THE IMPACT OF ON-THE-JOB TRAINING ON EMPLOYMENT AND EARNINGS DUAL TRAINING SYSTEM IN THE PHILIPPINES

by

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Based on the first-stage data from the tracking survey

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ABSTRACT

This paper estimates the impact of Philippine Dual Training System (DTS) on labor market outcomes using a recent survey that tracked graduates from DTS and regular programs. Based on the finding that the probability of enrolling in DTS jumps from 0.35 to 0.55 around the normalized average highschool score being zero, Fuzzy Regression Discontinuity Design estimation shows significantly positive impacts on the latest monthly earnings and (marginally) current employment incidence. Quantitatively, the impact on monthly earnings that is attributable to DTS is substantial, i.e., a nearly 50% increase relative to the average regular program graduate earnings. The impact significantly increases with the length of on-the- job training (OJT), measured by the number of weeks in company during DTS, which implies that the OJT part of DTS is the most essential contributor to higher earnings of the DTS graduates. The comparison of (private) internal rate of return among DTS, regular programs and college graduates demonstrates that DTS has relatvely high returns among these options. Policy implications are derived from the above findings.

1. Introduction

It has been increasingly recognized that vocational training has to be responsive to skill needs in the economy so that those who are trained in vocational training programs can readily contribute to the production, narrowing the existing skill gaps. When particular skills that are required in the production are not available in the labor market, companies implement training to their employees to develop human capital specific to their production technology. This often happens as a form of on-the-job training (OJT). Recently, some vocational institutions started working with private companies to institutionalize OJT as part of their vocational training programs.

One example is the Dual Training System (DTS) in the "Technology Institutes" managed by the Technical Education and Skills Development Authority (TESDA) in the Philippines. [5]TESDA officially

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[5] TESDA is the government agency mandated to manage and supervise technical education and skills development in the Philippines. As the nation's premier TVET authority, the agency sets the direction of the TVET policy through plans and regulations, issues certificates for workers and training providers, and provides for TVET indirectly through training scholarships and directly through the 122 TESDA Technology Institutes (TTIs) under the direct TESDA management. In 2011, the number of enrollees at

defines the DTS as “instructional mode for technology-based education and training in which learning takes alternately in two places, the school or the training center and the company”. For instance, at the Jacobo Z. Gonzales Memorial School of Arts and Trade, one of the training institutions that pioneered the DTS, about 50% of its students are placed in the DTS during the second and last year of their education and training. The DTS track is popular and oversubscribed among the students.

For employers who participate in the DTS program, it promises availability of future employees trained to their specific needs and standards. Employers pay 75% of the minimum wage to DTS trainees. For training institutions, the DTS track means maximized use of limited facilities and equipment and less need for investment in sophisticated technology, among other benefits. More than anything, the DTS is intended to benefit the trainees. TESDA envisages that the DTS trainee beneficiaries enjoy quality training and acquire proper skills, work attitude, and knowledge leading to better employability after training and improved career mobility. The continued popularity of the DTS track among trainees may be taken as a prima facie evidence for the success of the dual modality in TVET instruction.[6] Yet, no systematic evaluation has been carried out to assess the impacts of the DTS on employment and other labor market outcomes. A rigorous impact evaluation is required to disentangle the issues surrounding the DTS program, especially providing robust estimates of the economic returns to the program. This exercise will help better inform TESDA’s efforts, by justifying added tax incentives for participating employers, for instance.

2. Dual Training System

The Technical Skills and Development Authority (TESDA) was established in 1994 and mandated by law through the enactment of Republic Act No.7796. The TESDA Board is mandated to “primarily be responsible for formulating and continuing coordinated and fully integrated technical education and skills development policies, plans and programs (Republic Act No.7796).” TESDA ensures that competency assessment and certification of workers are continuously done in pursuit of professionalizing skilled workers. It develops competency standards and qualifications, coupled with training standards and assessment instruments, which serve as the basis for the registration, accreditation, and delivery of the various programs. Likewise, TESDA provides equitable access and provision of programs to the growing number of TVET clients. It also funds programs and projects for technical education and skills development. It supports TVET institutions (TVIs) through trainer’s development program, curriculum and materials development, career guidance and placement, and scholarship programs. The training delivery is conducted under four modes of training, namely: institution-based (school-based and center- based); enterprise-based; and community-based.

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the TTIs was about 157,000, and the number of graduates about 140,000. These figures account for about 10% of the total number of enrollees and graduates supported by TESDA’s provision, but in terms of intensity and duration of the training, the TTIs represent a key component in the TESDA’s TVET provision.

[6] Only recently, the number of DTS beneficiaries has been stagnant in the recent past at around 60,000 per year, having come down from the peak of about 100,000 recorded in 2006, despite TESDA’s strenuous efforts to expand the program.

