Labor Market Effects of a Dual-VET Apprenticeship
Evidence from Nepal

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Thomas Bolli, Patrick McDonald[1], Ursula Renold[2]

Abstract

This paper analyzes the labor market effects of a Dual-VET Apprenticeship pilot in Nepal. The formal upper secondary education program usually lasts for two years. The program started in the end of 2019. It ended in spring 2022 after being heavily affected by COVID-19. We analyze labor market outcomes in 2023 and 2024 based on structured phone surveys among applicants of the program. We address endogeneity based on randomization of applicants and discontinuity in application test scores. A large share of non-apprentices enrolls in general upper secondary and tertiary education. Hence, our estimations contrast the program to a control group with relatively high educational attainment. OLS results suggest that the program tends to increase work propensity. Due to missing tertiary vocational education in Nepal, the enrollment of non-apprentices in general education further mean that the program tends to decrease education propensity according to OLS results. However, these results do not hold in quasi-experimental estimates.

Keywords: Dual VET-Apprenticeship, RCT, RDD, Labor Market, Nepal

JEL: I21, I26, J24

Financing and Ethical Approval

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1   Introduction

Dual VET represents an important policy topic around the world. While vocational education in general is seen as a way to improve labour market outcomes, dual VET – programs with a considerable amount of workplace learning – is particularly effective at improving outcomes (Bolli et al. 2021). Moreover, VET is identified as an effective contributor to economic development and driver of youth labour market participation in low- and middle-income countries (Ghisletta et al., 2020, Mouzakitis 2010, Nilsson 2010, Tabbron and Yang 1997).

In this context, this paper analyses the impact of the Dual VET-Apprenticeship program of the Enhanced Skills for Sustainable and Rewarding Employment (ENSSURE) project in Nepal. These Dual VET-Apprenticeships last 24 months, beginning with three months of classroom learning, followed by 20 months that mix four to five days of workplace training each week with one day of classroom instruction per week. The program concludes with a month of classroom learning and final exams. Successful completion of the Dual VET-Apprenticeship results in a certificate equivalent to the Pre-Diploma under Nepal's Vocational Qualification Framework (NVQF, 2024). The analyzed cohort consists of 880 apprentices starting in November 2019 in five occupations: mechanical engineering, electrical engineering, hotel management, information technology (IT), and automotive engineering.

Both cohorts were impacted by the COVID-19 pandemic (Sharma et al., 2021), resulting in substantial disruptions to classroom and workplace training, as well as postponed final exams and graduations.

This paper analyses the impact of the Dual VET-Apprenticeship on labour market outcomes. Thereby, it contributes to the scant literature on the causal effect of apprenticeships in developing countries (Cho et al., 2013, McKenzie and Woodruff, 2014, Blattman and Ralston, 2015, Crépon and Premand, 2018, Hardy et al., 2019).

This paper uses two identification strategies to analyse the impact of the Dual VET-Apprenticeship on labour market outcomes. First, we randomize applicants in some schools. Second, we employ a regression discontinuity design based on the results of the entry examination. However, our identification strategies suffers from imperfect compliance in the beginning of the program that is amplified by a high dropout rate (36%) and the failure rate in the final examination (11%). Hence, the power of particularly the RCT is very limited.The OLS results suggest that the program tends to increase work propensity but tends to decrease education propensity. The latter finding highlights that a lack of permeability for Dual VET-Apprentices in Nepal represents a challenge. Therefore, improving access to general education and creating attractive opportunities of tertiary vocational education and training might improve the attractiveness of the program (Caves and McDonald, 2024). A substantial portion of non-apprentices enroll in general upper secondary high schools and bachelor studies.

The education activities also need to be considered in the interpretation of our results (Bolli-Kemper et al., 2024). We contrast the labor market outcomes of apprentices to non-apprentices, who often have enrolled in general upper secondary and tertiary education. This might explain why we find little evidence that labor market outcomes differ in terms of underemployment, formal employment, permanent employment, firm size and work happiness. Furthermore, the program might decrease income, which might be due to decreasing access to government employment as the latter positions depends on academic degrees. However, these results do not hold in quasi-experimental estimates.

The paper proceeds as follows. Section two provides an overview of the Nepali education system, the ENSSURE Dual VET-Apprenticeship program and the randomization process. Sections three and four describe the data and the methodology. Section five presents the results, which we discuss and conclude in section six.

2   Literature Review

2.1   Vocational education and dual VET

Vocational education and training (VET) is characterized by a focus on developing practical skills, usually within the scope of defined occupations (Billett, 2011, Moodie, 2002). Students or trainees learn competencies and specific tasks that allow them to move into the workforce. VET can be school-based, workplace-based, or dual, with a combination of school classes and workplace training.

Individuals benefit from VET through skills development and a better preparation for the workforce, but also because employers are aware of their skills (Müller & Gangl, 2003 Shavit & Müller, 1998). Vocational education provides access to careers with comparatively high incomes and high income certainty (Tuor and Backes-Gellner, 2010). It also ensures a smooth start to the career by facilitating the transition from education to employment (Korber & Oesch, 2019). This is a particularly important advantage, since early-career interruptions have a strong scarring effect on later career outcomes (Schmillen & Umkehrer, 2017). Further empirical research suggests that at the lower end of the wage distribution, VET is especially effective in securing higher income (Balestra & Backes-Gellner, 2017).

The benefits of vocational education are not consistent across the mode of instruction, with empirical evidence suggesting they are concentrated within dual VET. Indeed, many of the findings shown above come from analyses of dual VET programs (Backes-Gellner, 2021). A causal analysis by Bolli et al. (2021) further demonstrates that while dual VET leads to positive outcomes on a series of labor market outcome variables in terms of labor market integration (unemployment and inactivity rates) and job quality (full time contracts, part-time work, skills mismatch, and earnings). On the other hand, school-based VET has no impact on any of these indicators.

Dual VET may furthermore provide benefits for education and employment systems overall. Since it shifts a large amount of practical training to the workplace, dual VET may be a less expensive option for education departments (Hanhart & Bossio, 1998). Provided the conditions are set correctly, dual VET may generate a net benefit for the companies that participate (Mühlemann et al., 2007), though Wolter and Ryan (2011) note that there is no "secret recipe" for a profitable Dual VET program. In Nepal, the program in question in this study has been shown to generate a large net benefit for the median participating company (Renold et al., 2024a).

2.2   VET in low-income contexts

Until recently, most studies on VET had taken place in higher-income countries. Understanding the impact of VET programs in low-income contexts is nevertheless an important goal to pursue. By virtue of less-formal labor markets and different demographic profiles, simply extrapolating findings from high-income countries is insufficient (Kudrzycki et al., 2020). Moreover, in many cases, low-income countries grapple with brain drain of qualified workers, which warps the incentives of government investment in education (Docquier et al., 2007).

The empirical studies that do exist on the impact of VET in low-income countries do suggest that VET has a positive impact on labor market outcomes, where programs are large enough to be impactful, and where programs are kept up-to-date with changing labor market demands. Examples of programs that do not fulfil these requirements come from India, where VET is largely informal and not monitored to ensure that the needs of employers are met. Indeed, analysis by Zimmermann et al. (2013) suggests that only 8% of Indian youth receive some kind of vocational training, mostly non-formal or informal, and that this training does not have any impact on their engagement in formal or informal work. Even though the modernization of the formal VET system was in the political focus in the last 20 years and a lot of initiatives were launched, it remains a challenge for India to formally educate its next generation of talents in VET (Pilz & Regel, 2021).

A counterexample from Benin suggests that VET can function in informal contexts, provided it is in some way officially recognized. The Certificat de Qualification Professionnelle (CQP) program in Benin combines traditional informal apprenticeships with a day in school, leading to a formal certification. In this context, program participation is associated with higher life satisfaction, better living conditions and greater career aspiration than for individuals who are employed or out-of-work, and similar to those who are in regular school (Kudrzycki et al., 2020). Involving the government and employer groups in program oversight may lead to these better outcomes (Nouatin, 2021).

Finally, two meta-analyses, by Ghisletta et al. (2020), and Bolli-Kemper et al. (2024) summarize causal evidence on VET interventions. The former focuses on non-formal programs. Though not exclusively covering low- or middle-income contexts, the majority of the cases in this sample come from such regions. The analysis finds that such interventions have strong positive impacts on both labor market attachment and income. Furthermore, in line with Bolli et al. (2021)'s findings, the impacts are greatest for dual programs. Bolli-Kemper et al. (2024) focuses on formal programs, which are more widespread in high-income economies (mostly US community colleges) than low- and middle-income, but does contain studies from countries with similar economic profiles to Nepal's, notably including 5 programs in Asia. Overall, the meta-analysis finds only very small effects of vocational education on labor market outcomes, which diminish over time. These impacts are concentrated in increased labor market participation, with no effect on income. However, and relevantly for this analysis, effects where the control group is "unrestricted" – that is, non-treated individuals may be in employment or any other education program – is higher than for the overall sample.

In sum, while vocational education is generally seen as beneficial for youth and companies specifically and the labor market in general, causal analysis on these topics is patchy. Where it exists, it suggests mild-to-moderate outcomes, with dual VET having the greatest impact for both graduates and companies. With this in mind, we also expect our causal analysis of the ENSSURE project to show mild-to-moderate outcomes for its graduates.

