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The Nexus Between Education and Structural Transformation: Evidence from Vietnam*

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Abstract

Both structural transformation and education are the predominant subjects in the literature of development economics. This study examines the relationship between education before the tertiary level and the structural transformation of provinces by using Vietnam as a case study. In this study, education before the tertiary level would be disaggregated into three groups: primary, lower secondary, and upper secondary, then analyzed simultaneously on three-panel data models. Research data is taken from the statistical yearbook of provinces in Vietnam for 2015–2018. Research results show that education before the tertiary level plays a vital role in structural transformation. The enrolment rate of various education levels has a different influence on economic structure, and the lower secondary level has more significant effects than the upper secondary level. This reflects that participating in lower secondary is a fundamental requirement for taking some jobs in the non-agriculture sector, while upper secondary helps to upgrade the learner's abilities to respond to higher requirement jobs. The high rate of repeaters in upper secondary education will slow down the structural shift towards non-agriculture, and changing the traditional attitude about repeaters plays an essential role in improving this rate.

Keywords: Education, Structural Transformation, Drop-Out, Repeaters, Vietnam

JEL Classification Code: O14, I25, H52, P46

1. Introduction

Both structural transformation and education are the predominant subjects in the literature of development economics. Structural transformation, often known as the relocation of activities across sectors, is an important part of development (Diao et al., 2019). Any country's structural transformation is linked to its history, economic development, urbanization, or new social categories habits (Rodrik, 2016). Besides, the change in economic structure plays an essential role in increasing productivity and living standards sustainably (McMillan & Heady, 2014). The structural transformation is also thought to open up new growth avenues by providing opportunities or fresh combinations (Boschma, 2015). For policymakers, the structural transformation could be viewed as a tool for resiliency in the face of various fluctuations (Van Aswegen & Retief, 2020). Meanwhile, education plays a crucial role in shaping people's personalities and the future of society (Apple, 2013). More specifically, Gumenyuk et al. (2021) argued that education is one of the components that form the basis for the individual's professional development, initiative, and well-being. In addition, education also has a positive impact on economic development (Ismayilov et al., 2020; Kruss et al., 2015; Widarni & Bawono, 2021), the income of young households (Nguyen et al., 2021), and urbanization (Haryanto et al., 2021). As a result, study into the effects of structural transformation and education has been broadened to include a wide range of topics. However, there has been very little research into their relationship.

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In a few existing studies related to it, the structural transformation was examined by effects from education in general, but education has multiple levels with different objectives, especially education levels preceding tertiary education. Filling this theoretical gap could lead to a more thorough understanding of the relationship between education and structural transformation, or perhaps a new awareness of it.

As a developing country, Vietnam has significantly experienced the structural transformation from economic reform "Doi Moi" in 1986. After 30 years, the share of the non-agriculture sector in GDP increased from 53.7% in 1988 to 85.3% in 2018. This structural change contributed considerably to the economic growth of Vietnam. During that time, the average annual GDP growth rate was 6.75 percent, which is among the highest rates in the world. Simultaneously, the GDP per capita improved roughly fivefold from $400 to $64,000 (in constant 2010 US dollars)[1], transforming the country from one of the world's poorest to a lower-middle-income country. In addition, Vietnam is also the country in which education has always been considered as the top national concern and priority. The government has always set aside a huge portion (over 16%) of its expenditure for education. This helped the country improve the literacy rate among the population aged 15 years and older from 87.6% in 1989 to 95% in 2018[1]. Along with the significant change in both the economic structure and education, Vietnam will be a well-represented case to investigate the relationship between education and structural transformation.

Unlike previous studies, this study provides a deep analysis of the effects of education at the levels before tertiary education on provincial structural transformation by using Vietnam as the case study. The findings of this study will contribute to a better understanding of the relationship between education and structural transformation, which is especially significant in developing countries where agriculture plays a large role in the economy.