Among the three modes, there seem to be a very small proportion of enrollment and graduation in the enterprise-based programs (Table 1). The composition of enrolment and graduation in 2014 shows that the institutions-based training (i.e., school-based and center-based training) accounts for 51% and 47% of the total enrollment and graduates, respectively. There was an upward trend in enrollment from 2005 to 2014 compared to the enterprise-based mode, which has declined by 30% from 2005 to 2014 (Table 1). A similar pattern was observed for graduates, where the institution-based mode increased by 17.7%, while the enterprise-based programs declined by 5.6% (Table 1). The increase in enrollment and graduates in institution-based mode may probably be attributed to the increase in the number of TVIs, which accounts for 4,733 in 2013 (57% increase from 2001), mostly dominated by private TVIs (TVET Statistics 2008-2013).

Table 1. Enrolment and Graduation by Mode of Delivery

	2005		2010		2014	
Delivery mode	**Number**	**%**	**Number**	**%**	**Number**	**%**
Enrolled	1,683,382	100	1568617	100	2003417	100
Institution-based	487,086	28.9	860919	54.9	1028005	50.6
Enterprise-based	59,003	33.5	86978	5.5	69138	3.4
Community-based	1,137,293	67.6	620720	39.6	936274	46
Graduates	1,154,333	100	1344371	100	1785670	100
Institution-based	334,757	29	671488	49.9	833659	46.7
Enterprise-based	101,550	8.8	73352	5.5	57417	3.2
Community-based	718,026	62.2	599531	44.6	894603	50.1

Sources of Data: Planning Office, TESDA; TVET Statistics 2008-2013.

Under the enterprise-based mode is an instructional delivery system called Dual Training System (DTS), implemented between TVIs and private companies. It differs from the other enterprise-based mode, e.g., apprenticeship and learnership programs, in that earnings take place alternately in the TVI and the company or firm.

The Philippine DTS was adopted from the German model and was first introduced in the Philippines in the 1980s through a joint project of the Southeast Asian Science Foundation and the Hanns Seidel Foundation. It was first introduced in the Dualtech Training Center. The Dualtech experience was replicated nationwide in 1991, and in 1994, through the enactment of Republic Act No.7686 or the Dual Training System Act of 1994, the DTS was institutionalized. Under this DTS Law, TESDA is mandated to promote, coordinate, and administer the dual training system.[7]

Hence, the school and company share the responsibility of providing trainees with well-coordinated learning experiences and employable skills. Trainees spend about 40% of the training/learning time in school and more than 60% in companies for hands on training in the workplace. They also receive allowance of up to 75% of the minimum wage rate. This is probably one of the reasons why DTS is one of the more preferred modality in the enterprise-based training.

To encourage participation of companies or firms, the government offers savings on production cost through tax incentives. As stated in Republic Act No.7986 that "they shall be allowed to deduct from their taxable income the amount of fifty percent (50%) of the actual system expenses paid to the Accredited Dual Training System Educational Institution for the establishment's trainees: Provided that such expenses shall not exceed five percent (5%) of their total direct labor expenses but in no case to exceed twenty-five million pesos (P25 million) a year." In 2009, there were 348 TESDA accredited companies and 57 institutions/schools in the DTS program. As of December 2012, about 500 companies and institutions have been actively participating in the DTS. In addition to tax breaks, companies can also reduce recruitment and training costs, and maintenance costs. Some of these TVIs stated that DTS could provide a smoother transition from education to employment with extensive practical application with an absorption rate ranged in 80-90%, i.e., graduates are employed in the companies where they were trained (our personal communications with some TVIs, such as MFI, Dualtech, Don Bosco Tech, and JZGMAST).[8] It also prevents job mismatch by being more responsive to the needs of industries. On the trainee side, the advantages of DTS are on gaining access to state-of-the-art technologies in industries as well as earnings while learning.

The importance of DTS is expected to intensify with rapidly changing technologies in the workplace. TVIs have to constantly catch up with technological changes and update their training equipments and trainers' skills, which is often difficult under budget and human resource constraints.

3. Method

For identifying the DTS impact, we use Fuzzy Regression Discontinuity (FRD) using trainees' test scores. In FRD, we need discontinuity in the probability of receiving treatment, i.e., enrolling in DTS/DTP in our context, given the enforcing variable. The forcing variable we use in the analysis is test scores from two sources: (i) average highschool grade (score) and TESDA test scores. The latter is being collected now, so the current analysis relies only on the average highschool grade. The scores are normalized by using residuals after controlloing institution enrollment-year dummies and the current age.

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[7] Dualized Training Program (DTP) relaxes legal requirements on the company side, so that private companies can relatively easily adopt a nearly-identical enterprise-based training with TVIs. For example, MFI in NCR uses DTP, not DTS. The analysis below covers both DTS and DTP.

