

**The Impact of TVET (Technical and Vocational Education and Training) on
Income Growth and Employment of Trainees**

By

CHANG, Yoonseon

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF DEVELOPMENT POLICY

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Approval as of December, 2021

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ABSTRACT

After the introduction of human capital theory, education and training is regarded as an instrument for enhancing human capital; and it developed into concept of TVET, Technical and Vocational Education and Training. The existing studies are conflicting on the effectiveness of TVET. Some scholars argue TVET stimulates economic growth, improves employment and wage of workers, and reduces poverty. However, due to the occupation-specific characteristics of skills developed from TVET, other scholars argue that the effectiveness of TVET last only for short periods.

This study is to find the factors of TVET that can be effective in matching skills and job. This study uses the data collected from Kenya Life Panel Survey (KLPS), which is a longitudinal dataset of 7,527 respondents from 2003 to 2019. The data includes education, health, socioeconomic, demographic and other outcomes from students of primary schools in western Kenya. This study used the panel data studies to find the short-term and long-term effect from TVET.

This study finds that unemployed trainees have higher employability in the short run over employed trainees. According to the result of this study, however, trainees without work experience and training experience have a higher income growth rate in short run compared to experienced trainees. It contradicts the assumption of TVET in that work-related experience strengthens the individual's skill and thereby reflected in higher income. This study explained the findings can be attributable to mismatch between skill and job and limitation of training at individual-level. Also, this study suggests recommendations for future research.

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I. Introduction

UNESCO has Strategy for TVET (2016-2021), which includes for youth and adults to have decent work and enhance entrepreneurship as the way to inclusive society. UNESCO-UNEVOC developed Medium-term strategy (2021-2023) in accordance with Sustainable Development Goals (SDGs) 4, quality education. The targets suggested for achieving SDGs 4 are to provide equal opportunities for quality education including TVET, regardless of gender (Target 4.3); to enhance youths to have work-related skills for a decent job (Target 4.4); and to provide education and training opportunities to the vulnerable (Target 4.5). Especially, this strategy puts priority on African countries along with developing key strategies for specific target (i.e., digitalization, climate change).

OECD also emphasizes the importance of TVET as a means for youths to improve a positive outcome for individuals, employers and society (OECD, 2008, as cited in ILO Policy brief, 2021); and World Bank (2010) developed Skills Toward Employability and Productivity (STEP) program as a comprehensive approach toward skills development and thereby improving employment and productivity as stated. STEP program is the combination of sequential process for improving market outcomes across life cycle.

World Bank conducts surveys on the STEP program which indicate that individuals are over-qualified in low-income countries and they can't fully make use of their skills (Handel et al, 2016). Handel et al. (2016) discuss such mismatch problem and it can be divided into three concepts as follows - skills shortage, job shortage, and mismatched fields of study. Skill shortage is the condition that the supply of skilled workers is below the demand of employers, whereas job shortage is the condition that the supply of skilled workers exceed the demand of employers. In addition, mismatched fields of study are the gap between fields of study and

required knowledge in the labor market.

Furthermore, a recent survey of school-to-work transition exhibits that such skill and educational mismatches are prevalent in Africa. 17.5% of employed youth are over-skilled and 28.9% of them are under-skilled; 8.3% of them are over-educated and 56.9% are undereducated. Also, both over-skilled and over-education reduces job satisfaction and increase youth's likelihood of on-job search. Skill and educational mismatches of youth are persistent over time and skilled youth are more likely to transition to better-matched jobs than youth with inadequate education. (Morsy & Muksasa, 2019) This study is to find the conditions that TVET programs are most likely to be effective in matching skills and job.

II. Literature Review

Human Capital Theory and TVET

Ever since Schultz (1960) introduce human capital theory, education and training is considered crucial for enhancing human capital (Schultz, 1960, as cited in Asadullah & Zafar, 2019). It enhances skill and knowledge of individual and thereby facilitates employment in the labor market (Vandekinderen et al., 2018; Dean, 2003; Becker, 1962; Schultz, 1960, 1961). In the macroeconomic aspect, human capital (Lucas, 1988; Solow, 1956), along with technological progress (Nelson & Phelps, 1966) and innovation (Romer, 1990), contributes to economic growth. Also, national investment in education and training as an instrument of developing human capital and economic growth is positively correlated (Dean, 2003; Regmi et al., 2015, as cited in Asadullah & Zafar, 2019).