The rest of the study is organized into five sections. Section 2 is the literature review. The methodology and data are presented in section 3. Section 4 provides the research results. The discussion is in section 5. The final section is the conclusion.

2. Literature Review

2.1. Education and Productivity

Almost all of the literature investigates the effects of education on economics by analyzing human capital. Karachiwalla and Palloni (2019) supplemented quasi-experimental evidence on the relationship between educational attainment and structural transformation in which the increase in human capital leads the shift away from the agriculture sector in the long term. More clearly, Le et al. (2019), Pelinescu et al. (2019), and Widarni and Wilantari (2021) argued that education is regarded as the essential mean of investing in human capital, and it directly affects the economy by improving productive capacity and qualification of the workforce. Especifically, Porzio et al. (2020) indicated that investment in education help to improve human capital, then shortening the difference in labor productivity between agriculture and other sectors. Besides, Teixeira and Queirós (2016) agreed that more education is more productive and as the skills of the workforce increase, productivity and the capacity for innovation develop exponentially. Meanwhile, agricultural innovation and technology advancements allow farmers to produce the same amount of output with less labor per unit of land, allowing resources from the agricultural sector to be diverted to other sectors (Bustos et al., 2019). In research of sub-Saharan Africa, Djoumessi et al. (2020) showed that any productivity increase in agriculture will raise off-farm employment, and this is a causal relationship with a one-way direction.

2.2. Education and Job Requirements

In terms of employment requirements, the acquisition of necessary skills for workers to transition from low-skilled to high-productivity or knowledge-based jobs is at times ineffective due to a lack of education and training (Stiglitz & Yusuf, 2001). Because of the scarcity of human capital, Suhendra et al. (2020) suggested that labor with a low level of education would find it difficult to obtain a job that demands a high level of knowledge, such as in the formal and industrial sectors. Similarly, Liu et al. (2020) argued that young people in Vietnam are increasingly well educated; therefore, they enjoy a wider array of non-farm job options than their parents did. Meanwhile, Sen (2018) demonstrated that low educational quality in Thailand is a component of market failure, which is a key factor in limiting the supply of skilled workers from low- to high-productivity sectors. Workers in various sectors do, in fact, attend school at different times. Workers in agriculture have a lower value than workers in other sectors, with the largest differences in value occurring between the agricultural sector and skilled services. (Herrendorf & Schoellman, 2018). On the other hand, Lybbert and Taylor (2020) stated that if schools provide valuable knowledge and skills, human capital will be accumulated, and higher schooling will decrease the likelihood of migrating to farm jobs. In addition, Gillman (2021) presented that new industries appear along with the development of higher human capital. Thus the increase of education levels leads to the reallocation of labor in which labor leaves the agricultural sector as human capital deepens.

2.3. Impacts of Various Education Levels

Each level of education provides various knowledge and skills for the learner with a unique objective. Therefore, the effects of each education level on the economy have differences. By analyzing the impacts of different education levels on economic growth in India, Self and Grabowski (2004) indicated that there is a strong positive correlation between all levels of education and economic growth; however, the causal nexus only happens at primary and secondary levels while it does not occur with tertiary level. Similarly, Singh et al. (2018) estimated the long-run and short-run effects of different education levels on Malaysia's economic growth. The results showed that primary and tertiary education have important effects on economic growth in the long run, while only tertiary education is a significant and positive contributor to growth in the short run. At the regional level, Siddiqui and Rehman (2017) found that primary and secondary education was more remarkable in explaining the economic growth fluctuations in East Asia, whereas tertiary education showed positive impacts on growth in South Asia. More general, Petrakis and Stamatakis (2002) argued that the growth of less developed countries mainly relies on primary and secondary education while higher education plays an essential role in the growth of advanced economies. Besides that, Fleisher et al. (2010) stated that workers with no higher than primary education have much lower marginal product than labor with more than primary schooling. Meanwhile, Márquez Ramos and Mourelle (2019) showed that there is decreasing returns to the level of education in which the gap of individual wages between being illiterate and having a primary education is higher than the difference between having a secondary and tertiary education. In his research, Tchamyou (2020) agreed that inequality in income reduces with the expansion of education; however primary education creates more favorable conditions for positive income redistribution than other levels of education.