[8] However, we learned from some companies that the retention rate there is very low, so that they can accept new trainees under the DTS to replace the current trainees when they complete training. This pattern is observed in companies that require relatively easy skills, such as highway toll gate fee collectors.

The actual estimation problem in FRD is translated into an instrumental variable estimation (Woolridge, 2009; Hahn, et al., 2001). In this setting, F(w=1 | x) = Prob(DTS/DTP | x) depends on the forcing variable (test scores) and there is a point at which the probability discontinuously jumps. Let c define the point in x where F(w=1 | x) descretely jumps. The specification (casted in the instrumental variable estimation) is written as:

$$y(i) = a(0) + tau*w + b(j)*(x(i)-c) + d(j)*I[x(i)>=c]*(x(i)-c) + e(j,t)+v(i)$$

where i, j and t are trainee, institution and enrollment year, respectively. The domain of x is restraicted to c-h <x < c+h for local estimates, where c is the threshold point at which F(w=1 | x) = Prob(DTS/DTP | x) discretely changes. Let z= I[x>=c] be the IV for w. Institution-specific effects are allowed in b and d, and institution enrollment-year dummies are included (thus, the inference is based on within-institution-year variations).

4. Data

A tracking survey was designed to evaluate the DTS impact on labor market outcomes. The survey was conducted in January to March 2016 covering Regions 3 and 4A and National Capital Region (NCR). The total of 958 respondents (n1) were successfully tracked from 10 training institutions. The sample includes trainees who enrolled after 2008 and completed DTS/DTP or regular programs.

The survey modules ask questions on their background, schooling, vocational training, DTS details, work history (before and after training), and others. The institution survey was also conducted to collect information from the sample institutions on enrollment records, program and institutional costs, etc.

Table 2 shows the sample instuttions with brief characterizations. After triming the sample by imposing a few basic screening criteria, the effective sample size became 847 (n2), with 367 DTS or DTP trainees and 475 regular program trainees.

Table 2 Sample Institutions

Region	TVI	Type	Size	Years	n1	n2
Region III	Provincial Training Center Mariveles	Public	Large	2009-14	194	140
Region III	Provincial Training Center Orion	Public	Large	2011-14	160	150
Region III	Provincial Training Center Tarlac	Public	Large	2010-14	112	106
Region III	Jocson College	Private	Small	2012-14	49	43
Region III	Gonzalo Puyat School of Arts and Trades	Private	Small	2013	29	28
Region IV-A	Jacobo Z. Gonzales Memorial School of Arts And Trades	Public	Large	2009-14	150	134

Region IV-A	Provincial Training Center Rosario	Public	Medium	2012-14	85	80
Region IV-A	National College of Science and Technology	Private	Small	2012-13	16	9
Region IV-A	Quezon National Agricultural School	Public	Medium	2012-13	18	10
NCR	MFI Foundation	Private	Large	2008/09-13/14	145	142

Note: n1 is the tracked sample size. n2 is the sample size after triming with the condition that programs in the master list and actual respondents' answers are matched. A large reduction from n1 to n2 is observed in PRC Mariveles.

Table 3 tabulates the sample by enrollment year. The balance between DTS/DTP and regular program trainees is relatively stable across enrollment years.

Table 3 Program Type and Enrollment Year

	Enrollment year						
Program type	2009	2010	2011	2012	2013	2014	Total
DTP or DTP	33	26	44	81	101	82	367
Regular	38	25	52	110	137	113	475
-------- Total	71	51	96	191	238	195	

Ln latest monthly earnings and the average highschool grade are compared between DTS/DTP and regular program graduates (Table 4). In both, DTS/DTP trainees have significantly higher values. The probability of being currently employed also shows a higher value among DTS/DTP graduates but the difference is statistically insignificant.

Table 4: Simple Comparisons between DTS/DTP and RP

	DTS/DTP	RP	Diff	t value
Highschool average grade	83.18571	82.04629	1.139422	3.2738
Ln latest monthly earnings	9.179590	9.090334	0.089256	1.7813
Currently employed or not	0.7226891	0.6853933	0.037295	0.9164

Sample: age between 20 and 40, enrolled after 2009

Figures 1 and 2 show distributions of ln latest monthly earnings and the normalized average highschool grade (defined as the residuals of the average highschool grade after controlling institution dummies, enrollment year dummies, their interactions and age), respectively. DTS/DTP trainees display stochastically dominant distributions in both measures. Academically better performing students at high school are selected into DTS/DTP.