3 Randomized Control Trial

3.1 Education System Nepal

Figure 1 provides a simplified illustration of the Nepali education system. Secondary education in Nepal is divided into two parts. After the successful completion of the upper basic level, students are eligible to enter the lower secondary level at age 13. Secondary education in Nepal is free but not compulsory. Secondary education is divided into lower and upper secondary education. The lower secondary education consists of two years split into grades 9 and 10. At the end of grade 10, nationwide examinations are held (Comfort & Karkee, 2016). Students who pass grade 10 receive a Secondary

Education Examination (SEE) certificate. After passing the nationwide examinations at the end of grade 10, students face two distinct options:

1) Attending upper secondary education at an **academic high school** consisting of grades 11 and 12: Nationwide examinations are held at the end of grades 11 and 12. After the exams, students receive the school leaving exam (SLC) certificate. The school leaving exam provides access to general tertiary education that starts with Bachelor studies.
2) Entering **Technical and Vocational Education (TVET)**: Generally, the students study for 1.5 years after passing the SEE to obtain a pre-diploma or for 3 years to receive a diploma. The Council for Technical Education and Vocational (CTEVT) is responsible for conducting nationwide examinations. TVET on tertiary level does not exist and pathways from TVET into general education are absent.

Figure 1: Formal Education System of Nepal
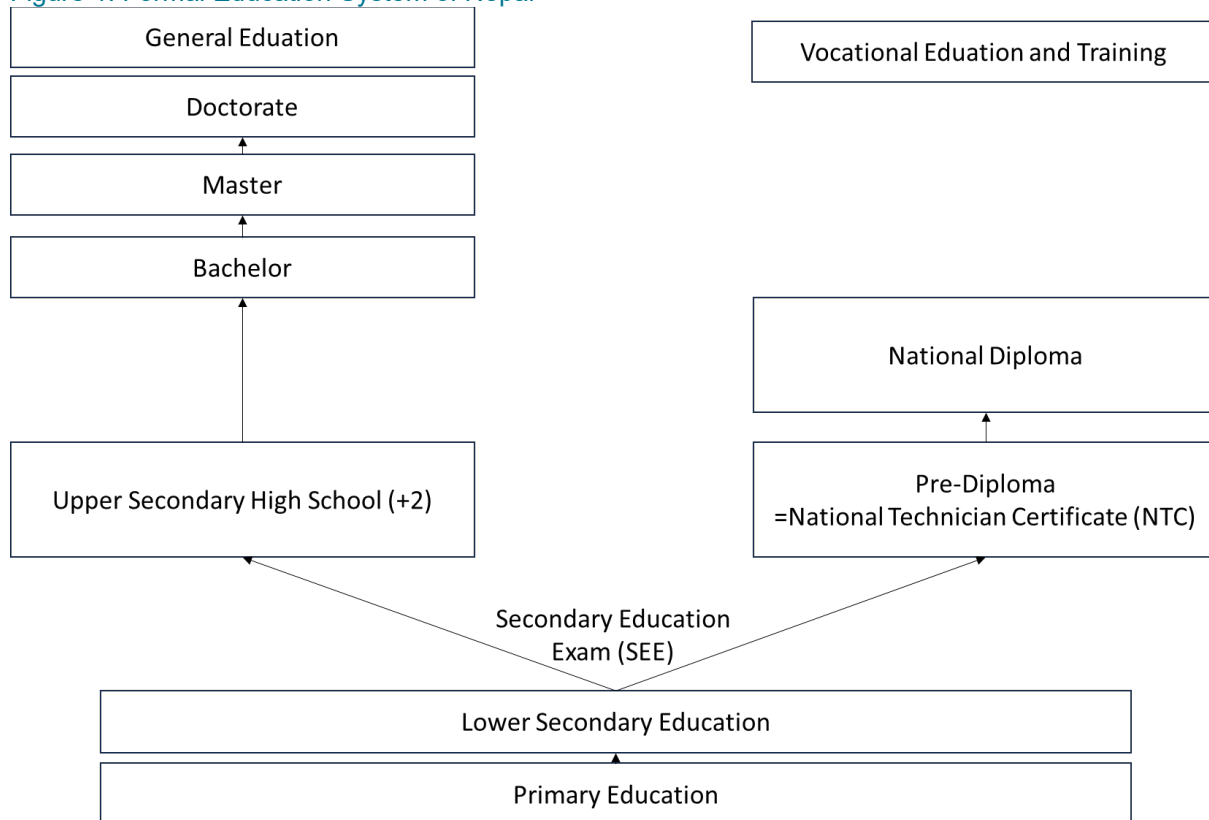
Notes: Own depiction based on CES (2022).

3.2   ENSSURE Dual VET-Apprenticeship program

The Enhanced Skills for Sustainable and Rewarding Employment (**ENSSURE**) project is a TVET project in Nepal. This project is a bilateral project between the Government of Nepal and the Swiss Agency for Development and Cooperation (SDC). It aims to increase the skills of Nepali workers to improve labour market outcomes and support industries and businesses. The project has started in 2016 and has three training components, namely the introduction of an apprenticeship program, short training courses and further training of employed workers.

This study focuses on the first component of ENSSURE, the introduction of a Dual VET-Apprenticeship program. This **Dual-VET-Apprenticeship** lasts for 24 months. The first three months consist of classroom education. The following 20 months combine four to five days of workplace training per week with one day of classroom education per week. Finally, the last month consists of classroom education. The apprenticeship leads to a formal certificate equivalent to the Pre-Diploma.

The **implementation** of the Dual VET-Apprenticeship project is a cooperation between the Council for Technical Education and Vocational Training (CTEVT) and HELVETAS Swiss Intercooperation Nepal (Helvetas). The main role of the CTEVT consists of developing the curricula and conducting entry and exit examinations. Helvetas acts as technical assistance provider.

The **first cohort** of 181 apprentices started between July and September 2018, including 129 mechanical engineering technicians and 52 electrical engineering technicians, facilitated by four schools across Koshi, Bagmati, and Lumbini provinces (Bolli et al., 2019). The second cohort entails apprentices in five occupations, namely technicians in hotel management, information technology (IT) as well as mechanical, electrical and automobile engineering. These Dual VET-Apprenticeships are delivered by thirteen schools in Koshi, Bagmati and Lumbini provinces (Bolli et al., 2020a). Table 8 in the appendix shows the number of program places offered in which occupation by each school in the second cohort.

Figure 2 shows the timing of treatment and surveys in respect to the **second cohort** of the Dual VET-Apprenticeship. We further show COVID-induced lockdowns of the country as well as school closures.

The original plan of the second cohort envisioned starting in autumn 2019. Schools started the program slightly delayed in November and December 2021. After about three months, right when workplace training was planned to start, Nepal entered a COVID-induced lockdown in March 2020 that lasted for five months. A second lockdown lasted six months from April 2021 onwards. During these lockdowns, workplace training was very limited. School closures were even longer, lasting from March 2020 to December 2020 as well as April 2021 to October 2021. Due to a delayed start and COVID, the planned end of the program was extended from autumn 2021 to spring 2022. Final examinations took place in April 2022. However, examination results were published only in autumn 2023.

The survey timeline further shows the timing of data collection. First, we obtain administrative data about applicants and program enrollment from the data base of ENSSURE in September 2019. Furthermore, the CTEVT publishes entrance examination results in September 2019. Thereafter, we conduct three waves of structured phone surveys among applicants in September 2020, April 2023 and April 2024.

Figure 2: Timeline of Program Delivery and Data Collection
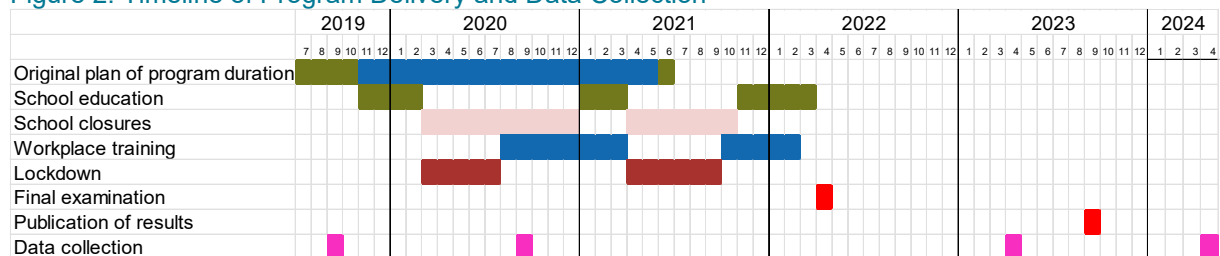
3.3   Randomization Process

Figure 3 illustrates the steps of the application process. Table 8 in the appendix provides details about the randomization process across schools.

The process starts with the public announcement of the program for 960 places in 22 schools. Most schools offer the program in a single occupation. Therefore, there are 27 school-occupations. Schools then organize an orientation event to inform potential applicants. Afterwards, individuals apply for the program, and schools screen applicants regarding eligibility.

These valid applicants represent the potential population for the randomization. The randomization procedure was agreed upon by all project partners. The number of applications vary across schools and occupations. Four school-occupation offers received less applications than places. Five additional school-occupations received less applications than 150% of offered places. No randomization took place for these school-occupations. Five additional schools, Asian School of Tourism & Hotel Management Pvt. Ltd., Adarsha Secondary School, Manmohan Smriti Polytechnic Institute, Rastriya Pravidhik Shikshalaya Pvt. Ltd and Sarswati Secondary School were exempted from randomization by the implementers. This represents an example of the challenges to run a field experiment. Differences between project planning and project implementation can lead to a gap between the power calculations before the project and the power of the field experiment.