Education and training developed into TVET (Technical and Vocational Education and Training) as an instrument to provide human capital for maximizing efficiency and profit in the

era of industrial revolution (Anderson, 2009, as cited in UNEVOC, 2013). Researchers identified the effectiveness of TVET on skill, productivity, employment and wage of workers. The empirical evidence supports that TVET enhances skills of youth, especially uneducated youth (Nilsson, 2010); increases productivity and wage of workers in farming in the long run (Kijime et al, 2012; Jothilakshmi et al, 2009). Furthermore, on-the-job training, which is one of TVET, positively affects wage and such effect enlarges along length training and the size of firms (Rosholm et al, 2007).

TVET stimulates economic growth by increasing productivity, innovation and adaptation (Almendarez, 2013); and improving employment and wage of workers (Asadullah, 2019). Asadullah (2019) finds that countries with higher employment and wages have higher economic growth than countries with lower employment and wages; the increase of employment and wage accounts for economic growth by 63% and 14% each. TVET influences social inclusion as well as economic growth. National spending on TVET improves the employment, wages and poverty ratings (Asadullah, 2019).

TVET versus General Education

Whereas general education provides fundamental skill and knowledge in mathematics and communication, TVET provides occupation-specific skills for work (Hanushek et al, 2011). Traditionally TVET is regarded as an opportunity to the unemployed youths, the students with weak academic background and the middle-level technicians in that it helps them competitive in the labor market with skills and reduces unemployment and poverty (Psacharopoulos, 1997). Vocationally educated individuals are more likely to be qualified for the first jobs (Verhaest, 2018) and employed sooner than generally educated individuals (Forster et al, 2016).

Vocationally educated individuals have the advantage of occupation-specific skills, however,

the lower probability of skill mismatches (Verhaest, 2018) and higher employability diminishes over time because they are less flexible compared to generally educated individuals (Forster et al, 2016). They have smoother transition from school to work, but less adaptable to technological change in later life (Hanushek et al, 2011). Even though they are over-qualified for their first job, they are likely to acquire less additional skills than those individuals who are over-qualified (Verhaest & Omey, 2012).

Vocationally educated individuals tend to match their job for skills in the first place, however, they are insufficient in terms of new skills required in the labor market. Besides they have lower fundamental skills and knowledge, which deters acquiring additional skills through practical learning in the workplace. In the contrary, unless generally educated individuals start their career at lower-level jobs, they learn work-related skills through experience in the workplace (Verhaest et al, 2018).

Even the evidence contradicts the traditional assumptions of TVET demonstrates that the vocationally educated youths are not motivated for TVET and their employability and wages are lower than that of individuals with general education (Oketch, 2007). Oketch (2007) attributes such phenomenon to poor quality and the high cost of TVET; poor understanding in the condition of the labor market and informal sector; neglecting the problem of unemployed TVET graduates (Atchoarena & Delluc, 2001, as cited in Oketch, 2007). Moreover, the indirect effects of TVET on economic growth via improved social inclusion (employment, earnings and poverty) rather reduces along the volume of TVET expenditure at the country-level (Asadullah, 2019).

Developing countries versus Developed countries

Along with the contradicting evidence of the effectiveness of TVET, Krueger and Kumar (2004)

argued that an economy of which policies favor vocational education will grow slower than that favors general education and the growth gap increases with the growth rate of technology. They attributed the growth gap between the US and European countries to the different education policies in that European countries favor vocational education and US favors general education. Even though European countries worked well with slower technological change, the US outpaced with the higher growth rate in new technological change.

