readiness program	Significant increase in end-of-program employment rate, with effect persisting at least a year	Employment effect smaller for those who already had LinkedIn accounts, larger for those with low initial communication skills

current review back to insights from previous studies and meta-analyses.[13] Our core contributions vis-à-vis these other reviews are twofold: First, in terms of coverage, we summarize a set of recent RCTs that have not previously been reviewed systematically. Second, in terms of substantive insight, we find reason to be relatively more optimistic about the potential of skills trainings to contribute to SDG 8 objectives, with one possible explanation for this being differences and progress in program implementation, at least for trainings that fall within the scope of our review.

Effectiveness in recent skills training RCTs Overall, the studies summarized here appear notably more optimistic on average than prior meta-analyses have been. For eleven of the evaluations of technical/vocational training or apprenticeship programs for youths and other workers that are included here, we are able to see if they had a positive effect overall either on a measure of employment (broadly speaking, any measure of the extent or intensity of income-generating activities) or on a measure of income or both. Six of the eleven studies identify positive effects on both of these dimensions.[14] We see positive effects on one or the other dimension in four studies (Bandiera et al., 2020; Hardy et al., 2019; McIntosh & Zeitlin, 2022; Nkonya et al., 2019) and just one study without a positive effect on either of these particular outcome types (Alcid et al., 2023).

For business and entrepreneurship trainings, the picture that emerges is similarly encouraging. We can observe an overall effect on a measure of entrepreneurial activity or performance in ten studies, and we see seven of them report at least one relevant significant positive effect,[15] while three do not (Bardasi et al., 2021; Bjorvatn et al., 2020; Mensmann & Frese, 2019).

This promising summary of recent evaluations stands in contrast to a bleaker set of older results. Overall, those reviews found that the majority of stand-alone training programs appear to have weak or no average effects on employment and job quality outcomes (Betcherman et al., 2004; Card et al., 2011; Grimm & Paffhausen, 2015; J-PAL, 2017; McKenzie & Woodruff, 2014). Kluve et al., (2017, 2019) observed positive effects on employment rates or earnings in only about one in three youth employment programs. Blattman and Ralston (2015) concluded that perhaps development initiatives should shift from a focus on trainings to a focus on

[13] Previous reviews overlap but are not exactly congruent with each other or with our review in terms of their geographic scope, target populations, types of interventions, outcomes, and included study designs. For example, Kluve et al., (2017, 2019) cover 113 counterfactual impact evaluations of a wide range of employment programs, including skills training and entrepreneurship programs, for youths in both high- and low-income countries, with a focus on earnings and employment as principal outcomes. Cho and Honorati (2014) include 37 experimental or quasi-experimental studies of entrepreneurship programs, including technical skills trainings relevant for self-employment, for individuals in developing countries, with income/profits, labor market activities, and financial behavior and attitudes as outcomes. Grimm and Paffhausen (2015) consider 53 evaluation studies of entrepreneurship trainings and other interventions targeted at micro-entrepreneurs in LMICs, with employment as the principal outcome of interest. While common themes emerge, findings from any one review also reflect its scope.

[14] In this group, we place Crépon and Premand (2019), Alfonsi et al. (2020), Bandiera et al. (2023), Atkin et al. (2021), Crawford et al. (2021), and Rosas et al. (2022).

[15] Here we see Araar et al. (2019), Alzua et al. (2020), Chioda et al. (2021), Blalock et al. (2022), Dimitriadis and Koning (2022), Lafortune et al. (2022), Dammert and Nansamba (2023).

capital-intensive programs, whether in the form of cash transfers or small business loans.

Explanations for recent developments A decade ago, McKenzie and Woodruff (2014) cautioned that well-powered studies (with large enough samples and a sufficient number of participants) remained relatively rare at the time, especially in low-income contexts, so some of the shift toward detectably positive results could simply be the result of researcher-side improvements. But as Carranza and McKenzie (2024) recently pointed out, policy-side efforts have also been underway to improve training programs, "in part due to the evidence from the first waves of rigorous training evaluations". These efforts have largely taken two forms.

First, funders have worked to improve implementation quality and effective program intensity, for example through sustained monitoring of service providers and beneficiary progress and appropriately incentivized contracts with service providers that ensure dependable program delivery.[16]

These kinds of quality parameters are difficult to observe, but one helpful proxy for implementation intensity may be whether programs are designed to be multipronged, involving providers and beneficiaries in more than one type of programmatic interaction. And when we again look at the list of studies included in our review, we see that five of the six technical training or apprenticeship programs with positive effects on both a measure of employment and a measure of income are indeed multi-component interventions, combining technical trainings with cash grants or subsidies (Crépon & Premand, 2019; Rosas et al., 2022), soft skills coaching (Crawford et al., 2021), or job placement (Atkin et al., 2021), and so on.[17] In fact, the gloomy outlook of previous reviews concerned stand-along trainings in particular. Already then skills training had been successfully combined with placement services (Chakravarty et al., 2016) or formalization support (Benhassine et al., 2018), and some best-practice guides were recommending that training interventions should be multipronged if possible (Datta et al., 2018).

The second policy adjustment observed by Carranza and McKenzie (2024) and others is a turn toward "demand-driven" programs. This could mean the involvement of private sector firms at the curriculum development stage to ensure that training content is contextually suitable, or the addition of a program in a particular sector if a market study identifies an unmet demand for skilled labor in this area. Again, multipronged interventions may be the safest bet to achieve some degree of demand responsiveness, simply because *some* training element may turn out to be valued in the labor market—the buckshot logic of effective multicomponent skills trainings.