The power calculation before the field experiment, assumed 1412 applicants of which 446 become apprentices, a power of 0.8, an effect size variability of 0.1, an R2 of 0.25, and a non-response rate of 25%. This yields a MDES of 0.25.
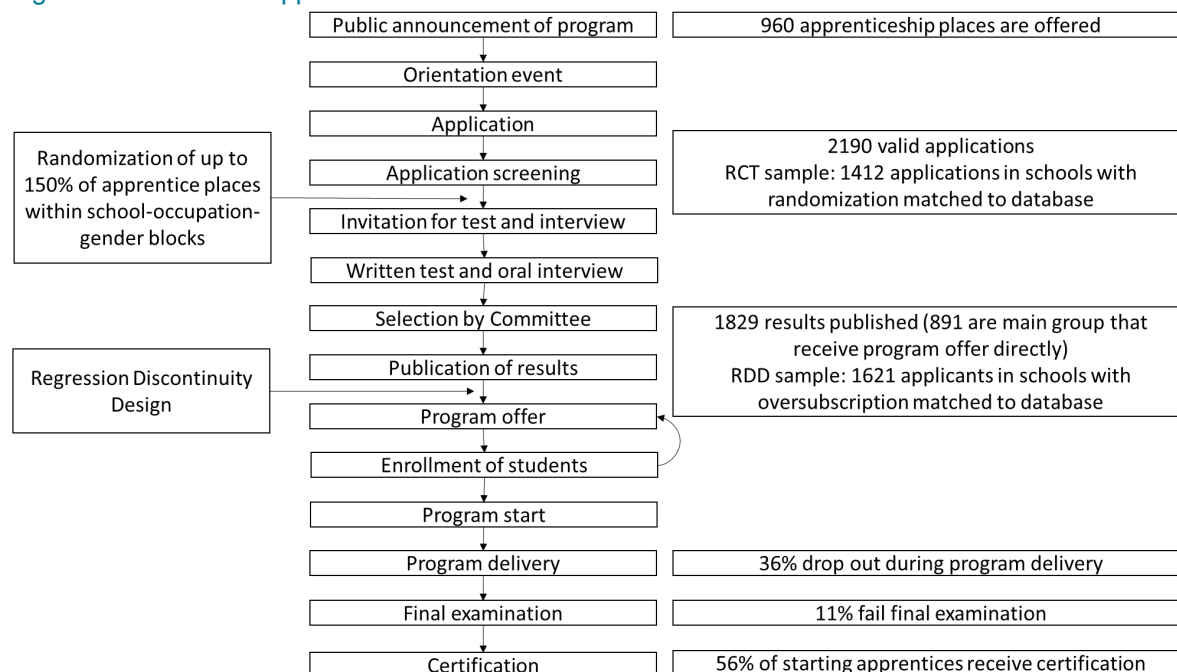
We randomized applicants within the remaining thirteen school-occupations. We randomized men and women separately. The treatment group entails 150% of program places for the three school-occupations which the oversubscription share is between 150% and 214% so that the share of the control group is lower than 30%. For the remaining twelve school-occupations, the control group comprises 30% of applicants. We videotaped the process of randomization using Excel in the presence of the research and implementing team.

The next step consists of selecting apprentices. Following the implementation guideline of ENSSURE (ENSSURE, 2018), the selection process started with applicants taking a written test. This written test provides a maximum of 40 points. Thereafter, schools interviewed the applicants to assess their interest and commitment as well as their skill and knowledge. These interviews awarded up to 30 points. In most schools, a school member and a representative of the companies conducted the interviews. The apprentice selection further accounted for up to 30 priority points according to gender, caste, ethnic and religious groups. In total, applicants could earn up to 100 points in the entrance examination score.

The CTEVT then published the total amount of points in the entrance examination score for 1829 individuals that completed this selection process. Based on the ranking within each school-occupation, individuals received a program offer. Refusal of offers lead to going down the ranking of entrance exam results until program places are filled for the program start or the list is empty. 880 students were enrolled.

As discussed in detail below, we use two identification strategies to address potential endogeneity of our estimates. The first identification strategy consists of randomizing valid applications into control and treatment group. This randomization takes place after schools screen applications for validity. The second identification strategy consists of exploiting the discontinuity in the probability of a program offer at a school-occupation-specific threshold of points. This identification strategy is based on the published results.

Figure 3 Overview of Application Process

Public announcement of program	960 apprenticeship places are offered
Orientation event	
Application	
Application screening	2190 valid applications RCT sample: 1412 applications in schools with randomization matched to database
Invitation for test and interview	
Written test and oral interview	
Selection by Committee	1829 results published (891 are main group that receive program offer directly) RDD sample: 1621 applicants in schools with oversubscription matched to database
Publication of results	
Program offer	
Enrollment of students	
Program start	
Program delivery	36% drop out during program delivery
Final examination	11% fail final examination
Certification	56% of starting apprentices receive certification

Randomization of up to 150% of apprentice places within school-occupation-gender blocks

Regression Discontinuity Design

4   Data

4.1   Data Sources

This paper uses data from several data sources. Figure 2 illustrates the timing of data collection.

We use several administrative data sources:

1) Application of individuals: ENSSURE provides us data on contact information for all applicants, conditional on treating it confidentially. This data also serves as baseline information regarding age, gender, marriage status, ethnicity, educational attainment, previous training, family size, family income, living place and application motive. For some schools, this also includes information about the citizenship number to enable matching data in the long-term.
2) Published results of entrance exams: The CTEVT publishes information about which applicants completed the entrance examination process. It also shows the entrance examination score and whether applicants receive an initial program offer. It also shows the school-occupation threshold necessary to receive an initial program offer.
3) List of admitted applicants: ENSSURE provides us data about which applicants have accepted a program offer.

Furthermore, we survey applicants three times in September 2020, April 2023 and March 2024. Our survey population consists of all 2190 valid applicants. However, for our estimations, the population consists of applicants for which we have the relevant information to assess exogenous variation. Hence, we have two slightly different estimation populations:

1) For school-occupations with randomization, our population of the RCT sample consists of all 1412 valid applicants that can be matched to our database. Three of these applicants were allowed to switch into a school-occupation that was not randomized.

2) For school-occupations without randomization, our population of the RDD sample consists of all applicants with published entrance examination scores that we can match to the applications of individuals. Of the 1829 published results, 1621 applicants are in school-occupations that have oversubscription and can be matched to our database.

In addition to these quantitative sources used in the paper directly, we gathered information surrounding the program implementation. We conducted semi-structured interviews before the start of the program to analyse the processes to motivate participation of schools, companies and apprentices as well as the matching process of companies and apprentices (Bolli et al., 2019). We also conducted structured surveys among training companies to understand their perspective and provide evidence regarding the costs and benefits of providing Dual VET Apprenticeship places. The results suggest that firms make a moderate net benefit during the program duration (Bolli et al., 2020a and Renold et al., 2024a). We further analysed drivers and barriers of scaling-up the dual VET apprenticeship program based on semi-structured interviews with government and industry representatives (Bolli et al., 2020b). Finally, we complemented the micro-level evaluation of the Dual VET-Apprenticeship by an analysis of the constitutional reform and its impact on TVET in Nepal (Renold and Caves, 2017, Renold et al., 2018, 2021, Renold et al., 2024b).

4.2   Sample

Table 1 shows the population of valid applications in total and by applicant status (apprentice starters and non-apprentices at the beginning of the program) as well as response rates by applicant status for the surveys in 2020, 2023 and 2024.

The table shows that electrical engineering (34%) and IT (27%) represent the most prevalent applicant occupations, followed by hotel management (18%), automobile engineering (14%) and mechanical engineering. The 2190 applicants consist of 880 apprentices and 1310 non-apprentices.

Response rates of the 2023 survey amount to 61% and 54% for apprentice starters and non-apprentices, respectively. Response rates of the 2024 survey are even more similar between apprentice starters and non-apprentices with 57% and 58%, respectively. Response rates are relatively similar across occupations.

Table 1: Population and Response Rate by Occupation

Training Occupation	Population			Response rate 2020		Response rate 2023		Response rate 2024	
	All Applicants	Apprentice starters	Non-apprentices	Apprentice starters	Non-apprentices	Apprentice starters	Non-apprentices	Apprentice starters	Non-apprentices
Hotel	390	195	195	66%	61%	64%	59%	55%	65%
IT	600	209	391	67%	60%	63%	51%	59%	56%
Automobile	308	186	122	77%	76%	61%	41%	55%	61%
Mechanical	157	91	66	62%	59%	47%	44%	53%	48%
Electrical	735	199	536	77%	76%	64%	59%	59%	58%
Total	2190	880	1310	70%	68%	61%	54%	57%	58%

4.3   Non-Compliance

Non-compliance arises when participants do not receive the intervention to which they were allocated by the exogenous variation. In the case of our randomized control trial, this refers to members of the treatment group who do not complete the apprenticeship as well as to members of the control group who do complete the apprenticeship. We randomize the pool of valid applicants. There are several sources of non-compliance:

1) We assign a larger treatment group than the number of program places. This means that some members of the treatment group become non-apprentices. This issue might be aggravated if schools complied imperfectly with the randomization results, though we have no reliable information on this point.
2) Some applicants from the treatment group do not appear for the entry test and oral interview. This means that some members of the treatment group become non-apprentices.
3) Some applicants refuse a program offer they receive. This means that some members of the treatment group become non-apprentices.
4) Other applicants, depending on their ranking in the entry test and oral interview, receive an offer because of a refusal of a treated person. This means that some members of the control group become apprentices.
5) Some apprentices drop out of the program after enrollment. This means that some members of the treatment group become non-apprentices and more specifically, are apprenticeship non-completers.
6) Some apprentices do not pass the final exam. This means that some members of the treatment group become non-apprentices and more specifically, are apprenticeship non-completers.