Despite such pessimistic perspective against TVET, Blunch and Castro (2007) state that TVET is particularly crucial to economic growth and social inclusion in developing countries. African countries still adopt TVET in public education systems (Oketch, 2007). According to Middleton et al (1993), World Bank assisted more than half of its investment for educational systems in developing countries to TVET from 1963 to 1976. Moreover, African countries which used to associated TVET with the colonial educational administration turned to adopt TVET after independent from colonization.

The empirical evidence on the effectiveness of TVET in African countries are found in recent cases in Ethiopia and Botswana. Dessie and Ademe (2017) explain that TVET for small and medium businesses enhances creativity and innovation which fosters economic growth and reduced poverty in Ethiopia. Mupimpila and Narayana (2007) find that the contribution of TVET exceeds that of university education on economic growth of Botswana, from comparison of enrollment in the university and that of TVET institutions.

Job-Skill mismatches in Kenya

Existing literatures discuss the contradicting perspectives regarding the effectiveness of TVET. The effectiveness of TVET itself and its effectiveness over general education is controversial. Even whether TVET can be effective in developing countries is questionable. This study is to

find the evidence that certain variables of TVET can be effective in developing countries from the case of Kenya. Kenya is one of the countries with skill and educational mismatches. According to World Bank Enterprise Survey 2013 (as cited in Puerta et al., 2018), the percentage of Kenyan firms, which responded that skill mismatch in workforce hinders operation management and growth of firms, was 30% in 2013 which is a 10-fold increase from 3% in 2007.

Also, both STEP household survey (2013) and STEP employer survey (2016-2017) implicates that both employers and employees recognize the skill gap in Kenya. Puerta et al. (2018) suggest the skill gap in Kenya is a problem of skills mismatches as well as skill shortage. Employers are concerned that their employees are not sufficient in related-skill and skill level, which implicates that those firms are going through skills shortage.

More than 30% of Kenyan firms responded that they have difficulty due to lack of skills and required work experience. Even worse, less than 30% of employers in Kenyan firms don't recognize skill gaps between required skills for work and the skill of current workers. On the other hand, employees in Kenya perceive they are over-qualified or underqualified. 40% of workers who finished secondary education responded they are qualified and workers with education lower than secondary education responded they are unqualified.

Moreover, STEP survey explains Kenya ranked the second lowest among 11 countries in match rate for education level of workers and job-requirement; 40.4% are under-educated and 24.9% are over-education for job-requirement (Handel et al, 2016). Even though, in this context of skill mismatch, author uses panel data studies to find the effect that pays off from TVET along the time following the recommendation for future research suggested by Nilsson (2010).

Table 1. Individual Match Rate between Worker Education and Job-Required Education, by Country

Country	Under-education	Matched	Over-education
Armenia	5.8%	66.2%	28.0%
Bolivia	25.2%	40.1%	34.6%
Georgia	4.0%	66.4%	29.4%
Ghana	12.8%	47.7%	45.1%
Kenya	40.4%	34.5%	24.9%
Lao PDR	13.7%	45.1%	41.1%
Macedonia	5.1%	72.6%	22.3%
Sri Lanka	10.4%	43.5%	46.1%
Ukraine	3.8%	72.1%	24.0%
Vietnam	4.0%	26.0%	70.0%
Yunnan Province	10.7%	56.6%	32.6%

Source : World Bank STEP Skills Measurement Program (as cited in Handel et al, 2016)

III. Methodology

This study will analyze the impact of attributes of trainees and characteristics of TVET programs on a labor outcome, which is income growth and employment. It will adopt an independent sample's t-test to identify the differences between the income growth rate of trainees depending on the attributes of vocationally educated individuals. Data on employment outcome will include only current employment status in certain industry, this study will use chi-square to identify the relevance of attributes of trainees and characteristics of TVET programs and employability. Then this study will test the correlation for scale variables.

