



Impacts of Lower and Upper Secondary Vocational Education on Economic Growth

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Abstract: The recent global financial crisis has called for improvement on the intensity of economic challenges such as skill shortage to strengthen global economies. Vocational education and training (VET) is one of the education systems that is important for improving workers' and firms' efficiency, productivity and competitiveness. In view of the contribution of VET in addressing labour market imbalances, it is crucial to understand that impacts of the VET on economic growth. Therefore, this study examines the impacts of lower and upper secondary VET on economic growth in 92 countries from year 2000 to 2016 by using panel regression model. The results indicate that upper secondary VET is significantly and positively influence economic growth but lower secondary VET does not affect economic growth. The study further examines the impacts of lower and upper secondary VET on the economic output indicator below and above median groups, respectively. It indicates that the effect of upper secondary VET on economic growth is stronger in the economic output indicator below median group compared to whole sample. The implications from this study are that upper secondary VET does matter for economic growth and it is more important to the countries below median group. Therefore, policymakers need to emphasize on upper secondary VET to enhance the contribution of national investment in VET to improve economic growth.

Keywords: Lower secondary vocational education and training, upper secondary VET, economic growth

1. Introduction

Vocational education and training (VET) are gradually receiving attractiveness at the government priorities and global debates for education and national development plans. More importantly, the Sustainable Development Goals (SDGs), launched in 2015 in the United Nation's publication Transforming our World are envisioned to deliver an "ambitious and transformational vision" that has an objective directed explicitly towards VET (UN, 2015). In Goal 4 of the SDGs, VET is a dominant feature that pursues to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (UN, 2015). It shows the prominence of human development and the necessity to contemplate more seriously about skills for life and work.

VET beyond the year 2015 that highlights the skills for sustainable development is explored by Mcgrath and Powell (2016). They suggest that human development and sustainable development must be seen as inseparable by planning and evaluating VET for its contribution to sustainable development. In reality, much current VET is

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designed in preparing individuals for task that lacks some or all of the features namely life-enhancing, environmentally-sensitive and intergenerationally-aware. VET could contribute to minimize the problems of poverty, injustice and inequality. They conclude that VET is important to transform skills, work and the world to ensure sustainable development and protect the interest of individuals that populate the earth in the future. Jabarullah and Hussain (2019) further support that VET encourages training in essential real-world skillsets namely problem solving, critical thinking, lifelong learning and communication to enhance the skills of the graduates to be well aligned with the dynamic expectations of today's job market.

Wiemann and Fuchs (2018) explain that VET is deemed to be one of Germany's export hits to improve economic growth. Their research describes how dual VET is transforming the skill formation system in Mexico based on qualitative studies in metropolitan regions of the Mexican central highland. The outcome suggests that the Mexican skill formation system under revolution by providing companies with intermediary skilled workers will change Mexico towards a more knowledge-based production country. Their research contributes to concluding an exploration gap on skills in manufacturing that are relevant in practice. Thus, it shows that VET is still under-researched in regional studies and economic geography.

Ethnicity, vocational education and training and the competition for advancement through education are examined by Strathdee and Cooper (2017). The results conclude that the transformation of VET in New Zealand can provide more equality by generating more rewarding and meaningful pathways into employment. From their examination on the relationship between ethnicity, participation and achievement in VET, and the labour market, they point out the significance of dissimilarities in the rules of the competition for advancement through education across space and time in facilitating the outcomes of VET.

A study that anticipates studying the differences between vocational education and the binary higher education is performed by Houten (2017). This study focuses on the Netherlands which has a binary higher education system (academic education and higher professional education) and secondary vocational education. The conclusion describes the difference between secondary vocational education and higher professional education complements to the development of a labour market. Specifically, higher professional education cultivates graduates to an international labour market. Whereas, vocational education is targeted at lower-skilled employees that encountered unequal employability opportunities. Paton, Fluck and Scanlan (2018) further explain that VET usually have no, or low-level entry requirements, compared to the universities which require an academic achievement score that meets the intellectual demands of each course and the completion of twelve years. Hence, VET is a better alternative other than higher education to prepare the graduates equipped with suitable skills in meeting the demands of employers.

As a summary from the literature review, it is found that human capital and particularly VET is crucial to economic growth. There is a difference between general higher education and secondary vocational education. The missing of the literature on the topic related to the impacts of lower secondary VET and upper secondary VET on economic growth requires attention. The human capital and economic growth relationship has been much studied theoretically and empirically and the most notable article is by Mankiw, Romer and Weil (1992). They explain that the accumulation of human, as well as physical capital, provides an excellent description of economic growth. However, the importance of VET on economic growth is a niche in the literature. VET is described as a well-established antidote for youth unemployment because they are unable to meet the cost of higher education general education alone or ease the threat of poverty and economic well-being (Asadullah, Ullah, Asadullah, & Ullah, 2018). The significance of the VET has augmented manifold due to the stimulus of technological dynamism on the skill set required from labor. International relief organizations including United Nation Educational, Scientific and Cultural Organization (UNESCO) and World Bank have been supporting VET for poverty alleviation and economic prosperity of developing countries. According to UNESCO, technical or vocational secondary education (VET) is distinct from a pure generalist curriculum. Therefore, the importance of VET and general education is different. VET is found to have positive effects on economic growth (Siddiqui & Rehman, 2017). Nevertheless, the difference between lower secondary VET and upper secondary VET on economic growth is not being studied extensively in the literature. The main objective of this study is to examine the impacts of lower secondary VET and upper secondary VET on economic growth based on a panel regression model in selected countries. This paper also intends to explore the impacts of lower secondary VET and upper secondary VET on the economic growth below and above median level, respectively.