The results for the **RCT sample** show that non-compliance is relatively high. In the beginning of the program, only 35% of applicants in the treatment group start an apprenticeship. Furthermore, 20% of the control group start another apprenticeship.

Non-compliance increases over the course of the program. **Dropout** of apprentices during the program is relatively high (36%). Therefore, compliance in the treatment group decreases further to 25% in the end of the program due to dropout. Non-compliance in the control group also decreases to 14%.

Furthermore, a substantial share of apprentices **fails the final exam** (11%). Failing to pass the program further decreases compliance in the treatment group (11%) and non-compliance in the control group (7%). This is common in TVET of Nepal in general and during COVID in particular. Pérez-Viana et al. (2024) show that graduation rates in upper secondary vocational education and training in Nepal amount to 40%. Similarly, Shreshta (2023) find that diploma students in civil engineering have dropout rates of 68%, 62%, 66%, 63%, 53% and 41% in the first to sixth semester. MoEST (2024) find that 22'000 graduates finish from an enrolment capacity of about 60'000 students.

All these sources of non-compliance result in only 11% of the treatment group being compliant with the RCT conditions. On the other hand, compliance in the control group is relatively high, at 89%, and, as detailed above, in fact increases across the period of the RCT due to dropout and failure of the final exam. Table 9 in the appendix presents the non-compliance rates across the period of the RCT.

For the exogenous variation arising from the discontinuity of the entrance examination score, we randomize the pool of valid applicants with a published entrance examination score. Therefore, the first two sources of non-compliance do not apply to the **RDD sample**. The results for the RDD sample show that compliance is substantially higher. In the beginning of the program, 72% of applicants in the treatment group start an apprenticeship. Furthermore, 18% of the control group start an apprenticeship. Dropout decreases compliance in the treatment group to 46% in the end of the program though. Non-compliance in the control group also decreases to 13%, though. Failing to pass the program further

decreases compliance in the treatment group (28%) and non-compliance in the control group (6%). Again, Table 9 in the appendix presents the details.

4.4 Who are the applicants?

Table 2 shows summary statistics of our control variables, thereby providing information about the characteristics of the applicants before the Dual VET-Apprenticeship. The results show that applicants are 20 years old on average. Less than a third of applicants are female. Families have six members on average, earning 112'000 NPR per year. Two thirds of applicants are poor. About half of applicants are Tarai, living in the plains.

Only 10% of applicants have completed another upper secondary education program. The most common grades in the school exit examination (SEE) are C (32%) and C+ (35%). Taking average GPA per category suggests that the average score is lower for the applicants (2.2) than for the population (2.4, Kathmandu Post, 2023).

Table 2: Summary Statistics of Control Variables

Variable Name	Variable Definition	Obs	Mean	Std. Dev.	Min	Max
Age	Age	985	19.70	3.61	14	41
Female	Dummy that is 1 if the applicant is female, 0 otherwise	1,016	0.29	0.45	0	1
Family Size	Number of individuals in the family	1,015	6.18	3.92	1	100
Family Income	Total income of family in NPR	1,010	112'040.30	101'416.30	0	800'000
Poor	Dummy that is 1 if the family income is less than 20'000 NPR per family member, 0 otherwise	1,015	0.66	0.47	0	1
Tarai	Dummy that is 1 if the applicant lives in Tarai, 0 otherwise	1,016	0.48	0.50	0	1
Education	Dummy that is 1 if the applicant has completed upper secondary education, 0 otherwise	1,016	0.10	0.30	0	1
SEE Grade	Grade of school-leaving certificate (SEE) from A+ to F	1,006	4.96	1.22	1	9

4.5 Dependent Variables

We analyse several measures of labour market outcomes as shown in Table 3. The first set of variables consist of three measures for the activity of the applicants. The education variable captures whether applicants enroll in another education program. The working variable measures whether applicants

work. Applicants that are neither in education nor working are inactive, the inverse of which we capture in the active variable.

Concerning work characteristics, we start with whether applicants would like to work more, capturing underemployment. We also ask respondents whether the work contract is permanent or temporary. We further analyse whether the job is in the formal employment sector by asking whether they contribute to the social security fund or whether the firm is VAT or PAN registered. We also analyse two additional firm characteristics in whether the applicants work for the government and for a firm that has at least ten employees.

Finally, we measure the outcomes of work characteristics in terms of work satisfaction and pay. Payment includes wages, earnings and additional benefits, such as food, housing, transportation, clothing, medical assistance, information and communication equipment and other benefits.

Table 3: Summary Statistics of Dependent Variables

Variable Name	Variable Definition	Obs	Mean	Std. Dev.	Min	Max
Active	Dummy that is 1 if applicant is working or in education, 0 otherwise	1,016	0.7608 268	0.4267 888	0	1
Education	Dummy that is 1 if applicant is in education, 0 otherwise	1,016	0.2027 559	0.4022 502	0	1
Working	Dummy that is 1 if applicant is working, 0 otherwise	1,016	0.5580 709	0.4968 609	0	1
No Underemployment	Dummy that is 1 if applicant doesn't want to work more, 0 otherwise	356	0.6601 124	0.4743 375	0	1
Formal	Dummy that is 1 if applicant pays for the social security fund or works in business that is VAT or PAN registered, 0 otherwise	288	0.3993 056	0.4906 082	0	1
Permanent	Dummy that is 1 if applicants' job is permanent, 0 otherwise	287	0.2369 338	0.4259 44	0	1
Government	Dummy that is 1 if applicant works for the government, 0 otherwise	287	0.1637 631	0.3707 068	0	1
Larger Firm	Dummy that is 1 if applicant works in firm with 10 or more employees, 0 otherwise	347	0.5360 231	0.4994 208	0	1
Work Happiness	Dummy that is 1 if applicants work satisfaction is satisfied or completely satisfied on a 5-point Likert scale, 0 otherwise	360	0.6666 667	0.4720 606	0	1
Ln Pay	Logarithm of the sum of wages, earnings and value of additional benefits	345	10.255 47	0.6601 398	8.7795 57	13.056 22

5   Methodology

Our baseline estimation consists of OLS estimates with standard errors ε clustered at the school-occupation level:

$$y_{i,s,o} = \propto + \beta Complete_i + \gamma X_i + \rho_{s,o} + \varepsilon_i$$

Where $y_{i,s,o}$ denotes the dependent variable of individual I in school s, in occupation o.. The vector of control variables, X, entails school-occupation fixed effects, age, gender, family size, family income, poverty, region, prior educational attainment and secondary education exam (SEE) grade. Table 3 provides variable definitions and summary statistics.

For the RCT, we further estimate 2SLS estimations with standard errors ε and ϵ clustered at the school-occupation level:

$$y_{i,s,o} = \propto +\beta Complete_i + \gamma X_i + \rho_{s,o} + \varepsilon_i$$

$$Complete_{i,s,o} = \delta + \theta Treat_i + \vartheta X_i + \rho_{s,o} + \epsilon_i$$

Treat refers to an indicator variable that is one for the treatment group and zero for the control group.

For the RDD, we further estimate 2SLS estimations with standard errors ε and ϵ clustered at the school-occupation level:

$$y_{i,s,o} = \propto +\beta Complete_i + \gamma X_i + \rho_{s,o} + \varepsilon_i$$

$$Complete_{i,s,o} = \delta + \theta Thres_i + \rho_1 Score_i + \rho_2 Score_i * Thres_i + \vartheta X_i + \rho_{s,o} + \epsilon_i$$

Thres refers to an indicator variable that is one for the treatment group and zero for the control group. Score is the entry examination score normalized by the school-occupation specific threshold for being in the first group of applicants that is offered a Dual VET-Apprenticeship position.

6 Results

6.1 Satisfaction of Apprentices

As a first indication of effects of the Dual VET-Apprenticeship, we analyse the satisfaction of apprentices with the program.

Figure 4 shows satisfaction measured on a 5-point Likert scale in the years 2020, 2023 and 2024. The results suggest that apprentices were happy to completely happy in 2020 (4.4). The satisfaction drops slightly, being neutral to happy by 2023 (3.7) and 2024 (3.9). These results suggest that the program has worked reasonably well. The drop in satisfaction may be linked to the fact that the end of the program was disorganised – qualitative evidence collected from apprentices in the 2023 survey indicated long waiting times for examination results and official diplomas, hampering the ability of completed apprentices to find work.
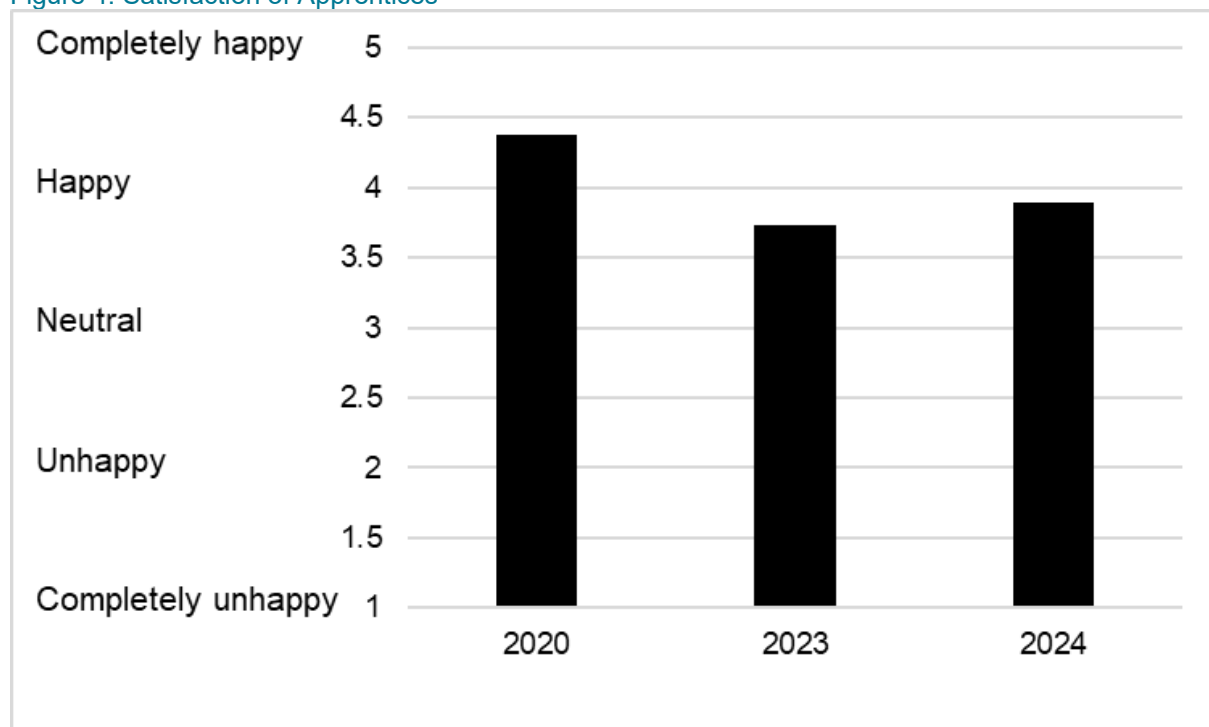
Notes: The figure shows average satisfaction of apprentices in 2020, 2023 and 2024. N=617/107/193