Figure 1 Ln Monthly Earnings

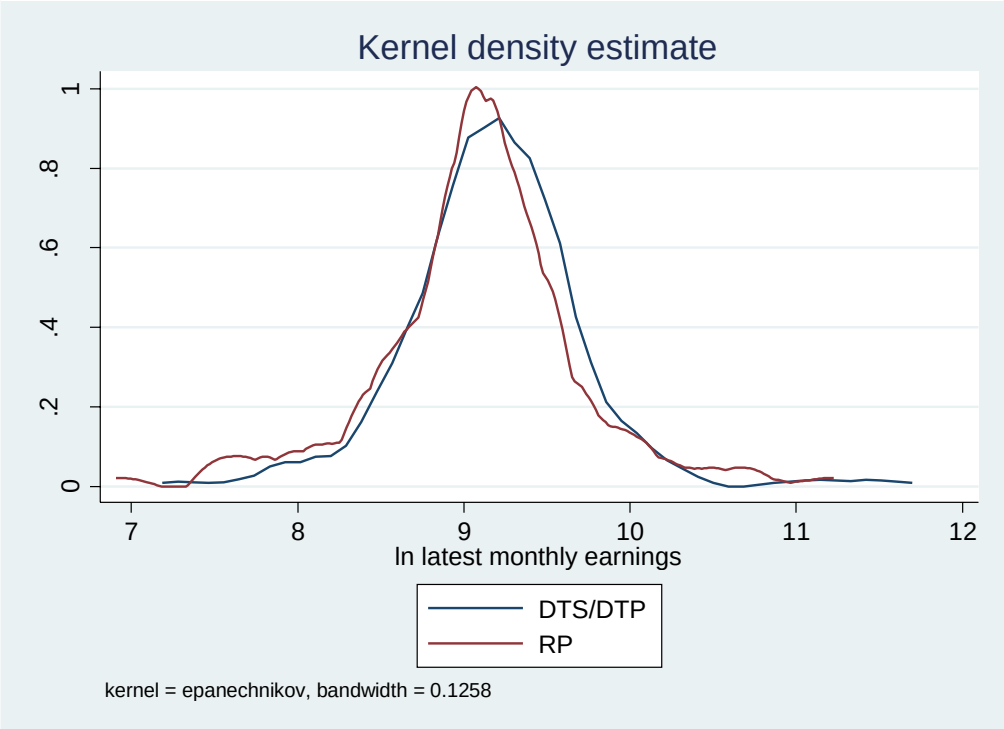
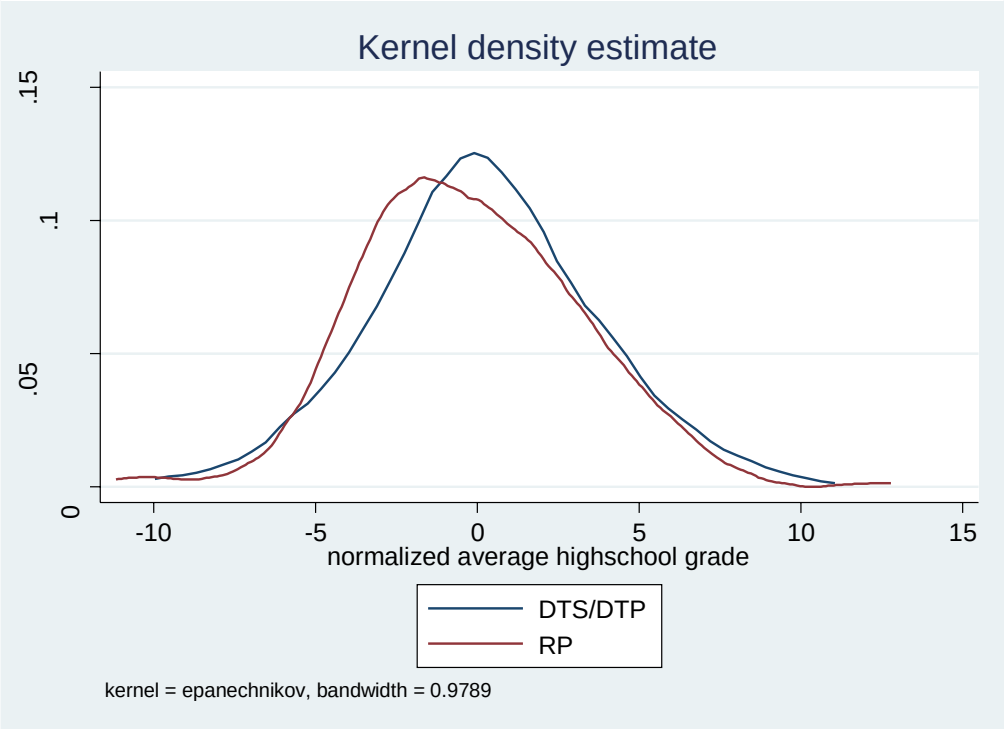


Figure 2 Average Highschool Grade



5. Results

This section summarizes empirical results. Based on the finding that the probablity of being in DTS or DTP increases with a discreate jump from 0.35 to 0.53 when the normalized average highschool score is around zero, fuzzy regression discontinuity design estimation shows significantly positive impacts on the latest monthly earnings and (marginally) current employment incidence. The impact increases as the length of OJT during DTS/DTP increases at least up to 30 weeks. Quantitatively, the impact on monthly earnings attributable to DTS/DTP is substantial, i.e., a nearly 50% increase relarive to the average regular program graduate earnings.