[16] Program intensity also depends on training durations (Escudero et al., 2019; McKenzie and Woodruff 2014), although duration effects may vary across contexts and program objectives. For example, Hirshleifer et al. (2014) suggest that for vocational training courses in Turkey longer programs have less impact on employment than shorter ones, perhaps because longer courses leave less time for job searches.

[17] We do not necessarily see that multicomponent treatments within the same program outperform results in a training-only condition (Bandiera et al., 2023; McIntosh and Zeitlin 2022), although it could be that a multicomponent design as such is an indicator of implementation (and implementer) intensity across conditions.

One point of confusion is that demand responsiveness generally entails the involvement of private sector firms and an interest in their needs but does not necessarily imply that market demand is in fact optimally met by having private sector firms engaged in program implementation. This may help explain why results for apprenticeship programs tend to be relatively mixed. Among the studies included in our review, Crépon and Premand (2019) show lasting positive effects of a dual apprenticeship program in Côte d'Ivoire, Crawford et al. (2021) find that those assigned to apprenticeships in a study in Nigeria are no better off than those trained—more cost-effectively—in skills development centers, and Hardy et al. (2019) sees a shift from wage work to self-employment among those assigned to apprenticeships, but with newly self-employed beneficiaries on average unable to realize enough profits to offset their lost wage income. Alfonsi et al. (2020) offer a particularly helpful illustration of how private sector involvement does not equate responsiveness to market demands. They assign youths to either vocational training or firm-provided training and find that both are effective vehicles for skills transfers. But only those assigned to vocational training saw sustained wage increases because they received *certified* skills. Here, firm-provided program implementation ran counter to actual market demand.[18]

4.2 Effect Heterogeneities

Frequently, studies report effect heterogeneities. We broadly highlight three factors: Macro-level economic conditions; poverty and disadvantage at the beneficiary level; and gender. One reason to focus on these three factors is that they may explain some portion of the discrepancy between pessimistic earlier reviews and the more hopeful results we have presented here. Broadly speaking, skills trainings tend to be more effective—and have historically been more effective—in less developed contexts, with poorer participants and female beneficiaries, a profile that the recent studies included in this review are more likely to fit than studies that informed earlier reviews, many of which were implemented in developed countries. While skills trainings have arguably gotten better about being implementation-intense and demand-responsive, we suspect this shift in who is being targeted is one reason for the distance between our summary of results and those of earlier systematic reviews.

Regional or country-specific economic conditions Historically reviews have shown that program effects vary with the development level of a country. Despite the generally moderate impacts, Kluve et al. (2017) find systematic evidence of larger training effects on employment and earnings outcomes in low- and middle-income countries than in high-income countries. In advanced economies, demand for skilled labor is high and cohorts are overall relatively well-educated to start with, so a limited-duration skills intervention targeting disadvantaged workers might not be enough to help them catch up with their peers.

[18] We see mixed evidence concerning apprenticeships in previous literature too. For example, Alzúa et al. (2016) report positive effects from a firm-linked training program in Argentina, while Cho et al. (2013) find no labor market impacts of an apprenticeship training program in Malawi.

Both within and between developing countries, the performance of training programs should vary with labor demand conditions and the extent to which programs' target skills match local market demand. Indeed, Ibarrarán et al. (2019) document greater returns to training investments in regions with higher demand for skilled labor in the case of a training program in the Dominican Republic. More generally, Escudero et al. (2019) find more pronounced positive effects of training programs on labor market outcomes in times of economic expansion in a meta-analysis of 296 impact evaluations of active labor market programs in Latin America and the Caribbean. An expanding, innovating economy often sees demand for skilled workers rise (Vivarelli, 2014).[19] We do not see any obvious pattern of this type emerging from our systematic review, but the number of RCTs is still small and effectively covers just a small and non-random subset of sub-Saharan Africa's many labor markets.

Beneficiary-level disadvantage and poverty Following a similar logic, prior reviews have suggested that program activities targeted at particularly disadvantaged, poor beneficiaries tend to produce the largest effects. Training interventions are often narrow in scope and duration, so they might not move the needle much for better-off individuals, but they can make a difference for those starting out with more limited skill sets. Abebe et al. (2017), for example, detect the most substantial effects of an intervention including a job application workshop and transport subsidies in Ethiopia among the most disadvantaged participants. In their meta-analysis of interventions in Latin America and the Caribbean, Escudero et al. (2019) find that training programs increase employment rates and earnings in particular when they explicitly target poor individuals. Kluve et al., (2017, 2019) also find that disadvantaged, low-income individuals benefit most in their meta-analysis of youth employment interventions. We also see these patterns in our systematic review (Beaman et al., 2021) but not nearly as commonly as one might expect. This could be a function of only a surprisingly small share of studies reporting heterogeneous effects of this kind to begin with.

Gender Heterogeneity by gender is by far the most commonly estimated and reported type of heterogeneous effect, in earlier studies and also in the set of RCTs in our systematic review. Earlier reviews indicated that, if anything and on average, women benefit slightly more from skills training than men. Escudero et al. (2019) find this divergence in their meta-analytic study of programs in Latin America and the Caribbean. Blattman and Ralston (2015) note that youth technical and vocational trainings seem to positively affect women but not men, although business skill programs appear to have similar effects for both. And Kluve et al. (2017) observe that effect sizes with respect to employment and earnings may be larger for young women than young men, but caution that this should not be taken to imply that programs targeting women will generally hold greater promise.