6.2 Activities of Applicants

Figure 5 illustrates how the activities of applicants develop over time. The figure differentiates between non-apprentices, apprenticeship dropouts and apprenticeship completers. Non-apprentices include all applicants that never started the Dual VET Apprenticeship. Apprenticeship dropouts include all applicants that started the Dual VET Apprenticeship but did not receive the certificate, either because they dropped out before the final examination or failed the final examination. Apprenticeship completers include all applicants that started the apprenticeship and passed the final examination.

Most of the **non-apprentices** are not working (36%), searching for work (7%), work in a company in Nepal (11%) or participate in another education program (41%) in 2020. The most common type of education is a general upper secondary high school (59%) and bachelor studies (22%), while pre-diploma (3%) and diploma (12%) are relatively seldomly chosen as an alternative to the Dual VET-Apprenticeship that leads to a pre-diploma. This finding suggests that these applicants have relatively high education aspirations.

The share of non-apprentices in another education program decreases to 30% in 2023. However, bachelor studies become the dominant education program (73%), followed by diploma (14%) and only few general upper secondary high school (6%). In 2024, the share of non-apprentices in another education program decreases to 22%. Bachelor remains the most relevant alternative (72%), followed by diploma (11%). The high percentage of enrollment in academic programs is an indication that many young people may already have a high school diploma that allows them to complete a bachelor's program and therefore do not want to complete a second secondary education. The share of inactive (not working or searching for work) non-apprentices decreases from 43% in 2020 to 37% and 25% in 2023 and 2024 respectively. Conversely, the share of working non-apprentices increases from 16% in 2020 to 33% and 53% in 2023 and 2024 respectively. In 2024, 25% of apprentices work in a company in Nepal and 21% work in the family business.

In 2020 most of the apprenticeship **dropouts** are inactive (84%) or work in company in Nepal (13%), while only 4% pursue another education program – the high rate of inactivity can almost certainly be explained by the COVID restriction in place at the time of the survey. The share of inactive among apprenticeship dropouts decreases to 39% and 19% in 2023 and 2024, while the share of working among apprenticeship dropouts increases to 43% and 62%, respectively. In 2024, 33% of apprenticeship dropouts work in a company in Nepal while 16% work in the family business.

After finishing the program, 15% and 9% of apprenticeship completers continue in another education program in 2023 and 2024, respectively. These education programs mostly consist of bachelor studies (69%, 83%). The share of inactive apprenticeship completers decreases from 32% in 2023 to 19% in 2024. The share of working among apprenticeship completers increases from 53% to 72%. In 2024, 43% of apprenticeship completers work in a company in Nepal, while 22% work in the family business.

Figure 5: Development of Applicant Activities over Time
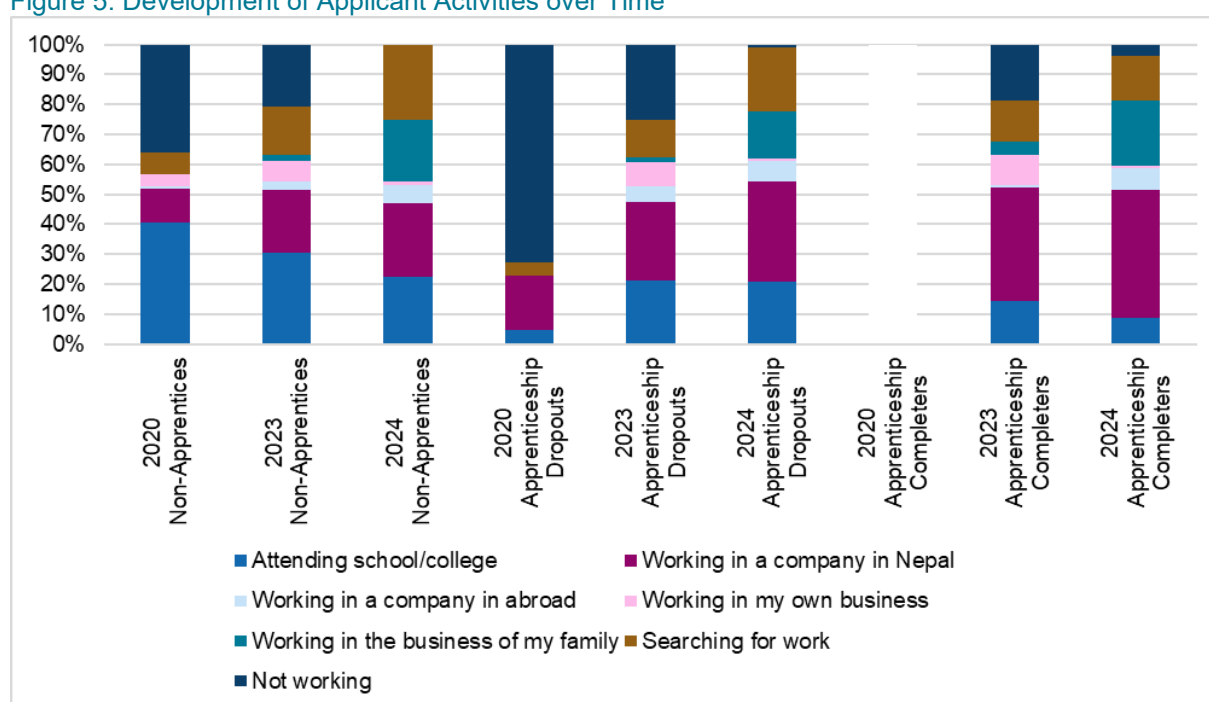
Notes: The table shows the activities of applicants in 2020, 2023 and 2024. The figure distinguishes non-apprentices (applicants that didn't start the Dual VET-Apprenticeship), apprenticeship dropouts (applicants that started the Dual VET-Apprenticeship but did not receive the Dual VET-Apprenticeship certificate) and apprenticeship completers (applicants that received the Dual VET-Apprenticeship certificate). N(non-apprentices)=578, 561, 744, N(apprenticeship dropouts)=104, 128, 134, N(apprenticeship completers)=107, 116, 138

Figure 6 differentiates the activities of male and female applicants in 2024. The results for apprenticeship **non-completers** show that female apprenticeship non-completers are more likely to attend an education program (37%, 34%) than male apprenticeship non-completers (19%,19%). However, inactivity of female apprenticeship non-completers (37%, 34%) is also higher than for than male apprenticeship non-completers (19%,15%). The share of working apprenticeship non-completers is higher for men (61%, 62%) than for women (34%,38%). However, for both male and female apprenticeship non-completers, working apprenticeship dropouts work slightly more often in a company in Nepal rather than in the family business. These results show that the activity of non-apprentices and apprenticeship dropouts are relatively similar within gender, but that men and women differ substantially.