This study will analyze Kenya Life Panel Survey (KLPS) which is a longitudinal dataset of education, health, socio-economic, demographic and other outcomes from students of primary schools in western Kenya. KLPS is the panel survey after a deworming project in Kenya and includes collected dataset about training experience as well as demographics of the 7,527 respondents. KLPS was conducted four times; from 2003 to 2005 (KLPS-1); from 2007 to

2009 (KLPS-2); from 2011 to 2014 (KLPS-3); and from 2017 to 2019 (KLPS-4). Among KLPS dataset, this study will focus on demographic, income, employment and TVET experience.

IV. Research Questions

This study will examine the conditions in which TVET education can be effective. It will estimate the outcome of TVET by the average annual income growth rate of trainees and employment in 5 years and 10 years. By comparing the impact in 5 years and 10 years, this study will identify the short-term and long-term impact of TVET on competitiveness of trainees in the labor market. In the other aspect, it will find the conditions that can maximize the effectiveness by selecting the right trainees, providing proper TVET and finally matching suitable jobs for skills.

This study assumes that the precedent attributes of trainees, including demographic conditions, are expected to affect the decision for participating in TVET programs and how actively trainees participate in the TVET programs. The attributes of trainees which is associated with trainees' ability - for instance, work experience, income level and employment status - are also expected to affect the propensity to participate in TVET programs and effort to maximize the output from the TVET programs.

The characteristics of the TVET program itself are also expected to be crucial factors influencing the outcome of TVET. The characteristics of the TVET programs are training sector and disciplines which are directly related to the supply of skills. Also, delivery mode of TVET can be a factor influencing the outcome from the TVET program. Delivery mode can be categorized by private or public institution; the level of school (high school, vocational school, training center, polytechnical university); a degree or non-degree program; and provision by

program, scholarship, voucher and loan. Furthermore, whether the training is provided within a workplace or in class can be considered.

The quality control of the TVET program and capacity of teachers are assumed to be influencing factors as well. The existence of the quality assurance system for training institutions and license issuance for TVET teachers; a requirement for apprenticeship; the established standard and qualification for skills can be assumed as factors affecting the quality skilled labor. Furthermore, the counseling and job search services can also be considered as factors that can directly affect matching skills for jobs. The dataset of KLPS is confined to demographics and disciplines of TVET, however, this study focuses on the effect of attributes of trainees and the characteristics of the TVET program on the outcome of TVET.

The Attributes of Vocationally educated individuals

The demographic attributes of vocationally educated individual are expected to be the fundamental factors influencing the outcome of TVET. This study specified the demographic attributes of vocationally educated individuals as follows: age, gender, schooling year, marital status and the existence of children. Whether vocationally educated individuals have children is accounted given they are married.

H1 a-b: The impact of TVET on both income growth rate and employability is independent from the age of vocationally educated individuals.

H2 a-b: The impact of TVET on both income growth rate and employability is equal by gender of vocationally educated individuals.

H3 a-b: The impact of TVET on both income growth rate and employability is independent from the schooling year of vocationally educated individuals.

H4 a-b: The impact of TVET on both income growth rate and employability is equal by marital status of vocationally educated individuals.

H5 a-b: The impact of TVET on both income growth rate and employability is equal by the existence of children of vocationally educated individuals.

This study hypothesized that work-related attributes of vocationally educated individuals affect the outcome of TVET as well. It is on the similar assumption that TVET is to enhance the work-related capacity and the work-related capacity is reflected in work-related attributes. Those factors are work experience, employment status and training experience. Employment status includes unemployment; employment in formal job; and employment in informal job.

H6 a-b: The impact of TVET on both income growth rate and employability is equal by past work experience of vocationally educated individuals.

H7 a-b: The impact of TVET on both income growth rate and employability is equal by past training experience of vocationally educated individuals.

H8 a-d: The impact of TVET on both income growth rate and employability is equal by employment status (employed or unemployed) of vocationally educated individuals. Also, the impact of TVET is equal by the type of employment (formal or informal employment).