There is in fact tremendous variation in how gender interacts with interventions across studies, and the extent to which beneficiaries of one gender outperform others may be heavily dependent on context. In many earlier studies, women appear to be

[19] Hirshleifer et al. (2014) note that the links between contextual economic indicators—in their case regional unemployment rates—and demand for skilled labor can be ambiguous.

better served by a given intervention. For example, Chakravarty et al. (2016) show that women gained employment to a greater extent than men following a youth skills training and job placement program in Nepal, and Attanasio et al. (2011) find large effects on employment and earnings for women only after a training program in Colombia.[20] But in other studies, effects are observed for male but not female participants. Ibarrarán et al. (2019) find an effect of youth trainings on formal employment for men only in the Dominican Republic. So do Alzúa et al. (2016) for a vocational training program including skills training and private sector internships in Argentina as well as Hirshleifer et al. (2014) in the context of short-term vocational skills programs in Turkey, with the latter also reporting an effect for men only on hours worked. In Yemen, McKenzie et al. (2016) too find an effect of a short skills training and subsequent internship placement program on hours worked for men only.

In the studies included in our systematic review, heterogeneous effects across genders are relatively frequently reported, and here too women appear to benefit slightly more than men on average (Atkin et al., 2021, Crawford et al., 2021, and women in some trades in Hardy et al., 2019). However, counterexamples exist as well: Araar et al. (2019) shows that male-owned MSEs see greater revenue gains in an intervention featuring improved credit access and skills training for personnel.

The reason why women benefit more from training interventions in some contexts could be that they have more to gain, as they usually start out with worse outcomes than men. In other contexts, constraints may still be binding. Cho et al. (2013), for instance, suggest that female participants suffer disproportionately from credit constraints and external shocks (pregnancy, illness or injury in the household, other family obligations), which make sustained investments in their own human capital difficult. Even if an effect is present for both men and women, different mechanisms could be underpinning each. For example, Kugler et al. (2015), a study in Colombia, found that participants in a training course were more likely to be enrolled in tertiary education programs more than a decade later. For women, vocational training appears to have relaxed credit constraints. For men, training improved their field-specific understanding of the returns to tertiary education. Further untangling gender-specific mechanisms across contexts remains a task for future research.

[20] Note that Chakravarty et al. (2016) observe that effects on employment type, hours worked, and earnings did not differ across gender, and that the employment effect for women could be due to the fact that men started at a much higher level of employment and it was easier for women to make large marginal gains, or could stem from women's course choices as employment effects were primarily observed in traditionally female-dominated training fields. Attanasio et al. (2011) report no gender difference in program impact on rates of formal employment, but warn that the effect for men could be attributable to attrition bias.

5 Research Gaps

5.1 Understudied Low-Income Countries

Having summarized results from the studies in our review, we now turn to gaps that still exist. Perhaps most glaringly, prior reviews have struggled with the fact that the bulk of research on skills trainings studies interventions in developed or upper middle-income countries. Fewer training programs in low-income or lower middle-income countries have been rigorously evaluated, especially in Africa.[21] As we have documented in this systematic review, this has begun to change, and a slew of RCTs in sub-Saharan Africa has been published and more are in the pipeline.

However, some countries remain particularly understudied. Uganda, Tanzania, Ethiopia, and Rwanda alone account for a good bit more than half of the studies included in our systematic review. Some large countries such as the DR Congo are not represented at all, nor are any other countries in Central Africa. This evidence gap matters, because context matters for program efficacy (Quinn & Woodruff, 2019).

5.2 Comprehensive Measures of Job Quality

The development of comprehensive and context-sensitive measures of job quality remains one area of possible further consideration. Default models of what constitutes a good job in a rich-country context often do not apply. Employment, for example, is not a useful binary indicator in a place where many people are underemployed, lack sufficient cash income, must work for subsistence, and cannot afford the luxury of unemployment (Blattman & Ralston, 2015). Earnings from formal and informal work, hours worked and hours spent seeking work, types and variety of tasks completed, reported job satisfaction, workplace safety, health indicators and work-related injuries, time spent with family or household members, other family and household considerations such as food security and relatives' ability to access medical care or educational opportunities could all feature in a discussion of employment quality. Several of the studies included in the systematic review consider such outcomes (e.g., Beaman et al., 2021), and future studies could perhaps go even further and consistently conceive of job quality in broad, contextually appropriate ways.

5.3 Large-Firm Interventions

While there is a vast body of literature on the impacts of business and management trainings for microenterprises in developing countries, the evidence base becomes progressively thinner for larger firm sizes. This is also evident in the list of studies

[21] This is an issue not only concerning trainings in non-agricultural technical occupations, but also in the agricultural sector (Maïga et al., 2020).

included in the systematic review (Anderson & McKenzie, 2022; Araar et al., 2019; Dammert & Nansamba, 2023). Even studies that—according to their title—focus on small and medium-sized enterprises (SMEs) often have mainly micro-sized firms in their sample. This partly reflects the heavily skewed firm size distribution in developing countries, but the paucity of evidence on medium or even large enterprises also constitutes a genuine research gap. The appropriate type of intervention is closely linked to firm size, with larger, more complex firms requiring individual consulting and tailor-made strategies that take the whole firm or plant into account. As the findings of McKenzie and Woodruff (2015) illustrate, there is considerable scope for improving firm-level outcomes, with business practices having large effects on the productivity and profits in their sample of medium and large firms in developing economies. At the same time, there are very few studies of consulting interventions in medium and large enterprises, with Bruhn et al. (2018) for Mexico and Bloom et al., (2013, 2020) for India being notable exceptions.