3. Methodology and Data

3.1. Methodology

To provide deep understanding, this study uses panel data which provide multidimensional information about the education and structural transformation of each province over time (Table 1). As for this type of data, this study uses three models simultaneously in analyzing: Pooled OLS model, Random-effect model, and Fixed-effect model. With Pooled OLS model, the assumption is that observations of each province have no correlation at different times, and these observations have homoskedasticity between provinces. This model has the form as the following Equation:

$$\mathrm{SNA}_{it} = \beta_1 + X_{it}\beta + \omega_{it} \quad (1)$$

Where: SNA_{it} is share of non-agriculture sectors in the gross regional domestic product of province i at time t. β_1 is the intercept term. X is a matrix of independent variables that are described in Table 1. The vector of regression coefficients is β which would be estimated. The random disturbance term is ω with a mean of 0. This model pool all of the data for provinces and years then runs an ordinary least squares regression model. Meanwhile, the fixed-effects model and random-effect model assume that there is the heterogeneity of specific provinces (Croissant & Millo, 2008; Hausman, 1978). In the fixed-effect model, the differences of characteristics across provinces are explained by the intercept. This model is described in the equation below:

Table 1: Description of Key Variables

Variables		Description
SNA		Non-agriculture share in the gross regional domestic product (%)
Enrolment rate	PEnrol	Enrolment rate of primary education (%)
	LEnrol	Enrolment rate of lower secondary education (%)
	UEnrol	Enrolment rate of upper secondary education (%)
Rate of repeaters	Prep	Rate of repeaters of primary education (%)
	LRep	Rate of repeaters of lower secondary education (%)
	URep	Rate of repeaters of upper secondary education (%)
Rate of drop-out	PDrop	Rate of drop-out of primary education (%)
	LDrop	Rate of drop-out of lower secondary education (%)
	UDrop	Rate of drop-out of upper secondary education (%)

$$SNA_{it} = \alpha_i + X_{it}\beta + \omega_{it} \quad (2)$$

Where: α_i is the intercept term of each province. By contrast, the difference in provinces' characteristics in the random-effect model is supposed to be random and uncorrelated to predictor variables included in the model. This model is presented in the following equation:

$$SNA_{it} = \alpha + X_{it}\beta + \theta_i + \omega_{it} \quad (3)$$

Where: α is the constant term, θ_i is the random error term with mean 0 and variance (σ_θ^2). With three models, the choice of a suitable model to analyze is based on some tests. The *F* test is used to assess the suitability between the fixed-effect model and Pooled OLS model, whereas the Breusch-Pagan Lagrange multiplier test compares the random-effect model to Pooled OLS model (Breusch & Pagan, 1980). In addition, the Hausman test is implemented to choose between fixed or random effects.

3.2. Data

Education can be analyzed through lots of different aspects and is usually represented through human capital with various proxies such as enrolment rate (Barro & Lee, 2013; Fabro & Aixalá, 2012; Mendy & Widodo, 2018), years of schooling (Haraguchi et al., 2019; Porzio et al., 2020; Teixeira & Queirós, 2016), expenditure on education (Hartwig, 2012; Widarni & Wilantari, 2021), or student/teacher ratios, test scores, etc. (Benos & Zotou, 2014). However, these proxies in previous studies only partially described a picture and do not reflect the whole picture about education. For example, the number of years spent in school or the amount spent on education must be adjusted to represent the quality and progress of students' learning when they may take a long time to complete each level. In another case, the years of schooling or expenditure on education face the challenge to reflect the quality, progress of learning of students when they could take a lot of time to graduate each level. As such, this study uses synthetically three rates: enrolment rate, rate of repeaters, rate of drop-out as proxies for education to present a comprehensive view.