The figure further suggests that the activities of apprenticeship **completers differ from** apprenticeship **non-completers** for both men and women, albeit not in the same manner. The genders are similar in that male and female apprenticeship completers are slightly less often inactive than apprenticeship non-completers. However, while male apprenticeship completers are only slightly less likely to attend an education program than apprenticeship non-completers, female apprenticeship completers are much less likely to attend an education program than apprenticeship non-completers. Hence, male apprenticeship completers have a similar working share (75%) than male apprenticeship non-completers (61%, 62%). The difference is even more pronounced for female apprenticeship completers (63%) compared to female apprenticeship non-completers (34%,38%)

Figure 6: Applicant Activities by Gender
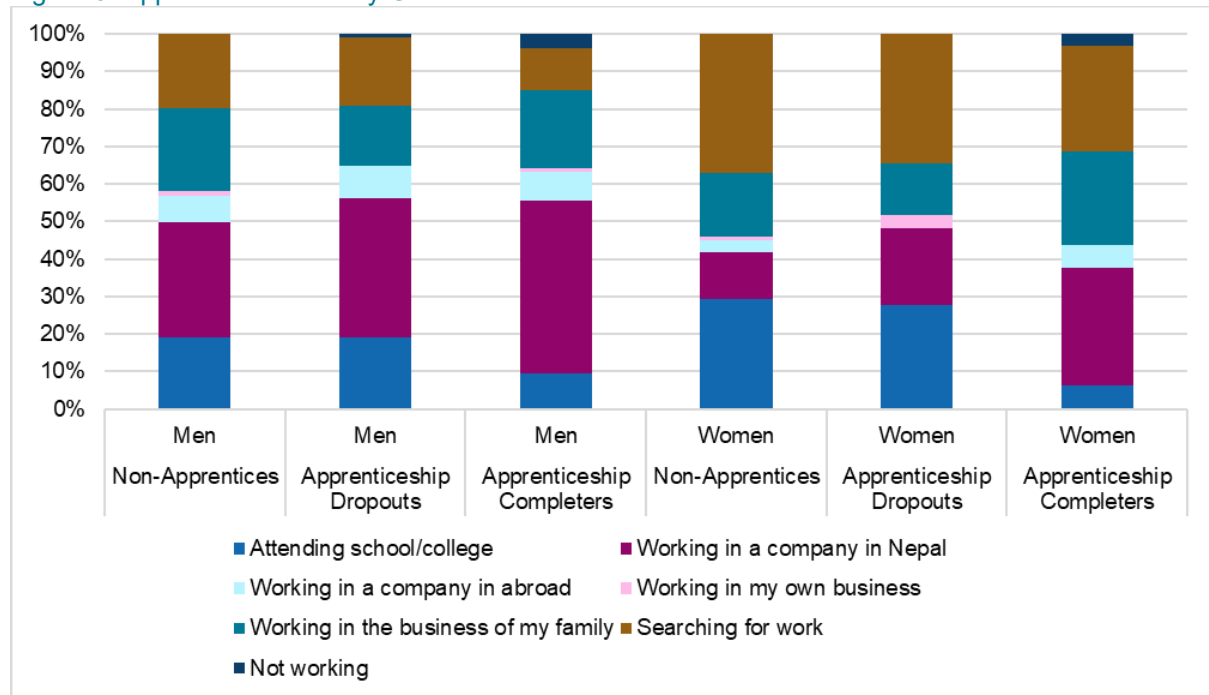
Notes: The table shows the activities of applicants 2024. The figure distinguishes between men and women as well as between non-apprentices, apprenticeship dropouts and apprenticeship completers. N(non-apprentices)=509, 235 N(apprenticeship dropouts)=105, 29 N(apprenticeship completers)=106,32

Figure 7 displays the work characteristics of applicants working in a company or their own business in 2024. The results show that non-apprentices and apprenticeship completers are similarly often underemployed, but that underemployment is even more prevalent among apprenticeship dropouts. About a third of working applicants work in the formal labour market, where the share is somewhat higher for non-apprentices. The results further show that non-apprentices more often work in a permanent job or government job than apprenticeship completers, with apprenticeship dropouts taking the rear. About half of the working applicants work for a firm with at least 10 employees. This share is highest for apprenticeship completers. Work satisfaction is generally high, with about two thirds indicating a four or five on a 5-point Likert scale. Work satisfaction is highest among apprenticeship dropouts. The share of applicants with pay above the median is higher for non-apprentices and apprenticeship dropouts than apprenticeship completers.

6.3   Estimation Results

Table 4, Table 5 and Table 6 display estimation results of OLS, RCT and RDD estimates for the difference in labor market outcomes between apprenticeship completers and apprenticeship non-completers.

The descriptive OLS results show that apprenticeship completers are significantly more likely to be **active** than apprenticeship non-completers. The subsample analysis reveals that this effect is only significant for women and service sector occupations. The RCT estimates are mostly positive but remain insignificant, which is not surprising given the low power of the first stage. The RDD estimates are negative but insignificant, though the F-statistics is substantially higher than for the RCT estimates. Figure 8 illustrates the RDD first stage graphically.

The OLS results confirm that apprenticeship completers are significantly less likely to attend an **education** than apprenticeship non-completers. The difference is significant in all subsamples. RCT estimates are positive but insignificant. RDD estimates are negative in all subsamples. However, only the estimate for women is statistically significant.

Apprenticeship completers are more likely to **work** than apprenticeship non-completers according to the OLS estimates. The difference is significant for all subsamples. RCT estimates have both positive and negative insignificant effects. RDD estimates are mostly positive but remain insignificant.

The OLS estimates further show that most **work characteristics** of apprenticeship non-completers and apprenticeship completers are statistically indistinguishable. The RCT and RDD estimates support this interpretation. However, the F-statistics of the RCT estimates drops below one, questioning the power of the estimates even more. The F-statistics of the RDD estimates remain relatively stable and are above the rule of thumb of ten for the pooled sample, men and manufacturing occupations. For the subsamples

of women and service occupations, the partial F-statistics are slightly below this rule of thumb, varying between two and eight.

There are two exceptions to the insignificance of differences of work characteristics of apprenticeship non-completers and apprenticeship completers. The first exception pertains to **payment**. OLS estimates suggest the apprenticeship completers earn about 15% less than apprenticeship non-completers. The coefficients are negative for all subsamples, though only significant for men and manufacturing. RCT estimates are also negative albeit insignificant. Similarly, RDD estimates are insignificant in all subsamples but remain insignificant.

Apprenticeship completers also work less often for the **government**. The difference is significant for the full sample as well as for women and service occupations. The insignificant RCT estimates vary substantially across subsamples. The RDD estimates are negative for women and service sector subsamples.

Hence, while our results present a positive relationship between completing the apprenticeship and being active, we find little evidence of a causal effect of the Dual VET-Apprenticeship on labour market outcomes. This might be because a substantial share of the control group enrolls in general upper secondary and tertiary education programs. This comparison might also explain why we find that apprenticeship completers might be work less often for the government than apprenticeship non-completers, potentially due to the occupations in which the apprentices train. This in turn might explain why apprenticeship completers tend to receive lower payments than apprenticeship non-completers. However, from a statistical point of view, all of these interpretations need to be considered with substantial caution.

Table 4: OLS Estimation Results

	All	Men	Women	Manu	Service
Active	0.037	0.051	0.007	0.042	0.036
	(0.037)	(0.033)	(0.123)	(0.040)	(0.064)
N	968.000	682.000	286.000	500.000	468.000
Education	-0.123***	-0.085**	-0.249***	-0.110**	-0.143**
	(0.036)	(0.034)	(0.082)	(0.050)	(0.055)
N	968.000	682.000	286.000	500.000	468.000
Working	0.161***	0.136***	0.256**	0.152***	0.179***
	(0.039)	(0.036)	(0.112)	(0.050)	(0.061)
N	968.000	682.000	286.000	500.000	468.000
No Underemployment	0.009	-0.002	0.206	0.089	-0.058
	(0.071)	(0.076)	(0.228)	(0.082)	(0.121)
N	339.000	283.000	56.000	196.000	143.000
Formal Labour Market	-0.001	0.024	-0.378	-0.025	0.035
	(0.073)	(0.070)	(0.282)	(0.089)	(0.128)
N	274.000	231.000	43.000	162.000	112.000
Permanent	0.000	0.011	-0.246	0.008	-0.020
	(0.080)	(0.090)	(0.207)	(0.126)	(0.098)
N	273.000	230.000	43.000	162.000	111.000
Government	-0.054	-0.022	-0.262*	-0.012	-0.140**
	(0.067)	(0.070)	(0.143)	(0.095)	(0.066)
N	273.000	232.000	41.000	164.000	109.000
Large Firm	0.013	0.008	-0.190	-0.090	0.102
	(0.081)	(0.084)	(0.194)	(0.108)	(0.113)
N	334.000	281.000	53.000	194.000	140.000
High Work Satisfaction	0.007	-0.020	0.275	-0.037	0.038
	(0.075)	(0.079)	(0.306)	(0.109)	(0.108)
N	345.000	289.000	56.000	199.000	146.000
lnPay	-0.272***	-0.301***	-0.254	-0.289***	-0.261
	(0.096)	(0.092)	(0.525)	(0.097)	(0.164)
N	330.000	275.000	55.000	190.000	140.000

Notes: The table shows coefficients of completing the Dual VET-Apprenticeship for different dependent variables and subsamples. Coefficients and clustered standard errors at school-occupation-gender level in parentheses refer to OLS estimations. *, **, *** denote significance at the 10%, 5%, and 1% level,

Table 5: RCT Estimation Results

	All	Men	Women	Manu	Service
Active	0.438	0.128	0.837	-0.040	2.270
	(0.585)	(0.676)	(0.796)	(0.500)	(3.741)
N	703.000	501.000	202.000	439.000	264.000
	4.452	2.188	3.434	6.220	0.365
Education	1.069	1.700	-0.134	1.141**	0.882
	(0.831)	(1.324)	(0.868)	(0.563)	(3.290)
N	703.000	501.000	202.000	439.000	264.000
F-stat	4.452	2.188	3.434	6.220	0.365
Working	-0.631	-1.572	0.971	-1.181	1.388
	(0.921)	(1.334)	(1.041)	(0.732)	(2.044)
N	703.000	501.000	202.000	439.000	264.000
F-stat	4.452	2.188	3.434	6.220	0.365
No Underemployment	10.890	2.193	0.421	2.927	0.834
	(128.831)	(4.730)	(0.711)	(6.312)	(1.837)
N	229.000	191.000	38.000	167.000	62.000
F-stat	0.006	0.221	0.547	0.201	0.302
Formal Labour Market	6.338	2.969	1.812	3.995	7.130
	(22.463)	(4.867)	(4.799)	(13.923)	(70.120)
N	190.000	161.000	29.000	139.000	51.000
F-stat	0.075	0.443	0.084	0.090	0.006
Permanent	-8.177	-1.695	9.434	-6.349	-21.074
	(34.420)	(2.346)	(21.700)	(37.765)	(179.704)
N	188.000	159.000	29.000	138.000	50.000
F-stat	0.042	0.353	0.084	0.019	0.008
Government	1.446	1.562	-15.499	2.451	29.690
	(5.572)	(2.318)	(90.010)	(7.980)	(459.039)
N	189.000	161.000	28.000	140.000	49.000
F-stat	0.085	0.533	0.010	0.098	0.003
Large Firm	-1.071	0.251	12.820	0.558	23.070
	(4.342)	(3.019)	(76.005)	(2.398)	(277.118)
N	229.000	192.000	37.000	165.000	64.000
F-stat	0.138	0.230	0.016	0.439	0.005
High Work Satisfaction	-4.879	-1.197	0.864	-2.647	12.125
	(18.727)	(2.178)	(1.458)	(6.046)	(130.887)
N	234.000	196.000	38.000	169.000	65.000
F-stat	0.059	0.449	0.547	0.173	0.006
lnPay	-4.134	-1.143	1.103	-2.166	6.970
	(13.920)	(2.034)	(1.580)	(4.142)	(36.655)
N	225.000	187.000	38.000	161.000	64.000
F-stat	0.078	0.470	0.547	0.250	0.027