This omission is particularly problematic from an employment perspective, as one might expect wage job creation to happen especially in medium and large enterprises. Studies focusing on microenterprises often do not consider employment creation explicitly or find no or very small effects (Anderson & McKenzie, 2022; Grimm & Paffhausen, 2015; McKenzie & Woodruff, 2014), as the scope of expansion is limited. The expected employment effects of business trainings/consulting in larger firms are not only positive, as the limited existing evidence illustrates. On the one hand, Bruhn et al. (2018), find positive, large and significant effects of consulting services on employment creation in their sample of micro, small and medium-sized enterprises. Bloom et al. (2013), on the other hand, find that while productivity rose, employment dropped in treatment plants due to the adoption of labor-saving technology. Anderson et al. (2016) provide some evidence on the link between training contents and employment effects, finding that a marketing curriculum leads to increases in sales and employment, whereas an accounting curriculum leads to cost savings. Their results underscore the importance of balancing the objectives of firm performance and job creation when designing interventions, which still requires an improved understanding of the mechanisms driving firm-level effects.

5.4 Mechanisms

Several studies included in the systematic review carefully engage with causal pathways (e.g., Hirvonen et al., 2023), but broadly speaking this set and also prior literature contains relatively little systematic evidence about the mechanisms that connect training programs with employment and job quality outcomes (Kluve et al., 2017). Many studies offer qualitative accounts that helpfully lay out the landscape of possible pathways, but few collect data on intermediate outcomes or try to quantitatively estimate the importance of these pathways. This also means that meta-analytic work on mechanisms is scarce.

Intermediate outcomes are often difficult to measure and mechanisms thus challenging to estimate. Some insights can be gleaned from thinking creatively about testable corollaries of different proposed mechanisms. For example, Alzúa (2016)

suggests that the temporal fragility of effects could hint at the underlying mechanism. Training that increases human capital, for example by transferring vocational skills and technical expertise, should put beneficiaries on a long-term trajectory of increased earnings and heightened employability. Conversely, effects might decay more rapidly for trainings—especially those administered in partnership with private companies—that affect employment by providing beneficiaries with informal or formal contacts that help them get a job.[22]

5.5 Dissipation Over Time

The effects of training interventions diminish over time. Few programs have sustained, long term effects. But the rates at which effects decay is highly uncertain and difficult to anticipate. We still lack a systematic understanding of the extent to which and the processes by way of which different types of effects wane over time (Grimm & Paffhausen, 2015).

Several studies included in the systematic review show that the time horizon is limited for the effects of many training programs, although some also find persistent effects (Brudevold-Newman & Ubfal, 2023; Wheeler et al., 2022). Persistence or the lack thereof has been a theme in many studies over the years. For example, an evaluation of labor market interventions that targeted young women in poor areas of Nairobi identified income effects that dissipated after a year (Brudevold-Newman et al., 2017). A study of a training program in Turkey estimated a three-year window for improvements in rates of formal employment (Hirshleifer et al., 2014). A vocational training program in Argentina substantially improved formal employment rates and earnings—carefully measured using administrative data—after 18 months, but no main effects could be detected after 33 months and after four years (Alzúa et al., 2016). In an analysis of thirteen different programs that recorded subjects' employment situation on an annual basis and of which twelve showed a positive effect after a year, Cummings and Bloom (2020) report that six increased earnings beyond the first and only four beyond the second year.

On the other hand, several other studies have identified long-run effects (Attanasio et al., 2015; Ibarrarán et al., 2019; Kugler et al., 2015). A Colombian voucher program enabling training access appears to have increased formal sector earnings by 35,000 Colombian pesos, or 14 percent, the probability of working in the formal sector by four percentage points and for a large firm by three percentage points, all up to ten years later (Attanasio et al., 2015), and a randomly assigned training program in the Dominican Republic continued to raise earnings six years after the fact (Ibarrarán et al., 2019).

Where a research gap remains is with respect to the question why and how some effects do not dissipate quickly over time, while many others do. What can explain different time horizons for different kinds of program effects?

[22] Depending on the context, one could also argue that network effects should outlast content effects. Our point is that researchers should try to develop testable implications of potential mechanisms.

5.6 Cost Effectiveness

Relative few of the studies included in the systematic review discuss cost effectiveness (e.g., Crawford et al., 2021). This reflects a challenge across many impact evaluations, which still address the cost effectiveness of interventions relatively infrequently. In 2007, one review found that only one in ten evaluations discussed cost effectiveness (Betcherman et al., 2007), but the issue persisted a decade on in Kluve et al. (2017) and continues to be an issue today. More studies are needed that compare the economic value generated by an intervention to the intervention's budgetary cost as well as its associated opportunity costs. In some cases, programs may yield returns in excess of their budget, but fail to outperform alternative interventions (e.g. cash grants to beneficiaries). At this time our understanding of how training programs perform in these comparisons remains limited.

5.7 Spillovers and General-Equilibrium Effects

Apart from their direct impact on beneficiaries, skills development programs may also affect non-beneficiaries indirectly, through spillover effects. Spillover effects can be positive, when skills learned during training are passed on to coworkers or family members benefit from income gains, or negative, for example when a business training leads entrepreneurs to expand their business and cause losses for their competitors. If a program is large and impactful enough, it may have general equilibrium effects and change outcomes for whole markets, for example when the availability of skilled employees attracts foreign investment. However, we do not see this issue much addressed in the studies included in the systematic review.