The next two graphs show that the probability of being selected in DTS/DTP jumps at a threshold point in the normalized average highschool grade (zero). Strikingly, the probablity of being in DTS or DTP increases with a discreate jump from 0.35 to 0.53. These also correspond to clearly differently located medians of the scores by the two groups (see Figure 3). By fitting a linear specification in probit on I(DTS/DTP) and x in two regimes (x<0, x>0), the second graph also shows a clear discontinuity in the probablity at zero. The estimation using fuzzy regression discontinuity (FRD) uses the observed discontinuity of the probability along with the value of the normalized average highschool grade.

Figure 3 Probability of Being in DTS/DTP [Non-parametric]

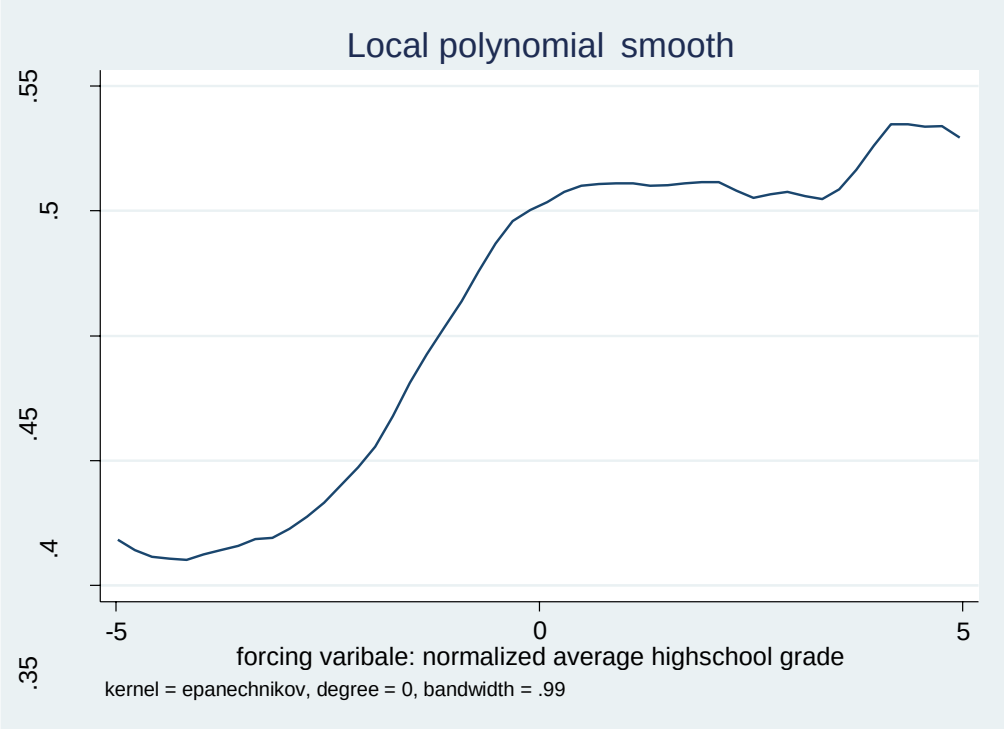
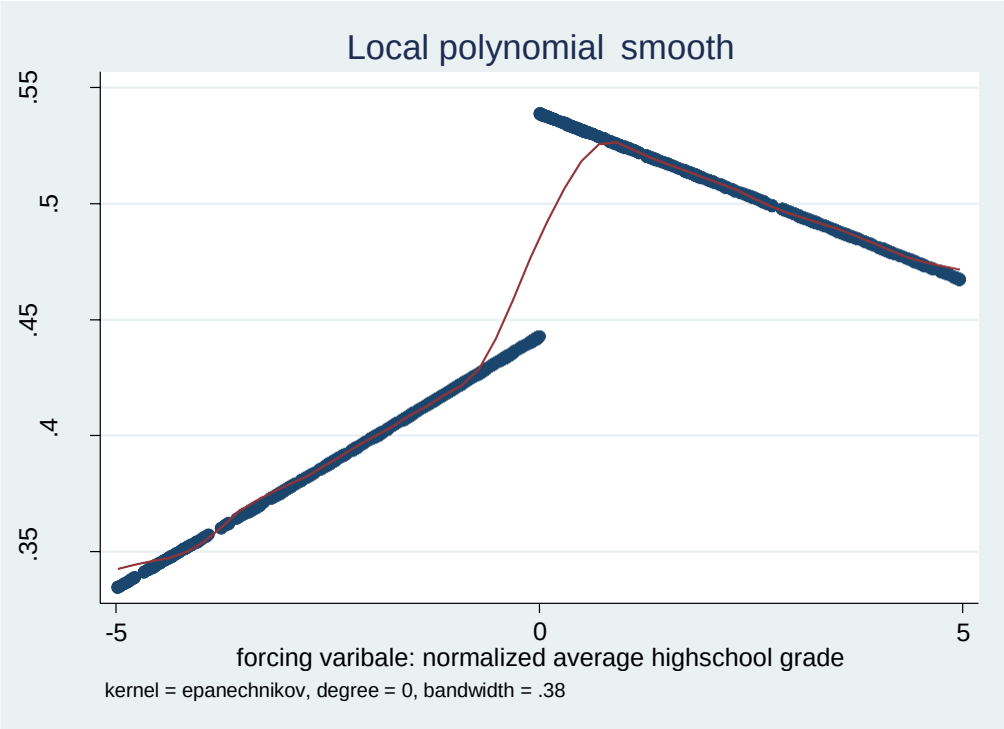