2. Data and Methodology

This study employs panel regression model to examine the impacts of lower secondary VET and upper secondary VET on economic growth. The data selection on economic growth, lower secondary vocational education and upper secondary vocational education are based on a random selection of 92 countries that covers the year 2000 to 2016 and the source of data is the World Bank. These 92 countries are selected because the data for all three variables are complete from the year 2000 to 2016. This study does not cover the data prior to year 2000 because the emphasis of VET prior to 2000 is relatively less important and the majority of the data are missing. Chinedu, Wan-Mohamed, and Ogbonnia (2018) highlighted that the call for the advancement of TVET deepens and becomes imperative in the 21st century that adheres to sustainable standards.

The panel regression model is illustrated in Equation (1);

$$\ln GPC_{it} = \beta_0 + \beta_1 \ln LSVET_{it} + \beta_2 \ln USVET_{it} + \varepsilon_{it} \quad (1)$$

where GPC is gross domestic product per capita in the US dollar that stands for the indicator of economic growth, LSVET is enrolment in lower secondary vocational that stands for the indicator of lower secondary VET and USVET is enrolment in upper secondary vocational that stands for the indicator of upper secondary VET. LSVET refers to the total number of students enrolled in vocational programmes at public and private lower secondary education institutions, whereas USVET refers to the total number of students enrolled in vocational programmes at public and private upper secondary education institutions. All the variables are expressed in the natural logarithm to capture the impacts in terms of percentage. The expected signs of LSVET and USVET on economic growth are to be positive. It is because, in accordance with the general literature review, VET has a positive influence on economic growth.

The panel regression models in this research are examined through three models namely, pooled ordinary linear regression model (pooled OLS), random effect model (REM) and fixed-effect model (FEM). Firstly, pooled OLS is exploited to present results based on the probability of the data but disregards the panel structure of the data. This means that the model disregards the panel nature of the data and treat ε_i as identically and independently distributed disturbances that are uncorrelated with independent variables. Thus, the data can be pooled and OLS can be utilised to evaluate the model. However, pooled OLS may cause heterogeneity bias, which explains that the countries are all different from one another in fundamental unmeasured ways that vary across countries. Hence, REM or FEM will be employed because ε_i is decomposed into two independent components error term as $\varepsilon_{it} = \lambda_i + u_{it}$. λ_i is time-invariant that captures the country-specific effect. REM handles the constants for each section as random parameters by assuming λ_i as a random variable and it is drawn independently from some probability distribution. In FEM, the constant is treated as group-specific which means the model allows for different constants for each country. The λ_i in FEM is assumed to be constant and it may be correlated with some of the regressors in the model. The selection between pooled OLS and REM is based on Breusch-Pagan Lagrangian Multiplier (BPLM) test where the null hypothesis refers to $\sigma_\lambda^2 = 0$ (Pooled OLS is preferred) versus the alternative hypothesis refers to $\sigma_\lambda^2 > 0$ (REM is preferred). The choice between REM and FEM is based on Hausman Test where the null hypothesis refers to $Cov(\lambda_i, X_{it}) = 0$ (REM is preferred than FEM), versus the alternative hypothesis, refers to $Cov(\lambda_i, X_{it}) \neq 0$ (FEM is preferred than REM) (Gujarati & Porter, 2009).

3. Results and Discussions

The descriptive summary is presented in Table 1. Most of these countries are developing countries, thus the average value for gross domestic per capita is USD13,282. This value falls within the threshold value for the upper-middle income group (USD 3,996 to USD 13,375) which is defined by the World Bank. It is observed that the USVET is much higher than LSVET where the average of USVET is approximately 3 million as compared to the average of LSVET at 0.2 million. This general data indicates that most of the countries emphasis VET at upper secondary level.

Table 1 - Descriptive Data

	Observation	Mean	Std. Dev.	Min	Max
GDP	604	13,282	15,689	127.43	130,267
LSVET	604	244,177	668,248	10	3,997,656
USVET	604	3,265,251	9,780,486	34	57,800,000

Table 2 is the correlation relationship between the variables. Since the correlation values among the independent variables are less than 0.8 and Gujarati and Porter (2009) assert that the coefficient correlation that is less than 0.8 may not be subjected to serious multicollinearity problems. Moreover, we verify for multicollinearity problem by using variance inflation factors (VIF). As a rule of thumb, Gujarati and Porter (2009) recommend a critical threshold of a maximum of 10. The VIF for this model is 2.12, thus it does not exert serious multicollinearity problems.