Spillovers and general equilibrium effects pose several analytical challenges: spillovers can sometimes be captured in an experimental setting but identifying program impacts becomes more complicated if control group outcomes are also affected by the program. Spillover effects on individuals outside the control group may go undetected. Ways to deal with possible spillover effects need to be considered explicitly in the experimental design. One way of doing so is to cluster treatments and ensure distance between treatment and control groups, another is to incorporate the possibility of measuring individual-level spillovers when planning an RCT. An example from Colombia is given by Kugler et al. (2015), who are able to show that vocational training boosts not only female participants' own rates of formal employment, but also those of their relatives. But analyses of spillovers do not appear to feature in current RCTs of skills trainings to the extent that one might expect.

6 Conclusion

This systematic review has provided three sets of insights concerning skills trainings in sub-Saharan Africa. We began by sketching out how skills training interventions and related support programs affect employment-related outcomes, with the

dominant theory being the creation of market-relevant human capital. We observed that market relevance of transferred skills is crucial and that we should not expect to observe program efficacy in the absence of local (or otherwise accessible) demand for upskilled labor. For skills trainings to contribute effectively to SDG 8, i.e. to positively influence productivity and hence jobs-rich growth, they need to be both of sufficient quality and intensity to engender human capital development as well as sufficiently responsive to market demand.

We then presented insights from a systematic review, conducted using standard SPIDER and PRISMA tools and processes, of skills training RCTs in sub-Saharan Africa. We also extensively linked these insights back to earlier literature and prior reviews and meta-analyses. We observe that results from recent RCTs in sub-Saharan Africa appear on average more optimistic about the potential efficacy of training interventions than prior reviews, which generally did not draw much on trials conducted in sub-Saharan Africa. We suspect that our more upbeat summary of results reflects to some extent a shift in who is being targeted with these programs, but perhaps (and hopefully) also some movement toward more demand-led, high-quality, and multipronged programs. Findings with respect to effect heterogeneity are more consistent with prior reviews, especially with respect to gender effects. In prior overviews, women have been seen as benefiting slightly more from training interventions on average, and a similar pattern appears to emerge in the set of recent RCTs that are the focus here.

Finally, the review identified several research gaps, including the need for more work in understudied regions and especially in Central Africa, given the concentration of RCTs in just a handful of countries. We outlined several ways in which future research can build on and extend existing work, with regards to measures of job quality, large-firm interventions, causal mechanisms, explanations for variation in effect dissipation over time, programs' cost effectiveness, and general equilibrium effects.

We conclude by noting that our review is limited in scope. We focus on RCTs in sub-Saharan Africa, a previously rare and hence salient study type, but this means that we do not discuss many other recent studies carried out in other geographic contexts or using different research designs. We also do not provide a formal meta-analytic synthesis of included studies or numerical summary of statistical estimates but focus on laying out the landscape of relevant studies as a first step. This is a limitation that future work may wish to address.

Acknowledgements The authors gratefully acknowledge funding from Germany's Federal Ministry for Economic Cooperation and Development (BMZ). This paper was written as part of the RéUsSITE project, which provides research support to the Ministry's Special Initiative Decent Work for a Just Transition (Invest for Jobs).

Funding Open Access funding enabled and organized by Projekt DEAL. This work was supported by the Federal Ministry for Economic Cooperation and Development (BMZ) of Germany (Forschungsvorhaben "Wissenschaftliche Begleitung und Erforschung der Wirkungen der Sonderinitiative Ausbildung und Beschäftigung").

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

References

Abebe, G., Caria, S., Fafchamps, M., Falco, P., Franklin, S., & Quinn, S. (2017). Anonymity or distance? Job search and labour market exclusion in a growing African City. *The Review of Economic Studies, 88*(3), 1279–1310.

Aberra, A., & Chemin, M. (2023). Know your rights! A field experiment on legal knowledge, property rights, and investment in Kenya. *The Journal of Law, Economics, and Organization,*. https://doi.org/10.1093/jleo/ewad020

Agarwal, R., Bacco, F., Camuffo, A., Coali, A., Gambardella, A., Msangi, H., Sonka, S. T., Temu, A., Waized, B., & Wormald, A. (2023). Does a theory-of-value add value? Evidence from a randomized control trial with tanzanian entrepreneurs. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4412041

Alcid, A., Bulte, E., Lensink, R., Sayinzoga, A., & Treurniet, M. (2023). Short- and medium-term impacts of employability training: Evidence from a randomised field experiment in Rwanda. *Journal of African Economies, 32*(3), 296–328.

Alfonsi, L., Bandiera, O., Bassi, V., Burgess, R., Rasul, I., Sulaiman, M., & Vitali, A. (2020). Tackling youth unemployment: Evidence from a labor market experiment in Uganda. *Econometrica, 88*(6), 2369–2414.

Allemand, M., Kirchberger, M., Milusheva, S., Newman, C., Roberts, B., & Thorne, V. (2023). *Conscientiousness and labor market returns: Evidence from a field experiment in West Africa*. World Bank. https://doi.org/10.1596/1813-9450-10378

Almås, I., Berge, L. I. O., Bjorvatn, K., Somville, V., & Tungodden, B. (2020). Adverse selection into competition: Evidence from a large-scale field experiment in Tanzania. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3696242

Alzúalaura, M., Cruces, G., & Lopez, C. (2016). Long-run effects of youth training programs: Experimental evidence from Argentina. *Economic Inquiry, 54*(4), 1839–1859.