Figure 4 Probability of Being in DTS/DTP [Probit]



As described, the actual estimation problem in FRD is translated into an instrumental variable estimation (Woolridge, 2009; Hahn, et al., 2001). We look at two key outcome variables: ln latest monthly earnings and current employment incidence. The latest monthly earnings come from the most recent employment even though he or she may not be currently employed. For example, a former trainee has experienced a few jobs after completing training but currently is temporarily unemployed as a transition to the next employment. In this case, the last employment is used to compute the latest monthly earnings.

The specifications include the forcing variable: the normalized average highschool grade (x), its interaction with z = I(x>0), age, all of which interacted with institution dummies, and institution-enrollment-year dummies. The identifying instruments are z interacted with institution dummies. The forcing variable x is defined as the residuals of the average highschool grade after controlling institution dummies, enrollment year dummies, their interactions and age. The sample consists of the respondents aged between 20 and 40 and enrolled after 2009. As indicated above, the following estimation accommodates potential heterogeneity specific to each institution by interactions with institution dummies (not shown in tables).

Table 5 DTS/DTP Impacts: Fuzzy Regression Discontinuity Estimation

Dependen t: Sample:	Ln latest monthly earnings	x in (-5,5)	Currently employed or not	x in (-5,5)
DTS/DTP	0.8531	0.4031	0.4395	0.366
	(2.62)	(2.00)	(1.75)	(1.75)
Number of obs	505	439	505	439

Numbers in parenthesis are absolute t values using robust standard errors with institution clusters. The specifications include the forcing variable: the normalized average highschool grade (x), its interaction with z = I(x>0), age, all of which interacted with institution dummies, and institution-enrollment-year dummies. The identifying instruments are z interacted with institution dummies. The forcing variable x is defined as the residuals of the average highschool grade after controlling institution dummies, enrollment year dummies, their interactions and age.
Sample: age between 20 and 40 and enrolled after 2009. Columns 2 and 4 use the sample in which the normalized average highschool grade (x) is in the range between -5 and 5.

Table 5 summarizes key results. Based on the finding that the probablity of enrolling in Dual Training System jumps from 0.35 to 0.55 around the normalized average highschool score being zero, fuzzy regression discontinuity design estimation shows significantly positive impacts on the latest monthly earnings and (marginally) current employment incidence.

Columns 2 and 4 use the sub-sample in which the enforcing variable is relatively close to the threshold point, that is, x is in the range between -5 and 5. Since the discontinuity is observed when the normalized average highschool grade is around zero, the local estimates using its neighborhood are more reliable.

Figure A1 shows that ln earnings of the DTS graduates rather decline when the normalized average highschool grade increases, whereas that of the regular program graduates mildly increases. This observation confirms that the average highschool grade does not cause a spurious effect of DTS on earnings by increasing both the probability of enrolling in DTS and earnings together.

Based on the estimate on Column 2 and the average ln latest monthly earnings among regular program graduates 9.097638, an increase of monthly earnings attributable to DTS/DTP is 4435.43 Peso[9]. Given that the average earnings among regular program graduates in our sample remain near the urban/city minimum wage level (8100 Peso), the estimated increase by completing DTS/DTP is substantial.
Quantitatively, the impact on monthly earnings that is attributable to DTS is substantial, i.e., a nearly 50% increase relarive to the average regular program graduate earnings.