For structural transformation in provinces, employment shares, final consumption expenditure shares, and value-added shares are considered the three most popular measurements (Herrendorf et al., 2014). Therefore, this study chooses value-added as a measurement of the non-agriculture share in gross regional domestic product.

As mentioned above, this study uses balanced panel data of 63 provinces in Vietnam from 2015 to 2018 with 252 observations. Data was collected from the annual statistical yearbook of provinces in Vietnam.

4. Results

4.1. Descriptive Statistics

The non-agriculture share in the gross regional domestic product of provinces (SNA) has a mean of 71.650% and ranges from 45.020% to 93.140% (Table 2). The enrolment rates of different education levels have heterogeneity. The mean enrolment rate in primary education is 100.449%, and this value decreases following the next level, 92.563% for lower secondary education and 68.100% for upper secondary education. Besides that, the enrolment rate in all education levels also have divergence between provinces; the lowest enrolment rate is lower than 50% whereas the highest rate is over 100% in all three education levels. As for the rate of repeaters, primary, lower secondary, and upper secondary

Table 2: Descriptive Statistics of Variables

Variables	Mean	Standard Deviation	Min	Max
SNA	71.650	10.177	45.020	93.140
PEnrol	100.449	7.978	47.072	119.080
LEnrol	92.563	8.763	48.300	100.300
UEnrol	68.100	18.089	31.480	102.700
PRep	0.771	0.682	0.000	3.930
LRep	0.644	0.502	0.000	2.960
URep	0.690	0.625	0.000	3.450
PDrop	0.139	0.267	0.000	1.730
LDrop	0.966	1.123	0.002	8.860
UDrop	1.848	1.617	0.010	15.620

education have a mean of 0.771%, 0.644%, and 0.690% respectively. In addition, there are some provinces that have the rate of repeaters as zero, while there are no provinces that have a rate of repeaters more than 4%. In contrast to enrolment rates, the drop-out rate increase along with education levels. On average, the lowest drop-out rate of all education levels belongs the primary education (0.139%), and the highest rate of drop-out belongs to upper secondary education (1.848%), while the rate of lower secondary education is intermediate (0.966%). Similarly, the difference between the maximum and minimum values of drop-out rate among provinces is the lowest in primary education, followed by lower secondary education and the highest in upper secondary education, which ranges from 0.010% to 15.620%.

4.2. Panel Data Model Analysis

The correlation matrix and multicollinearity test are shown in Table 3. It is clear that the independent variables have a correlation coefficient with others at a relatively low value (less than 0.7). Also, the variance inflation factor (VIF) of each variable in the multicollinearity test is lower than 3, and the mean of VIF is 1.595 (less than 2). At the same time, the multicollinearity in the regression analysis with panel data is not a big problem as the independent variables can correlate with one another, except in the case of perfect correlation (Wooldridge, 2010). From this, we can conclude that this model does not have multicollinearity, and all the above independent variables could be used in the regression analysis.

This study estimates the effect of education before the tertiary level on structural transformation in provinces using three types of models. Table 4 shows that the results of estimations vary across models. The coefficients and significance level of independent variables in Pooled OLS are different from the rest of the models. In addition, the significance level and sign of almost all independent variables in fixed-effect and random-effect models are similar, while the magnitude of the coefficients of these variables is different. The Breusch-Pagan Lagrange multiplier test with the null hypothesis: "No significant difference across units" gives $\chi^2 = 278.82$ (p-value < 2.2e-16), rejecting the null hypothesis. Meanwhile, the F-test, which testes for fixed effect with the null hypothesis: "OLS is better than fixed," gives a value of 62.50 (p-value < 2.2e-16); hence, the fixed-effects model is a better choice. Also, the Hausman test with the null hypothesis "random-effect model is more preferred than fixed-effect model" give $\chi^2 = 158.32$ (p-value < 2.2e-16), demonstrating that the fixed-effect model is more suitable to analyze the estimation results. According to Baltagi (2006) and Torres-Reyna (2010), cross-sectional dependence and serial correlation are the problem in panels with long time series. They are not much of a problem in micro panels with few years and a large number of cases. In our study, since the panel data is only four years old and there are 63 provinces, cross-sectional dependence and serial correlation are not issues in our regression.