The Characteristics of TVET programs

Moreover, this study analyzed the characteristics of TVET programs by discipline (categorized by sector and skill level), disciplines of multiple skills and length. Disciplines include sector (agriculture and fishery, manufacturing and services) and level of skills (beautician, driver, government job, health professional, tourism and food, informal transport, office worker, other professional, construction, tailor, teacher, unskilled). According to Handel et al (2016) skill

levels are categorized into four; specific high-level knowledge; specific mid-level knowledge and skill; general academic skills; and general cognitive skills. This study refers to ‘skill’ as specific high-level knowledge and specific mid-level knowledge and skills.

The length of TVET programs is adopted to verify the statement that failure of training is attributable to the limited duration of the training (Mahmud et al, 2014); and the 2-year TVET program increased the employability but the 3-year program didn’t change employability (Hall et al, 2009, as cited in Lowden et al, 2011). The dataset has limited information though, thereby this study didn’t find conditions regarding mismatches of skill and job.

H9 a-b: The impact of TVET on both income growth rate and employability is independent from the disciplined sector of TVET.

H10 a-b: The impact of TVET on both income growth rate and employability is equal by the skill level of disciplines.

H11 a-b: The disciplines of multiple skills affect both the income growth rate and employability of vocationally educated individuals.

H12 a-b: The impact of TVET on both income growth rate and employability is equal by the length of TVET.

Table 2. Category of Skills (Handel et al, 2016)

Skills	Sources
Specific high-level knowledge -STEM (Science, Technology, Engineering and Math) -Medical -Other managerial and professional fields	-Tertiary

<p>Specific mid-level knowledge and skills</p> <ul style="list-style-type: none"> -Technical occupations -craft and repair -Other mind-skill fields -Business procedures, information technologies and use of specific equipment, etc., 	<ul style="list-style-type: none"> -Secondary, TVET apprenticeships, OJT -Employers, TVET, Schools
<p>General academic skills</p> <ul style="list-style-type: none"> -Reading, writing, basic math -Organizational skills 	<ul style="list-style-type: none"> -Primary, Secondary, Tertiary and others
<p>General cognitive skills</p> <ul style="list-style-type: none"> -General knowledge -General reasoning, analytical skills -Problem solving -Trainability (learning how to learn) 	<ul style="list-style-type: none"> -Schools, Work, and Life experience

This study assumed that income growth and employability is higher for trainees with work experience in that work experience and augmented skill are complementary to each other. Even if work experience and skills learned from the TVET programs cannot be integrative as the TVET programs designed for enhancing skills in theoretical and practical aspect, experience workers are assumed to be more comprehensive in learning skills.

This study hypothesized the outcome of TVET depending on employment status: whether the trainees are employed or unemployed; and employed in formal job or informal job. Another hypothesis is the dropout rate from TVET programs. This factor can be related to employment status; marital status and the existence of children.

V. Results

According to the chi-square analysis, the relationship between age group (below 20 years old; 21~25 years old; 26~30 years old) and the income growth rate of vocationally educated

individuals (H1a) is statistically insignificant. However, the relationship between age group of trainees and their employment status in 10 years (H1b) is statistically significant ($\chi^2(2, 254) = 6.200, p=.045$).

The employability of the female in 10 years ($M=.02, SD=.456$) is higher than that of the male ($M=-.06, SD=.645$) according to the independent sample's t-test and the difference in the employability by gender (H2b) is statistically significant ($t(1,224)=2.541, p=0.011$). Still, the relationship between income growth and gender (H2a) are not statistically significant. The dataset from KLPS has employment status by sector and many respondents were employed in more than one sector, so employability in negative figures indicates that previously trainees were employed in more than two sectors but lost jobs.

The schooling year and income growth rate of trainees in 10 years (H3a) are positively correlated ($p=.164, n=258, p=.01$). Income growth rate increases in accordance with the schooling year in long term (10 years) but such correlation is not statistically significant for a short-term (5 years). Whereas the correlation of the schooling year and the employability is statistically insignificant (H3b).

Table 3. The Result of Data Analysis

Variables	Results
Age group	Age group and their employment status (employed or not) in 10 years is related.
Gender	The long-term employability of female is higher than that of male.
Schooling year	Schooling year and long-term income growth is positively correlated.
Marital status	The short-term income growth rate of married trainees is lower than that of unmarried ones. In the long-term, the gap gets narrower.
Work experience	The short-term income growth rate of individuals with work experience is lower than that of individuals without work experience.