Alzua, M. L., Baez, M. J., Galiwango, S., Joloba, D., Kachero, B., Lopera, M. A., Ssekandi, J., & Zigiti, Z. (2020). Beyond technical skills training: The impact of credit counseling on the entrepreneurial behavior of Ugandan youth. *Review of Development Economics, 24*(3), 750–765.

Anderson, S. J., Chandy, R., & Zia, B. (2016). *Pathways to profits: Identifying separate channels of small firm growth through business training*. World Bank.

Anderson, S. J., & McKenzie, D. (2022). Improving business practices and the boundary of the entrepreneur: A randomized experiment comparing training, consulting, insourcing, and outsourcing. *Journal of Political Economy, 130*(1), 157–209.

Araar, A., Awel, Y., Boka, J. B., Girma, H., Shafi, A., Yitbarek, E. A., & Zerihun, M. (2019). Impact of credit and training on enterprise performance: Evidence from urban Ethiopia. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3410577

Atkin, D., Schoar, A., & Wahnschafft, K. (2021). Evaluating Sama's training and job programs in Nairobi, Kenya.

Attanasio, O., Guarín, A., Medina, C., & Meghir, C., (2015). Long term impacts of vouchers for vocational training: Experimental evidence for Colombia. *NBER Working Paper Series*, Working Paper 21607, 1–38.

Attanasio, O., Kugler, A., & Meghir, C. (2011). Subsidizing vocational training for disadvantaged youth in Colombia: Evidence from a randomized trial. *American Economic Journal: Applied Economics, 3*(3), 188–220.

Bandiera, O., Bassi, V., Burgess, R., Sulaiman, M., Vitali, A., & Rasul, I. (2023). *The search for good jobs: Evidence from a six-year field experiment in Uganda*. National Bureau of Economic Research.

Bandiera, O., Buehren, N., Burgess, R., Goldstein, M., Gulesci, S., Rasul, I., & Sulaiman, M. (2020). Women's empowerment in action: Evidence from a randomized control trial in Africa. *American Economic Journal: Applied Economics, 12*(1), 210–259.

Bardasi, E., Gassier, M., Goldstein, M., & Holla, A. (2021). The profits of wisdom: The impact of a business support program in Tanzania. *The World Bank Economic Review, 35*(2), 328–347.

Beaman, L., Herskowitz, S., Keleher, N., & Magruder, J. (2021). Stay in the game: A randomized controlled trial of a sports and life skills program for vulnerable youth in Liberia. *Economic Development and Cultural Change, 70*(1), 129–158.

Benhassine, N., McKenzie, D., Pouliquen, V., & Santini, M. (2018). Does inducing informal firms to formalize make sense? Experimental evidence from Benin. *Journal of Public Economics, 157*, 1–14.

Bertrand, M., & Crépon, B. (2021). Teaching labor laws: Evidence from a randomized control trial in South Africa. *American Economic Journal: Applied Economics, 13*(4), 125–149.

Betcherman, G., Godfrey, M., Puerto, S., Rother, F., & Stavreska, A. (2007). *A review of interventions to support young workers: Findings of the youth employment inventory*. The World Bank.

Betcherman, G., Olivas, K., & Dar, A. (2004). *Impacts of active labor market programs: New evidence from evaluations with particular attention to developing and transition countries*. The World Bank.

Bjorvatn, K., Cappelen, A. W., Sekei, L. H., Sørensen, E. Ø., & Tungodden, B. (2020). Teaching through television: Experimental evidence on entrepreneurship education in Tanzania. *Management Science, 66*(6), 2308–2325.

Blalock, G., Nesin, B., & Simons, A. M. (2022). Developing sustainable supply chains: Evidence from entrepreneurship training in Ethiopia. *Africa Journal of Management, 8*(1), 36–58.

Blattman, C., Fiala, N., & Martinez, S. (2020). The long-term impacts of grants on poverty: Nine-year evidence from Uganda's youth opportunities program. *American Economic Review: Insights, 2*(3), 287–304.

Blattman, C., & Ralston, L. (2015). Generating employment in poor and fragile states: Evidence from labor market and entrepreneurship programs. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2622220

Blimpo, M. P., & Pugatch, T. (2021). Entrepreneurship education and teacher training in Rwanda. *Journal of Development Economics, 149*, 102583.

Bloom, N., Eifert, B., Mahajan, A., McKenzie, D., & Roberts, J. (2013). Does management matter? Evidence from India*. *The Quarterly Journal of Economics, 128*(1), 1–51.

Bloom, N., Mahajan, A., McKenzie, D., & Roberts, J. (2010). Why do firms in developing countries have low productivity? *American Economic Review, 100*(2), 619–623.

Bloom, N., Mahajan, A., McKenzie, D., & Roberts, J. (2020). Do management interventions last? Evidence from India. *American Economic Journal: Applied Economics, 12*(2), 198–219.

Brudevold-Newman, A. P., Honorati, M., Jakiela, P., & Ozier, O. (2017). *A firm of one's own: Experimental evidence on credit constraints and occupational choice*. World Bank.

Brudevold-Newman, A., & Ubfal, D. J. (2023). *Returns to soft skills training in Rwanda*. The World Bank.

Bruhn, M., Karlan, D., & Schoar, A. (2018). The impact of consulting services on small and medium enterprises: Evidence from a randomized trial in Mexico. *Journal of Political Economy, 126*(2), 53.

