In this paper, we employ apprentice-firm survey data collected in Bénin in two waves (baseline in 2019 and endline in 2021) for 427 apprentices training in 197 firms to analyze the impact of a national dual system training program on participating apprentices and firms. The program offered youth in select trades the opportunity to attend classroom training at a local training center once a week while continuing with their traditional in-firm apprenticeship training with an MC. Youth and firms were interviewed before the onset of training and after three years (somewhat shorter than the typical duration of an apprenticeship). We use a sector-specific skills test to compare the learning outcomes of dual system apprentices to unsuccessful program applicants and non-applicants (with both comparison groups pursuing traditional apprenticeships at the same firms as dual-system participants). We also estimate the marginal effect of apprentice participation in dual system training on firm size and profits.

Studies of vocational training interventions combining on-the-job and classroom teaching in middle-income countries have reported generally persistent if modest increases in earnings and mixed impacts on employment [@card2011; @attanasio2011; ibarraran2014; @alzua2016; @attanasio2017; @ibarraran2019], though similar interventions in LICs have been characterized by low take-up, high dropout, and low efficacy (see @blattman2015; @tripney2013; @ghisletta2021 for an overview). These programs tend to be shorter (several months, rather than years) and focus on employment in the formal sector.

To our knowledge, only one paper has addressed dual-system training in Sub-Saharan Africa. In a randomized experiment in Côte d'Ivoire, @crepon2019 find that youth offered a stipend for an apprenticeship that combined 12 to 24 months of on-the-job training with theoretical classes at local training institutions earn 15 percent more after three years, partake in more complex and non-routine tasks, and receive training certification at a higher rate than non-treated youth. We study a similarly structured program, but one that is about twice as long and does not involve any direct subsidies or eliminate fees.

A related literature addresses the profitability of dual-system apprenticeships for the employer through a detailed accounting of the costs and benefits of training. A number of such studies have been conducted in the European context with the aid of surveys and simulations [see @muehlemann2014; @muhlemann2016; and @muhlemann2019 for a review], but have only recently begun to generate interest in lower-middle and low-income countries. Examples include @bolli2021, who find that training costs outweigh benefits in Serbia, with larger firms suffering smaller losses, and @bolli2020, who show that training firms in Nepal generally profit from training, with little variation across firm size. To our knowledge, ours is the first rigorous cost-benefit study of dual-system training conducted in SSA.

We also contribute to the literature on informal apprenticeship in SSA as such, considering impacts on both apprentices and firms. Though traditional apprenticeships are very common in West Africa [@adams2013; @filmer2014; @walther2011], there is limited direct empirical evidence on their impact on labor market outcomes. Long-term returns to informal training are heterogenous, but appears to benefit youth with lower levels of education the most [@monk2008]. Skills acquired in informal training tend to be firm-specific, and thus more likely to lead to self-employment than to quick career progression in the formal sector than formal schooling [@frazer2006; @hardy2019; @alfonsi2020].

. Many informal trainees start their own microbusiness rather than entering the formal labor market.

impact of training on informal firms. Informal firms randomly assigned apprentices have been shown to grow in size and profitability; wage increases within manufacturing firms have also been shown to coincide with spells of training (@rosholm), especially for larger firms. As @crepon did not look at impact on firm size or profits, this study is the first to look at dual training from this perspective.

study a program in Côte d'Ivoire that offered a stipend to youth to participate in a 12-24 month long dual apprenticeship --- also eliminating all training fees. They find that, about two years after graduation, dual apprentices partake in more complex, non-routine tasks than traditional apprentices and have 15 percent higher earnings.

Experimental evidence shows that dual training increases the spectrum and complexity of tasks undertaken by apprentices. Another study shows that human capital gains are similar informal in-firm training and formal TVET, and persisted at least two to three years after graduation.

Few studies have focused on the details of the financial arrangements between traditional apprentices and firms, despite some authors suggesting that training fees may be a substantial source of financing for some firms [@velenchikApprenticeshipContractsSmall1995, @frazer2006]. @velenchikApprenticeshipContractsSmall1995 studies the structure of apprenticeship contracts in small informal firms in Ghana, and identifies three dominant transactions between apprentice and firm --- apprentice wages, fees and allowances --- and distinguishes between two broad types of contracts, with and without training fees. She finds that firms that do not charge fees are smaller and tend to offer more specific training. Frazer and Valenchik surmise that fees are a form of informal financing, but do not estimate the costs of allowances (provision of basic living expenses of the apprentice) or training equipment. This study allows us to estimate the size of costs and benefits in relation to each other and to overall firm profits (i.e. the importance of apprenticeship training in relation to all firm activities).

Finally, we contribute to the literature on the CQP program in Benin: the history of dual apprenticeship in Benin by @davodoun2011, an audit and critical appraisal of the CQP by @david-gnahoui2017, and a sociological study of the relationship of CQP stakeholders by @bankole2020.