Notes: The table shows coefficients of completing the Dual VET-Apprenticeship for different dependent variables and subsamples. Completion is instrumented in an RCT Coefficients and clustered standard errors at school-occupation-gender level in parentheses refer to 2SLS estimations. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. F-stat refers to the partial F-statistics of the instrument in the first stage. All estimates include fixed effects for school-occupations-gender and control for age, gender, family size, family income, poverty, region, education and school exit examination grade. The data uses responses from 2024.

Table 6: RDD Estimation Results

	All	Men	Women	Manu	Service
Active	-0.169	-0.305	0.201	-0.171	-0.223
	(0.200)	(0.220)	(0.426)	(0.198)	(0.412)
N	783.000	559.000	224.000	382.000	401.000
F-stat	15.433	12.589	3.427	11.826	7.262
Education	0.001	0.123	-0.429	0.066	-0.157
	(0.183)	(0.203)	(0.310)	(0.144)	(0.416)
N	783.000	559.000	224.000	382.000	401.000
F-stat	15.433	12.589	3.427	11.826	7.262
Working	-0.171	-0.428	0.631	-0.237	-0.066
	(0.262)	(0.284)	(0.476)	(0.237)	(0.587)
N	783.000	559.000	224.000	382.000	401.000
F-stat	15.433	12.589	3.427	11.826	7.262
No Underemployment	0.554*	0.724*	-0.434	0.793**	-0.030
	(0.328)	(0.422)	(0.749)	(0.353)	(0.711)
N	292.000	243.000	49.000	157.000	135.000
F-stat	16.161	15.671	1.044	14.680	2.823
Formal Labour Market	0.425	0.338	-0.481	0.260	1.007
	(0.305)	(0.256)	(0.987)	(0.170)	(1.980)
N	240.000	202.000	38.000	132.000	108.000
F-stat	9.273	8.270	0.389	18.868	0.650
Permanent	-0.041	-0.151	-0.290	0.040	-0.465
	(0.401)	(0.457)	(0.640)	(0.339)	(1.507)
N	238.000	200.000	38.000	131.000	107.000
F-stat	9.233	8.084	0.389	17.294	0.665
Government	-0.143	-0.011	-1.121	0.153	-1.307
	(0.408)	(0.459)	(0.716)	(0.311)	(0.976)
N	239.000	202.000	37.000	133.000	106.000
F-stat	9.968	8.609	0.370	18.786	0.770
Large Firm	-0.079	-0.225	1.019	-0.039	0.034
	(0.260)	(0.263)	(2.334)	(0.352)	(0.408)
N	287.000	241.000	46.000	155.000	132.000
F-stat	16.137	15.749	0.277	11.303	5.313
High Work Satisfaction	-0.237	-0.379	-0.589	0.230	-1.071**
	(0.373)	(0.446)	(0.907)	(0.278)	(0.443)
N	297.000	248.000	49.000	159.000	138.000
F-stat	17.806	17.624	1.044	14.699	4.147
lnPay	-0.877	-1.366**	3.470	-0.594	-0.634
	(0.574)	(0.687)	(4.718)	(0.590)	(1.149)
N	286.000	238.000	48.000	154.000	132.000
F-stat	15.021	15.765	0.513	12.068	2.645

Notes: The table shows coefficients of completing the Dual VET-Apprenticeship for different dependent variables and subsamples. Completion is instrumented in an RDD with linear running variables on either side of the threshold. Coefficients and clustered standard errors at school-occupation-gender level in parentheses refer to 2SLS estimations. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. F-stat refers to the partial F-statistics of the instrument in the first stage. All estimates include fixed effects for school-occupations-gender and control for age, gender, family size, family income, poverty, region, education and school exit examination grade. The data uses responses from 2024.

Table 7: RDD Estimation Results with rdrobust

	All	Men	Women	Manu	Service
Active	-0.285	-0.033	-0.651	-0.162	-0.370
	(0.470)	(0.445)	(1.060)	(1.661)	(0.612)
N	826.000	593.000	233.000	393.000	433.000
Education	0.325	0.395	0.074	1.212	0.112
	(0.474)	(0.545)	(1.116)	(2.750)	(0.456)
N	826.000	593.000	233.000	393.000	433.000
Working	-0.636	-0.267	-0.760	-1.463	-0.454
	(0.728)	(0.647)	(1.532)	(3.695)	(0.693)
N	826.000	593.000	233.000	393.000	433.000
No Underemployment	-0.301	-0.605	-0.127	-5.480	0.140
	(0.545)	(0.802)	(0.802)	(32.331)	(0.491)
N	306.000	255.000	51.000	159.000	147.000
Formal Labour Market	0.056	0.708	-0.464	-0.752	0.177
	(0.696)	(1.140)	(1.043)	(12.585)	(0.768)
N	252.000	212.000	40.000	133.000	119.000
Permanent	-0.295	0.452	-0.968	1.083	-0.173
	(0.632)	(1.005)	(0.634)	(4.660)	(0.596)
N	250.000	210.000	40.000	132.000	118.000
Government	-0.537	-0.277	-0.539	-1.383	0.247
	(0.588)	(1.085)	(1.123)	(8.680)	(0.461)
N	251.000	212.000	39.000	134.000	117.000
Large Firm	-1.062	-1.953	-0.105	-12.629	-0.280
	(0.739)	(1.827)	(0.835)	(68.256)	(0.484)
N	299.000	251.000	48.000	157.000	142.000
High Work Satisfaction	0.411	1.132	-0.557	14.421	-0.394
	(0.597)	(1.246)	(0.733)	(94.855)	(0.373)
N	310.000	259.000	51.000	161.000	149.000
lnPay	-1.869**	-2.659	-1.128	-23.938	-1.172*
	(0.924)	(2.070)	(0.995)	(233.305)	(0.626)
N	299.000	249.000	50.000	156.000	143.000

Notes: The table shows coefficients of completing the Dual VET-Apprenticeship for different dependent variables and subsamples. Coefficients and clustered standard errors at school-occupation-gender level in parentheses refer to OLS estimations. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. The data uses responses from 2024.

7   Discussion and Conclusion

In this article, we have analyzed the ENSSURE Dual VET-Apprenticeship program, with data from both and RCT and RDD sample. Descriptive results show those who complete apprenticeships are more likely to be in work than those who did not, results that are confirmed by OLS analyses. However, our findings provide limited support for a causal impact of the Dual VET-Apprenticeship on labor market outcomes. Overall, the findings are in line with the meta-analysis of Kemper et al. (2024), which shows that formal VET programs have at most a mild impact on labour market activity, and little on earnings.

This lack of evidence may be due to the fact that a significant portion of the control group participates in general upper secondary and tertiary education programs. This context could also help to understand why those who complete the program appear to work less frequently in government positions compared to those who do not complete it, or choose another educational pathway. It may also explain why apprentice completers earn less on average than those who do not complete an apprenticeship, or obtain another qualification. Another plausible explanation for the results is that it shows a dual TVET program represents a viable alternative to upper-secondary and higher education in Nepal, given the high proportion of the control group pursuing tertiary education in the 2023 and 2024 surveys. The program presents a welcome alternative option for youth who may be unsure which educational pathway they want to pursue following their high-school education. It also presents an option for poorer youth who may otherwise not have the means to consider further education – a possibility corroborated by the fact that two-thirds of the sample are from a poor background.

In the context of Nepal and the specificities of the Dual VET-Apprenticeship program, our results lead us to make the following observations. First, the results suggest **an entirely new program holds its own against established education pathways**, including university education. The Daul VET-Apprenticeship program is still in a pilot phase and has only educated a few thousand youth, only a fraction of whom successfully complete. As employers outside the pilot program begin to become aware of the skills graduates have, their outcomes may improve. Indeed, qualitative data collected as a part of the last two survey waves suggest that some graduates had difficulty applying for jobs, as employers were not aware that they had undergone an official education program and received formal certification.

Related to this observation, **improving organisational factors may improve outcomes**. There are two key strands to this point. First, in the qualitative data, completers pointed out that results and diplomas were slow to be conferred following the program. This meant that some completers were inactive while waiting for an official certification, or had to accept jobs for which they were overqualified, which may have also affected the finding that completers had lower wages than non-completers. Second, the **failure rate of apprentices is high**. This phenomenon is observed across VET programs in Nepal (Perez-Viana et al., 2024). It nevertheless raises concerns about the quality of instruction and preparation of students for final examinations, as well as the suitability of assessment based on what has been learned during the program. Dealing with this issue should be a high priority.