Training experience	The long-term income growth rate of individuals with previous training experience is lower than that of individuals without training experience. The long-term employability of trainees and previous training experience are related.
Employment status	The short-term employability of trainees who had jobs at the time of training is lower than that of unemployed trainees.
Employment type	The long-term employability of informally employed trainees is higher than that of formally employed trainees.
Disciplines	The disciplines (sector) and the long-term employability are related. The disciplines (skill level) and the employment status are related both in short-term and long-term.

The short-term income growth rate (H4a) of married trainee ($M=10.604$, $SD=37.074$) compared to that of unmarried trainees ($M=20.708$, $SD=38.901$) is significantly lower ($t(280)=-2.237$, $p=0.026$). In the long-term, the income growth rate of married trainees ($M=4.872$, $SD=17.127$) is lower than that of unmarried trainees ($M=9.061$, $SD=19.029$) and the gap of income growth between married and unmarried trainees gets narrower to 5%, however, it is not statistically significant ($t(251)=-1.857$, $p=0.064$).

It is consistent with the fact that average schooling years of unmarried trainees (9.34 years) are longer than that of married trainees (7.82 years); and schooling years and the long-term income growth rate is positively correlated. Therefore, unmarried trainees are likely to have a higher income growth rate in 10 years. Besides, employability in 5 years and 10 years and marital status is related and it is significant at 5% (H4b).

The income growth rate (H6a) of trainees with work experience in 5 years ($M=7.152$, $SD=33.965$) compared to that of trainees without work experience ($M=22.228$, $SD=39.548$) is demonstrated to be lower ($t(209)=.033$, $p=.01$). The short-term income growth rate (H7a) of trainees with previous training experience in 5 years ($M=9.055$, $SD=32.610$) is lower than that of trainees without training experience ($M=19.625$, $SD=42.885$), however, it is not statistically

significant ($t(209)=-1.850, p=.066$). Whereas the long-term income growth rate (H7a) of trainees with previous training experience ($M=3.002, SD=17.938$) is lower than that of trainees ($M=9.654, SD=19.358$) without training experience ($t(150)=-2.392, p=.018$). Employability of trainees in 10 years and previous training experience are related (H7b).

The difference between the income growth rate of employed workers and that of unemployed trainees is statistically insignificant (H8a). With respect to employment status (H8b), however, the short-term employability of trainees who had jobs at the time of training ($M=-.490, SD=.658$) compared to that of unemployed trainees ($M=.20, SD=.420$) is lower ($t(1,224)=21.130, p<.001$). In addition, the long-term employability (H8d) of informally employed trainees ($M=-.30, SD=.467$) is higher than that of formally employed trainees ($M=-.30, SD=.665$) and it is significant at 1% ($t(49)=2.981, p=.004$). The employability is higher for unemployed trainees in a short run and trainees with informal jobs in a long run.

The disciplines (skills for agriculture, industry and services sector) and employability in the long-term are related (H9b) and it is statistically significant ($\chi^2(2, 498) = 12.436, p=.002$). Also, disciplines of specific skills and employment status (employed) in both 5 years ($\chi^2(11, 375) = 34.970, p<.001$) and 10 years ($\chi^2(10, 303) = 33.544, p<.001$) are related (H10b). However, the income growth rate of trainees depending on disciplines shows statistically insignificant throughout sector (H9a) and skill level (H10a). The existence of children (H5), training for more than one skill (H11) and the length of the TVET programs (H12) are identified statistically insignificant in relation to income growth rate and employability.

VI. Discussion and Conclusion

This study finds that long-term income growth after the TVET program is positively correlated

with the schooling year. Unmarried trainees have higher income growth than married trainees in the short-term. With respect to employability, female trainees have higher employability in a long run over male trainees. Also, unemployed trainees have higher employability in a short run over employed trainees. Furthermore, among employed, informal trainees have higher employability in the short run compared with the formal trainees.