Card, D., Ibarrarán, P., Regalia, F., Rosas-Shady, D., & Soares, Y. (2011). The labor market impacts of youth training in the dominican republic. *Journal of Labor Economics, 29*(2), 267–300.

Carnicelli, L., Kosonen, T., & Pirttila, J. (2022). The impacts of union-led training on working conditions: Experimental evidence from Mozambique. *Policy Report*. https://doi.org/10.4419/96973254

Carranza, E., & McKenzie, D. (2024). Job training and job search assistance policies in developing countries. *Journal of Economic Perspectives, 38*(1), 221–244.

Chakravarty, S., Lundberg, M. K. A., Nikolov, P. V., & Zenker, J. (2016). *The role of training programs for youth employment in Nepal: Impact evaluation report on the employment fund*. World Bank.

Chioda, L., Contreras-Loya, D., Gertler, P., & Carney, D. (2021). *Making entrepreneurs: Returns to training youth in hard versus soft business skills*. National Bureau of Economic Research.
Cho, Y., & Honorati, M. (2014). Entrepreneurship programs in developing countries: A meta regression analysis. *Labour Economics, 28*, 110–130.
Cho, Y., Kalomba, D., Mobarak, A. M., & Orozco Olvera, V. H. (2013). *Gender differences in the effects of vocational training: Constraints on women and drop-out behavior*. World Bank.
Cooke, A., Smith, D., & Booth, A. (2012). Beyond PICO: The SPIDER tool for qualitative evidence synthesis. *Qualitative Health Research, 22*(10), 1435–1443.
Crawford, E., Crost, B., Dube, O., Ferrah, S., Holmlund, M., Khan, N., Mvukiyehe, E., and Umar, N. S., (2021). A way out? Evidence from two trials of the Mafita apprenticeship and community-based skills training programs in northern Nigeria. *World Bank, DIME Department, Endline Evaluation Report*.
Crépon, B., & Premand, P. (2019). Direct and indirect effects of subsidized dual apprenticeships. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3495770
Cummings, D., & Bloom, D. (2020). Can Subsidized Employment Programs Help Disadvantaged Job Seekers? A Synthesis of Findings from Evaluations of 13 Programs. Washington, DC: Office of Planning, Research, and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services, No. 2020–23.
Dalton, P. S., Rüschenpöhler, J., Uras, B., & Zia, B. (2019). *Learning to grow from peers: Experimental evidence from small retailers in Indonesia*. World Bank.
Dammert, A. C., & Nansamba, A. (2023). Skills training and business outcomes: Experimental evidence from Liberia. *World Development, 162*, 106120.
Datta, N., Assy, A. E., Buba, J., & Watson, S. M. (2018). *Integration: A new approach to youth employment programs—general guidelines for project teams*. World Bank.
Del Carpio, L., & Guadalupe, M. (2022). More women in tech? Evidence from a field experiment addressing social identity. *Management Science, 68*(5), 3196–3218.
Demerouti, E. (2023). Effective employee strategies for remote working: An online self-training intervention. *Journal of Vocational Behavior, 142*, 103857.
Dimitriadis, S., & Koning, R. (2022). Social skills improve business performance: Evidence from a randomized control trial with entrepreneurs in Togo. *Management Science, 68*(12), 8635–8657.
Escudero, V., Kluve, J., LópezMourelo, E., & Pignatti, C. (2019). Active labour market programmes in Latin America and the caribbean: Evidence from a meta-analysis. *The Journal of Development Studies, 55*(12), 2644–2661.
Evans, L., Lund, C., Massazza, A., Weir, H., & Fuhr, D. C. (2022). The impact of employment programs on common mental disorders: A systematic review. *International Journal of Social Psychiatry, 68*(7), 1315–1323.
Giustini, D., & Kamel Boulos, M. N., 2013. Google Scholar is not enough to be used alone for systematic reviews. *Online Journal of Public Health Informatics*, 5(2).
Grimm, M., & Paffhausen, A. L. (2015). Do interventions targeted at micro-entrepreneurs and small and medium-sized firms create jobs? A systematic review of the evidence for low and middle income countries. *Labour Economics, 32*, 67–85.
Gusenbauer, M., & Haddaway, N. R. (2020). Which academic search systems are suitable for systematic reviews or meta-analyses? Evaluating retrieval qualities of Google Scholar, PubMed, and 26 other resources. *Research Synthesis Methods, 11*(2), 181–217.
Hardy, M., Mbiti, I., McCasland, J., & Salcher, I. (2019). *The apprenticeship-to-work transition: Experimental evidence from Ghana*. World Bank Policy Research Working.
Hirshleifer, S., McKenzie, D., Almeida, R., & Ridao-Cano, C. (2014). The impact of vocational training for the unemployed: Experimental evidence from Turkey. *The Economic Journal, 126*(597), 2115–2146.
Hirvonen, K., Gilligan, D. O., Leight, J., Tambet, H., & Villa, V. (2023). *Do ultra-poor graduation programs build resilience against droughts? Evidence from rural Ethiopia*. International Food Policy Research Institute.
Ibarrarán, P., Kluve, J., Ripani, L., & Rosas Shady, D. (2019). Experimental evidence on the long-term effects of a youth training program. *ILR Review, 72*(1), 185–222.
J-PAL. (2017). *Skills training programs*. Abdul Latif Jameel Poverty Action Lab.
J-PAL. (2023). Vocational and skills training programs to improve labor market outcomes.