It can be seen that the coefficients of enrolment rates in secondary education (both lower and upper level) in the fixed-effect model are positive (0.102 and 0.064, respectively) and significant at 0.05 level while the coefficient of enrolment rate in primary education is insignificant (p-value = 0.841). As for the rate of repeaters, the coefficients in all education levels have negative values; however, this coefficient is significant at 0.01 level (p-value = 0.00054) in upper secondary education. On the other hand, the coefficients of the drop-out rate are insignificant in all levels of education.

Table 3: The Correlation Matrix and Multicollinearity Test

Variables	PEnrol	LEnrol	UEnrol	PRep	LRep	URep	PDrop	LDrop	UDrop
PEnrol	1.000	0.666	–0.439	0.047	0.008	0.026	0.092	0.022	–0.063
LEnrol	0.666	1.000	0.633	–0.230	–0.106	–0.074	–0.071	0.123	0.106
UEnrol	–0.439	0.633	1.000	–0.040	0.135	–0.125	0.120	–0.281	–0.236
PRep	0.047	–0.230	–0.040	1.000	0.166	0.172	0.152	0.020	–0.025
LRep	0.008	–0.106	0.135	0.166	1.000	0.194	0.054	0.486	–0.031
URep	0.026	–0.074	–0.125	0.172	0.194	1.000	–0.023	0.018	–0.088
PDrop	0.092	–0.071	0.120	0.152	0.054	–0.023	1.000	0.474	0.022
LDrop	0.022	0.123	–0.281	0.020	0.486	0.018	0.474	1.000	–0.065
UDrop	–0.063	0.106	–0.236	–0.025	–0.031	–0.088	0.022	–0.065	1.000
VIF	1.019	1.440	1.486	1.064	1.755	1.243	1.832	2.966	1.550
Mean VIF	1.595								

Table 4: Results from Panel Data Models

Dependent Variable: Value-Added Share of Non-agriculture						
	Pooled OLS		**Fixed-Effects**		**Random-Effects**	
	Coefficient	***t*-statistic**	**Coefficient**	***t*-statistic**	**Coefficient**	***z*-statistic**
Intercept	66.036***	–9.076			59.496***	–7.839
PEnrol	–0.096	–1.168	0.015	–0.2	–0.012	–0.181
LEnrol	0.035	–0.364	0.102**	–2.106	0.109**	–2.278
UEnrol	0.239***	–6.114	0.064***	–2.961	0.080***	–3.691
PRep	–5.628***	–6.339	–0.206	–0.334	–0.942	–1.584
LRep	0.468	–0.333	–0.853	–1.315	–0.755	–1.141
URep	–1.32	–1.463	–1.216***	–3.524	–1.289***	–3.629
PDrop	8.605***	–3.525	–0.905	–0.591	–0.185	–0.121
LDrop	–0.374	–0.43	0.034	–0.097	–0.091	–0.264
UDrop	–0.089	–0.217	–0.002	–0.014	0.019	–0.137
R-Squared:			0.268			
Breusch-Pagan Lagrange Multiplier Test	278.82***					
F test for individual effects	62.50***					
Hausman Test	158.32***					

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance.

5. Discussion

Based on the estimation results, the education enrolment rates play an important role in the structural transformation of provinces. More specifically, when enrolment rate in lower secondary and upper secondary level increase by 1%, the non-agriculture share in economic structure increase by 0.1% and 0.06%, respectively. Meanwhile, the impact of enrolment rate in primary education on structural transformation is statistically insignificant. From that, the enrolment of various education levels has a different influence on economic structure. The lower secondary level has more significant effects than the upper secondary level. This reflects that participating in lower secondary is a fundamental requirement for some non-agriculture jobs, while upper secondary helps to upgrade the learner's abilities to respond to higher requirement jobs. Therefore, the government must have a policy of compulsory education at the lower secondary level instead of the primary level (which exists presently in Vietnam).