Among these findings, the income growth depending on work experience and training experience contradicts the assumption of TVET in that work-related experience strengthens the individuals' skill and thereby reflected in higher income. According to the result of this study, however, trainees without work experience and training experience have a higher income growth rate in short run compared to experienced trainees. Furthermore, trainees without training experience have higher income growth in the long run as well.

This study looked into the difference of age by employment status. The average age of unemployed individuals (22.87 years old) is lower than that of employed individuals (23.34 years old). From previous data analysis of the relationship between age group and employment status, those individuals from 21 to 25 years old are more likely to be unemployed (66.67%) than employed (33.33%) in long-term. Also, the relationship between the age and income growth rate of trainees is not statistically significant. Therefore, author assumed that factors other than age affect the higher income growth of unexperienced individuals.

These findings suggest that TVET programs alone have a limited effect on individuals' income and employability. This implicates that factors outside training on individuals have a significant effect. First, the low income growth of vocationally educated and experienced individuals can be attributable to skill mismatch between skills developed from training and the demand in the labor market. From 2006 to 2020, the proportion of industry has been slightly above 16%; services sector has declined from 50.4% to 43.2%; and agriculture, forestry and fishing has expanded from 20.5% to 35.2% in Kenya (World Bank, 2021). The respondents

from KLPS were provided training for services and industry sector, which could result in job shortage or mismatched fields of study.

Also, the limited impact of TVET programs can be the mismatch between skill and demand in the informal sector. The informal sectors are usually not publicly registered and operated on household base with small capital (World Bank, 2002). It requires technical skills, management skills and adaptability to apply new skills in order to increase productivity and outcome. Hence, TVET programs in developing countries need adjustment for satisfying the demand in the informal sector as well.

However, a vast informal sector in developing countries is not considered sufficiently and it is one of the reasons that TVET has limited effect in developing countries compared with developed countries (Castro, 2008). The respondents of KLPS had training mostly for employed jobs and it can reduce the effectiveness of TVET as abovementioned limitation from mismatch. Also, according to World Bank's STEP survey on employment by the public/private and formal/informal sector in 12 countries, the informal sector in Kenya accounts for 76% in the labor market and it is notably high considering a mean value of the informal sector in those countries is 56% (Handel et al, 2016),

Lastly, the limited impact of TVET from this study is assumed to show the limitation of training outcome at individual-level and suggest the importance of economic growth and the entrepreneurial growth. Although global economy and technological progress are distinguished from the past, it can be referred to the past economic growth in Korea which used to be an agrarian country as recent Kenya. Korea had a precedent effort to foster economic growth in prior to the introduction of its vocational training system in 1970s when Korea showed its rapid growth.

From the 1960s to the 1980s, the Korean government fostered industrialization and expanded export by maximizing utilization of national resources including labor resources; and utilizing

foreign investment. Korea transformed from labor-intensive industry to export-oriented industry which expanded export and government provided political support to finance heavy chemical industry. The Korean government recognized that developed countries had adopted the vocational training system and the common perception of the needs to develop human resources considering scarce national resources.

Korea enacted Law of Vocational Training in 1967 and established the standard of vocational training and education of teachers. The vocational training in 1970s focused on education for labor supply to a growing heavy chemical industry. The government established more than twenty public training institutions and obligated employers train their employees within business for their demand. On the other hand, the government assisted the supply of teachers through Central Vocational Training Institute. Vocational training in the 1980s developed by extended length and enhanced the quality of training to supply the quality labor and current employees in adaptation to skill-intensive industry (Chung, 2008).

This Korean case implies that government's effort to stimulate economic growth from trade and investment and the entrepreneurial growth are the prerequisite for TVET to be effective. Government facilitated training by predicting changes in industry transformation and labor market demand and provided supportive policies to cultivate human resources. As a result, TVET functioned as a complementary instrument to support the increased labor demand from economic growth and expanded business activity.