To validate the effect of OJT during DTS/DTP on its impact, the sample is stratified by the number of weeks they worked in partner companies during the training program. If the exposure to actual works in

[9] dy2 = exp(9.097638+0.4031)-exp(9.097638) = 4435.43. If we use the estimate on Column 1, it is dy1 = exp(9.097638+0.8531)-exp(9.097638) = 12033.53, which appears to be too large compared to their average monthly earnings.

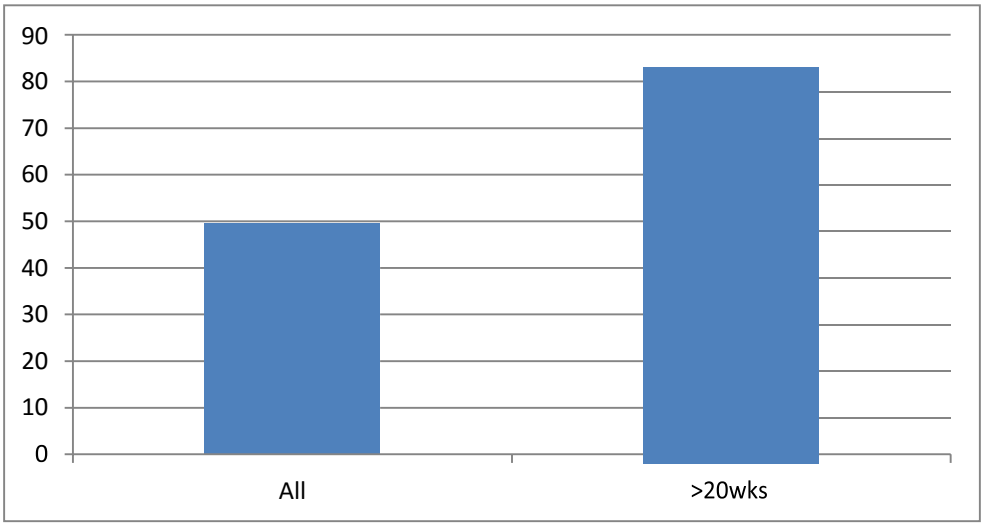
DTS/DTP is important, we expect to see an increase in the impact as the length of the OJT period increases.

Table 6 Impacts by the length of OJT (measured by the number of weeks in company)

Number of weeks in company Sample: x in (-5,5)		>20	> 20 DTS/DTP Manufacturin
DTS/DTP	0.403	0.756	0.6155
	(2.00)	(5.84)	(5.64)
Number of obs	436	403	388

Numbers in parenthesis are absolute t values using robust standard errors with institution clusters. The estimation uses the sample in which the normalized average highschool grade (x) is in the range between -5 and 5. Column 3 uses DTS/DTP trainees specialized in manufacturing and information technology courses (this excludes animal production, dress making, food and beverage services, garments, human resource management, and hotel and restaurant services among DTS/DTP trainees). Control group is regular program graduates in all cases.

Figure 5 Percentage increase in monthly earnings relative to regular programs



In Table 5, the point estimate increases if we use the DTS/DTP sample with the length of the OJT period longer than 20 weeks (Column 2). The above results suggest the importance of OJT during DTS/DTP in determining labor market earnings. In Column 3, the DTS/DTP sample is restricted to those majoyed in manufacturing and information technology courses. In the case of more than 20 weeks in company (Column 3), the impact estimate implies that their monthly earnings become more than 80% higher than the average earnings of regular program graduates (Figure 5).

Next, we calculate private internal rate of return for DTS/DTP, regular program and college graduates. For this purpose, several assumptions are made to make the calculation tractable. Based on the average daily wages computed from the 2013 (April) Labor Force Survey for each group defined by combination of formal schooling and vocational training completion, we have annual earnings profiles by age group.

For direct costs of vocational training and college education, we use tuition fees required at the University of Philippines (Diliman) and De La Salle University (Manila) in 2013 (their average: 70,000 Peso for two semesters) and TESDA/NCR Welding NC-II Course (18,000 Peso).

Table 7 Private Internal Rate of Return: DTS/DTP, Regular Programs, and College

		HS No-Voc	DTS Voc	RP Voc	College No-Voc
Private IRR			43%	31%	21%
COST					
Voc direct cost (enroll)		0	18000	18000	
College direct cost (annual)		0			70000
Opportunity cost (daily wage)*		0	171.8521	171.8521	171.8521
BENEFIT					
Discounted sum at 15/16 Daily wage (LFS April 2013)	15-19	171.8521	**	***	NA
	20-24	238.8784	467.9717	287.9717	455.2281
	25-29	270.9482	510.7535	330.7535	548.9707
	30-34	282.082	524.4051	344.4051	593.9605
	35-39	303.2594	548.2363	368.2363	675.1896
	40-44	304.5376	552.3596	372.3596	739.2538
	45-49	301.819	556.0221	376.0221	783.0038
	50-54	319.4452	557.9019	377.9019	856.3118
	55-59	322.4942	600.7196	420.7196	908.3265

* all groups assume 4 years of opportunity costs in age 15-19, ** 2 year OJT in DTS (75% of high school
graduate wage), *** 1 year employment (high school graduates + vocational training).