Karimli, L., Lecoutere, E., Wells, C. R., & Ismayilova, L. (2021). More assets, more decision-making power? Mediation model in a cluster-randomized controlled trial evaluating the effect of the graduation program on women's empowerment in Burkina Faso. *World Development, 137*, 105159.

Kemper, J., Stöterau, J., & Ghisletta, A. (2022). The Impact of Vocational Training Interventions on Youth Labor Market Outcomes: A Meta-Analysis. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4217580

Kimou, A. J. C., Ahoure, A., Djebbari, H., & Becho, I., (2022). Soft skills training and social inclusion of vulnerable youth in post-conflict Côte d'Ivoire: Evidence from a randomized control trial.

Kluve, J., Puerto, S., Robalino, D., Romero, J. M., Rother, F., Stöterau, J., Weidenkaff, F., & Witte, M. (2017). Interventions to improve the labour market outcomes of youth: A systematic review of training, entrepreneurship promotion, employment services and subsidized employment interventions. *Campbell Systematic Reviews, 13*(1), 1.

Kluve, J., Puerto, S., Robalino, D., Romero, J. M., Rother, F., Stöterau, J., Weidenkaff, F., & Witte, M. (2019). Do youth employment programs improve labor market outcomes? A quantitative review. *World Development, 114*, 237–253.

Kugler, A., Kugler, M., Saavedra, J., & Prada, L. O. H. (2015). *Long-term educational consequences of vocational training in Colombia: Impacts on young trainees and their relatives*. National Bureau of Economic Research.

Lafortune, J., Pugatch, T., & Ubfal, J. T. D. (2022). Can interactive online training make high school students more entrepreneurial? Experimental evidence from Rwanda. *IZA DP No. 15064*.

Lafortune, J., Riutort, J., & Tessada, J. (2018). Role models or individual consulting: The impact of personalizing micro-entrepreneurship training. *American Economic Journal: Applied Economics, 10*(4), 222–245.

Maïga, W. H. E., Porgo, M., Zahonogo, P., Amegnaglo, C. J., Coulibaly, D. A., Flynn, J., Seogo, W., Traoré, S., Kelly, J. A., & Chimwaza, G. (2020). A systematic review of employment outcomes from youth skills training programmes in agriculture in low- and middle-income countries. *Nature Food, 1*(10), 605–619.

McIntosh, C., & Zeitlin, A. (2022). Using household grants to benchmark the cost effectiveness of a USAID workforce readiness program. *Journal of Development Economics, 157*, 102875.

McKenzie, D., Assaf, N., & Cusolito, A. P. (2016). The demand for, and impact of, youth internships: evidence from a randomized experiment in Yemen. *IZA Journal of Labor & Development*. https://doi.org/10.1186/s40175-016-0048-8

McKenzie, D., & Woodruff, C. (2014). What are we learning from business training and entrepreneurship evaluations around the developing world? *The World Bank Research Observer, 29*(1), 48–82.

McKenzie, D., & Woodruff, C. (2015). *Business practices in small firms in developing countries*. National Bureau of Economic Research.

Mensmann, M., & Frese, M. (2019). Who stays proactive after entrepreneurship training? Need for cognition, personal initiative maintenance, and well-being. *Journal of Organizational Behavior, 40*(1), 20–37.

Methley, A. M., Campbell, S., Chew-Graham, C., McNally, R., & Cheraghi-Sohi, S. (2014). PICO, PICOS and SPIDER: A comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. *BMC Health Services Research, 14*(1), 579.

Morris, S., Carlos, C., Kistruck, G. M., Lount, R. B., & Thomas, T. E. (2023). The impact of growth mindset training on entrepreneurial action among necessity entrepreneurs: Evidence from a randomized control trial. *Strategic Entrepreneurship Journal, 17*(3), 671–692.

Nkonya, E., Bashaasha, B., Kato, E., Bagamba, F., & Danet, M. (2019). Impact of creative capacity building of local innovators and communities on income, welfare and attitudes in Uganda: a cluster randomized control trial approach. 3ie Grantee Final Report.

Novella, R., Rucci, G., Vazquez, C., & Kaplan, D. S. (2018). Training vouchers and labour market outcomes in Chile. *Labour, 32*(2), 243–260.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J.M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P., & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *The BMJ, 372*, n71.

Quinn, S., & Woodruff, C. (2019). Experiments and entrepreneurship in developing countries. *Annual Review of Economics, 11*(1), 225–248.

Rosas, N., Acevedo, M. C., & Zaldivar, S. (2022). Starting points matter: Cash plus training effects on youth entrepreneurship, skills, and resilience during an epidemic. *World Development, 149*, 105698.

Tarekegne, C., Wesselink, R., Biemans, H. J. A., & Mulder, M. (2023). The effects of comprehensive competence-based training on competence development and performance improvement of smallholder farmers: An Ethiopian case study. *International Journal of Training and Development., 28*, 119.

Vicente, P. C., & Vilela, I. (2022). Preventing Islamic radicalization: Experimental evidence on antisocial behavior. *Journal of Comparative Economics, 50*(2), 474–485.

Vivarelli, M. (2014). Innovation, employment and skills in advanced and developing countries: A survey of economic literature. *Journal of Economic Issues, 48*(1), 123–154.

Wheeler, L., Garlick, R., Johnson, E., Shaw, P., & Gargano, M. (2022). LinkedIn(to) job opportunities: Experimental evidence from job readiness training. *American Economic Journal: Applied Economics, 14*(2), 101–125.