This study is based on data regarding demographics and training experience of the respondents of KLPS, however, limited in that the dataset is mainly for follow-up on past deworming experiment. Moreover, the experiment was conducted on the children in the Western Kenyan region and therefore, the income and employment status of the respondents can't fully represent the outcome from TVET in Kenya. For future research, analysis of the type of institution

(private and public institution), degree (degree and non-degree program) and level of institution (high school, college, training center and other institutions) on the outcome of TVET is recommended.

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Appendix

Table 4. Result from independent sample's t-test by marital status

	Married		Not Married		<i>t</i> -test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Income Growth Rate in Short-term	10.604	37.074	20.708	38.901	.026*
Income Growth Rate in Long-term	4.872	17.127	9.061	19.029	.064

* It is significant at the 0.05 level (2-tailed)

Note. *M* = Mean. *SD* =Standard Deviation.

Table 5. Result from independent sample's t-test by work experience

	With Work experience		Without Work experience		<i>t</i> -test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Income Growth Rate in Short-term	7.152	33.965	22.228	39.548	.010*
Income Growth Rate in Long-term					insignificant

* It is significant at the 0.01 level (2-tailed)

Note. *M* = Mean. *SD* =Standard Deviation.

Table 6. Result from independent sample's t-test by training experience

	With Training experience		Without Training experience		<i>t</i> -test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Income Growth Rate in Short-term	9.055	32.610	19.625	42.885	.066
Income Growth Rate in Long-term	3.002	17.938	9.654	19.358	.018*

* It is significant at the 0.05 level (2-tailed)

Note. *M* = Mean. *SD* =Standard Deviation.

Table 7. Result from independent sample's t-test by employment status

	Employed		Unemployed		<i>t</i> -test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Employability in Short-term	-.49	.658	.20	.420	<.001*
Employability in Long-term					insignificant

* It is significant at the 0.01 level (2-tailed)

Note. *M* = Mean. *SD* =Standard Deviation.

Table 8. Result from independent sample's t-test by employment type

	Formal Employment		Informal Employment		<i>t</i> -test
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Employability in Short-term					insignificant
Employability in Long-term	-.03	.665	-.30	.467	.004* (<i>t</i> (49)=2.981)

* It is significant at the 0.01 level (2-tailed)

Note. *M* = Mean. *SD* =Standard Deviation.

Table 9. Result from Chi-Square Tests on employment status in long run

	Unemployed in 10years		Employed In 10 years		χ^2	<i>p</i>	
	<i>N</i>	%	<i>N</i>	%			
Age group	Below 20 years old	11	45.83	13	54.17	6.200	.045*
	21~25 years old	128	66.67	64	33.33		
	26~30 years old	29	76.32	9	23.68		

*It is significant at the 0.05 level (2-tailed)

Note. Age group (n=254)

Table 10. Result from Chi-Square Tests on employability in long run

		Not increased employability in 10 years		Increase in employability in 10 years		χ^2	<i>p</i>
		<i>N</i>	%	<i>N</i>	%		
Marital Status	Married	477	89.16	58	10.84	4.959	.026*
	Not married	586	84.80	105	15.20		
Training experience	Trained	234	91.05	23	8.95	4.876	.027*
	Not trained	578	85.63	97	14.37		
Discipline	Agriculture	31	72.09	12	27.91	12.436	.002**
	Industry	386	87.73	54	12.27		
	Services	10	66.67	5	33.33		

*It is significant at the 0.05 level (2-tailed)

**It is significant at the 0.01 level (2-tailed)

Note. Group by Marital status (*n*=1,226), Training experience (*n* =932) and Discipline (*n* =498)

Table 11. Result from Chi-Square Tests on employability in short run

		Unemployed in 5 years		Employed in 5 years		χ^2	<i>p</i>
		<i>N</i>	%	<i>N</i>	%		
Marital Status	Married	464	86.73	71	13.27	5.810	.016*
	Not married	564	81.62	127	18.38		

*It is significant at the 0.05 level (2-tailed)

Note. Group by Marital status (*n*=1,226)