Daily wage for DTS graduates was the sum of regular program gradyate wage and the DTS premium calculated from the impact estimate (Column 2, Table 5). Under the assumption of full employment (25 days per month), private internal rates of return calculated at age 17.5 are 43% for DTS/DTP, 31% for regular programs and 21% for college graduates, respectively.

6. Summary and Plan

Our preliminary results show that the DTS has a significantly positive impact on labor market earnings, relative to regular programs. The magniture of its impact increases with the leagth of OJT in company during DTS, which provides a direct proof that the OJT component of DTS is an important factor that contributes to higher labor market earnings among the DTS graduates. The comparison of private internal

rates of returns also shows that DTS has relatively high returns compared to regular program as well as college graduates.

Our research is in progress. First, the above analysis used data right after the first-stage cleaning/editing (April, 2016). The second and third stages of cleaning and editing are planned soon to improve the quality of the tracking survey data. Though such an additional data process can change the results reported above, we expect such a change is small.

Second, we plan to use TESDA entrance exam scores to conduct the FRD analysis (the data collection is on-going). Once the collection of test score data is completed, we will conduct a similar analysis using the test score as the enforcing variable. This exercise will validate the preliminary results reported above.

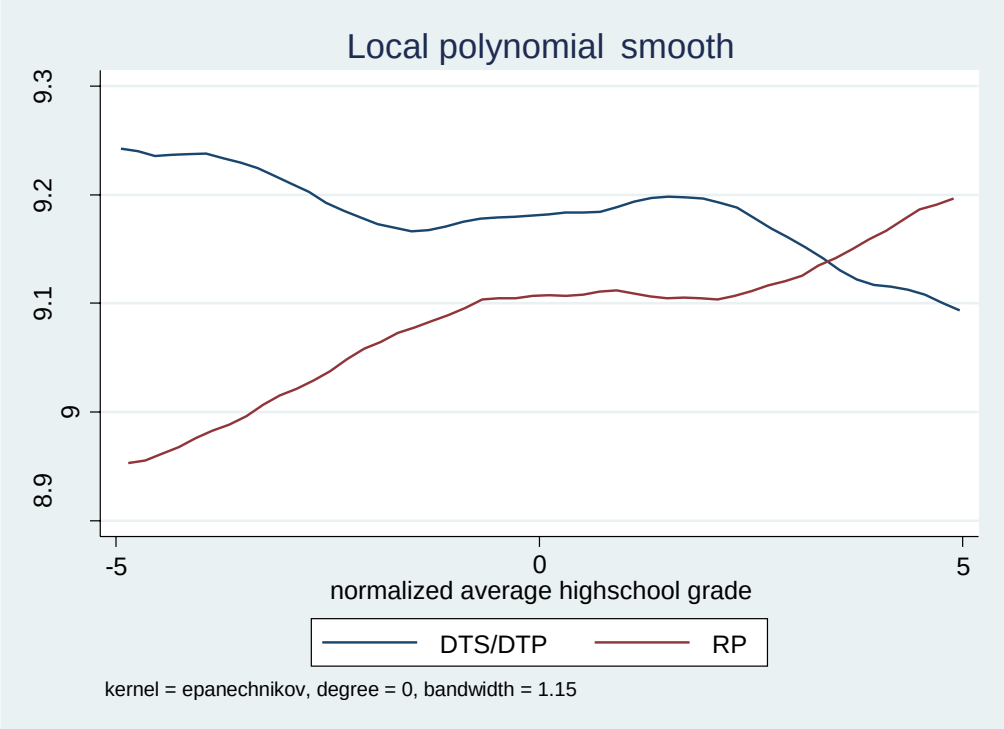
Third, the institution survey data are collected, which captures details of institutional costs for DTS and regular programs. Using the cost data, we plan to calculate social rate of return to answer the question of what types of government-subsidized training programs render high returns from the social planner's viewpoint.

Fourth, we also plan to conduct an institution analysis that cover multiple agents, i.e., training institutions, private companies and trainees in the DTS case, by using parameters estimable from our survey data (both tracking and institution) as well as Labor Force Survey. Roles of OJT, productivity growth, human resource management, and various incentives such as tax are highlighted in the analysis. The analysis will include social rate of return calculations in various sinarios.

The DTS impact evaluation paper will be completed by the end of 2016. The institution analysis paper including social rate of return calculations will be completed by May 2017.

Appendix

Figure A1 Relationship between average highschool grade and ln monthly earnings



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