Table 2 - Correlation of Variables

	lnGDP	lnLSVET	lnUSVET
lnGDP	1		
lnLSVET	0.0243	1	
lnUSVET	0.1961*	0.7262*	1

Table 3 illustrates the results of the panel regression model. The best model is FEM because BPLM test and Hausman test reject the null hypothesis. Therefore, the explanation of the finding is based on FEM model. It is observed that LSVET does not impose a significant relationship with economic growth. It contradicts with the finding from Houten (2017) that postulates VET is positive and significant to economic growth. The reason could be due to the teenagers at lower secondary are yet to have a good grasp of skills in the LSVET programme. On the other hand, USVET exerts a positive and significant relationship to economic growth. It suggests that 1% increase in the enrollment of upper secondary VET will lead to 0.187% improvement in economic growth. This finding supports the outcomes by Asadullah et al. (2018), Houten (2017) and Mcgrath and Powell (2016) that propose VET is beneficial to economic growth. The plausible explanation could be due to the upper secondary VET exposes the students on advanced skills to more matured teenagers that equip them with better skills to fit the employment ability.

Table 3 - Regression Model

	POLS	REM	FEM
lnLSVET	-0.143*** (0.0328)	0.0170 (0.0164)	0.0246 (0.0167)
lnUSVET	0.211*** (0.0320)	0.138*** (0.0330)	0.187*** (0.0391)
Constant	7.513*** (0.264)	6.808*** (0.415)	6.211*** (0.470)
Observations	604	604	604
R-squared	0.068	0.033	0.033
Number of countries	92	92	92
BPLM test	2010.38***		
Hausman test	7.44**		

Note: Figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10%, 5% and 1% respectively

As discussed earlier on, this study also intends to discover the impacts of lower secondary VET and upper secondary VET on the economic growth below and above the median level, respectively. The sample data exerts the median value for economic growth is USD 7,269 million. Therefore, the sub-sample of below and above the median economic growth group is arranged accordingly and the results of a panel regression model are shown in Table 4.

Table 4 - Regression Model based on Sub-sample of Below and Above Median Economic Growth Group

	Below Median Group			Above Median Group		
	POLS	REM	FEM	POLS	REM	FEM
lnLSVET	0.0363 (0.0349)	0.0142 (0.0309)	0.0295 (0.0348)	-0.0321* (0.0181)	0.0317*** (0.0116)	0.0349*** (0.0118)
lnUSVET	0.105*** (0.0316)	0.207*** (0.0372)	0.344*** (0.0521)	0.0264 (0.0190)	-0.067*** (0.0259)	-0.124*** (0.0416)
Constant	5.777*** (0.242)	4.948*** (0.470)	3.139*** (0.677)	9.876*** (0.163)	10.35*** (0.306)	11.03*** (0.497)
Observations	302	302	302	302	302	302
R-squared	0.127	0.155	0.155	0.010	0.062	0.062
Number of countries	58	58	58	49	49	49
BPLM test	880.20***			773.17***		
Hausman test	15.11***			7.78**		

Note: Figures in parentheses are standard errors. *, **, *** indicate statistical significance at 10%, 5% and 1% respectively

From Table 4, the findings for the below-median group are similar to Table 3 where USVET is positively and significantly influences economic growth but LSVET is not significant. The coefficient of USVET in Table 4 (0.344) is larger than the coefficient of USVET in Table 3 (0.187), this result illustrates that the impact of upper secondary VET is more important in countries with lower economic income. Interestingly, USVET becomes negatively and significantly affect economic growth when the income level of countries is above the median level. On the other hand, LSVET becomes positively and significantly affects economic growth when the income level of countries is above the median level. This might be due to in a higher income country, VET that focuses on procedural knowledge (as opposed to theoretical) that prepares people for a specific job to become less relevant to the country. The plausible reason is that high-income country is already well-developed and it requires more talents that are equipped with theoretical knowledge to have better decision making to drive economic growth. Nevertheless, lower secondary VET is still important to the high-income country because this may reduce the unemployment among young teenagers that will indirectly contribute to the economic growth.

4. Conclusions

VET has contributed a speedy return as an international policy priority since 2010. Furthermore, technology is transforming every wild that influences the way society works and lives in this 21st century. Therefore, the importance of VET on economic growth cannot be neglected. The main objective of this study is to examine the impacts of lower secondary VET and upper secondary VET on economic growth. Generally, upper secondary VET is crucial for economic growth. This paper also intends to explore the impacts of lower secondary VET and upper secondary VET on the economic growth below and above the median level, respectively. It is concluded that upper secondary VET is more relevant for low-income countries.

It is obvious that VET has received impetus at the national, regional, and global levels. Hence, VET must be able to anticipate and respond accordingly by offering relevant programmes, suitable curriculum, and new ways of teaching-learning and assessing the students. Meanwhile, realising that skills workers are needed and are taking a big portion of the whole workforce in a low-income country, it is necessary for the policymakers in low-income country invest in upper secondary VET because it can play a major role in economic growth.

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