Finally, **the program was severely COVID-affected**, and this no doubt affected outcomes. What should have been a two-year program with no break spiraled to almost four years from start to diploma conferral. We cannot, with this data, test the counterfactual proposition confidently, but we expect that the dropout rate would have been lower under "normal" circumstances. In addition to reducing non-compliance amongst the treatment group, which may have improved the strength of some of the estimates, a non-COVID-affected cohort may also have had better outcomes due to more consistent learning.

Looking at subsamples in the analysis, both descriptive and multivariate results seem to suggest that in terms of activity rates, the ENSSURE program has a greater impact on female apprentices than male. Given the ENSSURE program is partially motivated by a desire to improve employment outcomes of women and underprivileged groups, this is a positive sign. However, the descriptive statistics show that despite this positive development, women remain considerably less active than men in the apprentice sample.

We note that from a statistical perspective, these conclusions should be approached with considerable caution. Our estimates are often statistically insignificant, particularly for the causal identification

strategies. This is partially due to the comparatively small sample size, and the fact that non-compliance amongst the treatment group especially is very high. Indeed, only one out of every ten apprentices in the original treatment group successfully completes the program, a concerningly low number both from a statistical analysis perspective and from the perspective of the program.

With these points in mind, it may be wise to consider further analyses of the program. A further wave of surveys with this cohort may shed further light on the longer-term impacts of participation in the dual apprenticeship program – though existing literature on educational interventions suggests that their impact trends towards zero in the long run (Hanushek et al. 2017). Alternatively, tax records may be used for a more detailed analysis of the economic situation of apprentices and non-apprentices. Finally, an oversubscribed future cohort of the program may again be randomized to test the impact of the program in a – hopefully – uninterrupted period.

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Appendix

Table 8: Overview of Schools

School Name	School Type	Occupation	RCT programs	RDD Threshold	Apprentice places	Apprentices	Applicants
Asian School of Tourism & Hotel Management Pvt. Ltd.	Private	Hotel Management	0	51	40	19	23
Adarsh Secondary School TECS	TECS	Information Technology	0	53.5	20	40	90
Bachauli Secondary School	TECS	Hotel Management	1	48.25	40	40	42
Balaju School of Engineering & Technology	Constituent	Automobile Engineering	1	49.75	20	20	42
Balaju School of Engineering & Technology	Constituent	Electrical Engineering	1	48.25	40	40	43
Balaju School of Engineering & Technology	Constituent	Mechanical Engineering	0	0	40	20	10
Bheri Technical School	Constituent	Automobile Engineering	1	49.75	26	26	66
Bheri Technical School	Constituent	Electrical Engineering	1	50.75	20	19	46
Bheri Technical School	Constituent	Mechanical Engineering	0	0	24	20	5
Bhrikuti Secondary School	TECS	Electrical Engineering	1	54.5	40	40	160
DeerWalk Institute of Technology	Private	Information Technology	0	51.25	40	39	14
Janjyoti Secondary School	TECS	Information Technology	1	53.75	40	40	100
Kathmandu Institute of Hospitality Management	Private	Hotel Management	1	49.3	40	40	29
Korea Nepal Institute of Technology	Constituent	Mechanical Engineering	1	50.25	20	19	26
Korea Nepal Institute of Technology	Constituent	Automobile Engineering	0	0	40	37	3
Madan Ashrit Smriti Technical School	Partner	Hotel Management	0	47	40	27	23
Mahakavi Devkota SS	TECS	Automobile Engineering	0	0	40	34	1
Manmohan Smriti Polytechnic Institute	Partner	Electrical Engineering	0	53.25	20	24	42
Panauti Technical School	Constituent	Automobile Engineering	0	0	80	69	10
Panchodaya Secondary School	TECS	Electrical Engineering	1	51.75	40	40	187
Pathibhara Himalayan Polytechnic Institute Pvt. Ltd.	Private	Electrical Engineering	1	50.25	40	36	58
Pokhara Technical School	Constituent	Hotel Management	0	54.75	40	36	13
Rastriya Pravidhik Shikshalaya Pvt. Ltd	Private	Information Technology	0	55	20	20	34
South Asian School of Tourism and Hotel Management Pvt. Ltd.	Private	Hotel Management	1	45	40	33	65
Sarswati Secondary School	TECS	Information Technology	0	53.25	30	30	42
Shanti Namuna Secondary School	TECS	Mechanical Engineering	0	54	40	32	25
Tribhuwan Secondary School	TECS	Information Technology	1	49.75	40	40	111
Total			14		960	880	1310

Notes: The table also shows the school type: Constituent=CTEVT constituent school, Partner=CTEVT partner school, TECS= school with TECS program, Private=private school.

Regression function fit
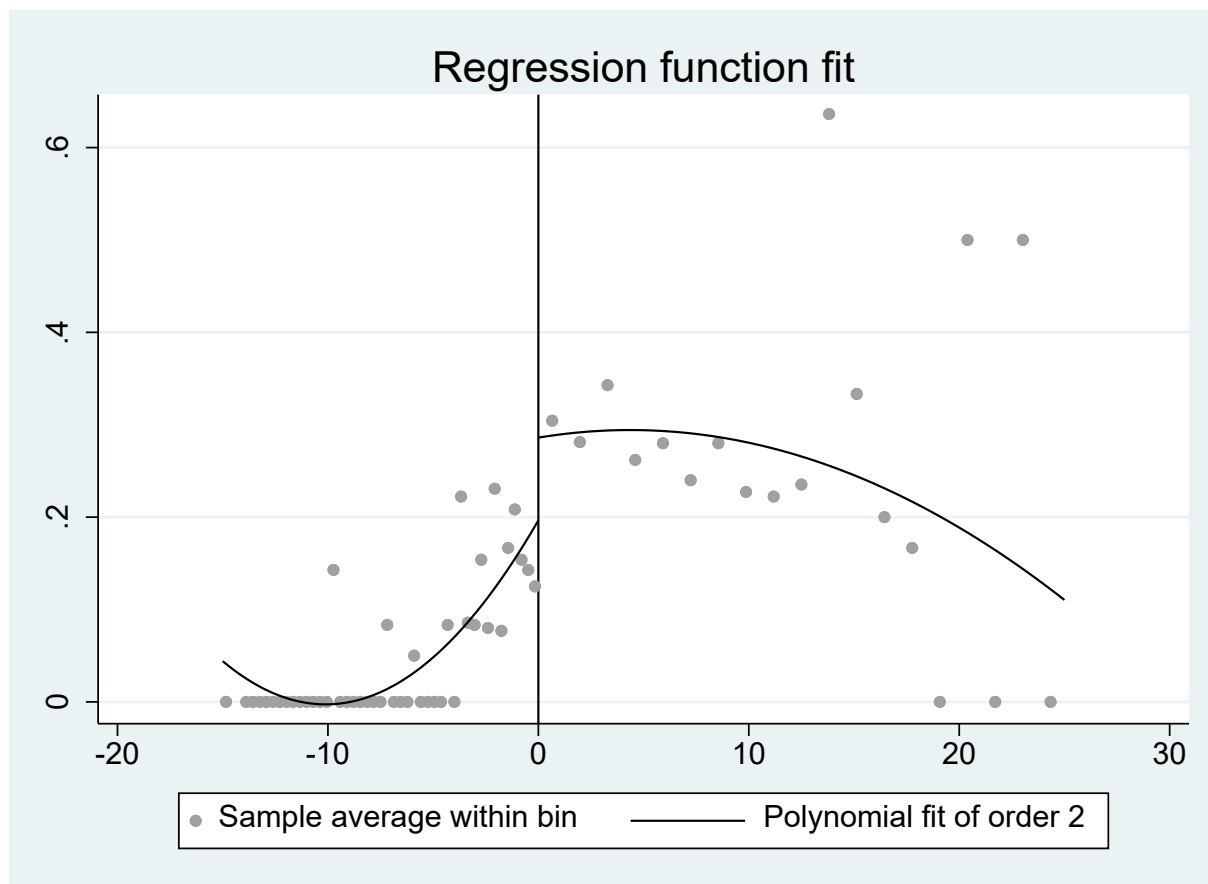
Notes: The figure shows the first stage of the RDD based on the Stata command rdplot.

Table 9: Non-compliance in the Beginning and End of the Dual VET-Apprenticeship

RCT sample

Beginning of program (N=1412)	Non-Apprentices	Apprentices
Control Group	80%	20%
Treatment Group	65%	35%
Before receiving final exam grades, 2023 (N=808)	Non-Apprentices	Apprentices
Control Group	86%	14%
Treatment Group	75%	25%
After receiving final exam grades, 2024 (N=757)	Non-Apprentices	Apprentices
Control Group	93%	7%
Treatment Group	89%	11%

RDD sample

Beginning of program (N=1621)		
Control Group	82%	18%
Treatment Group	28%	72%
Before receiving final exam grades, 2023 (N=946)	Non-Apprentices	Apprentices
Control Group	87%	13%
Treatment Group	54%	46%
After receiving final exam grades, 2024 (N=877)	Non-Apprentices	Apprentices
Control Group	94%	6%
Treatment Group	72%	28%

Notes: *Control group* refers to all individuals not placed in an apprenticeship program by the randomization/RDD cutoff; *Treatment group* refers to all those who were placed in an apprenticeship program. *Non-apprentices* refers to individuals who **are not participating in the program at a given time**, irrespective of where they were placed at the beginning. *Apprentices* refers to individuals who **are participating in the program at a given time,** irrespective of where they were placed at the beginning.

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