On the other hand, the repeater rate also affects structural transformation, and this relationship is negative. However, the impact of repeaters' rate on structural transformation is only significant at upper secondary education. If this repeater rate decreases by 1%, the non-agriculture share in the economic structure will increase by 1.2%. The reasons for this relationship are: First, society's conventional attitude about repeaters, especially in rural areas, is that repeaters are unfit to continue their studies, and investment in their education will be wasted. Thus, these learners are forced to help their families in agricultural activities instead of encouraging them to focus on their studies. Second, repeaters in this level are usually self-deprecating with their knowledge, and they doubt that their abilities could meet the high requirements of some jobs in the non-agricultural sector. Therefore, they consider jobs in the agriculture sector as a suitable option. In addition, because of their low self-esteem, these repeaters are hesitant to pursue higher education which could help them exploit and develop their skills and abilities, and, create additional job opportunities in non-agricultural sectors. Third, employers in various non-agricultural sectors emphasize having a strong academic record, which limits the opportunities for repeaters. Clearly, changing the traditional attitude about repeaters plays an important role in transforming the economic structure. In Vietnam, the culture of attaching importance to degrees is still very popular, while primary education or secondary education, or even higher education, is just one aspect of assessing the ability of labor.

Although it will take a long time to change society's mindset about repeaters in Vietnam, it can be possible. Policymakers should start by showing people good examples of repeaters who are still capable of succeeding, taking on jobs that require high skills and knowledge, and making contributions to the development of society in the future. In addition, the tasks of teachers and schools are to help weak students overcome self-doubt, guilt with friends and strive to complete the minimum requirements of the subjects. The government needs to have policies to financially support learners from poor families who cannot invest in their (learners) education and encourage such learners to continue enriching their knowledge and improving their skills and abilities.

There are many reasons for students dropping out of school. It may be because the family does not have the resources or conditions to allow their children to continue their studies, or because students themselves are frustrated when they cannot keep up with their peers, or it is also possible that families send these students to career training. With the diversity of reasons for dropping out, these drop-outs can enter the workforce in various occupations in both agriculture and non-agriculture sectors. Therefore, the relationship between the dropout rate at all levels of education and structural change is not statistically significant. However, it is worth noting here that dropping out of school will affect the quality of future labor resources. When students drop out of school in the long run, it will limit workers' ability and knowledge, which makes it difficult for these workers to fit into higher-requirement occupations. Therefore, to ensure the labor force can adapt to future jobs, policymakers need to control the dropout rate through propaganda about the role of education. In addition, policies on compulsory education and tuition support are also tools that can be considered.

6. Conclusion and Limitations

This study investigates the impact of education before the tertiary level on the structural transformation of provinces in Vietnam by separating the education criteria into three types of rates: enrolment, repeater, and drop-out rate, with three different levels. The findings suggest that the role of education in structural transformation cannot be denied and that different educational criteria have different effects on this process. The increase in the non-agricultural share of the provincial economic structure is due to an increase in the enrolment rate in both lower and higher secondary education. Meanwhile, in upper secondary education, there is high repeaters' rate, which has a significant impact on structural change. Therefore, it is evident that the government should adopt policies to encourage education (school) attendance through the dissemination of information on education benefits, education fee subsidies, or compulsory education, to accelerate structural transformation. Furthermore, schools and teachers must motivate and inspire students to continue their studies, enrich their knowledge, and develop skills that will enable them to fulfill the needs of jobs in the future. Another important aspect is that the school year should not be used as a proxy for education when examining structural transformation because repetition takes longer but has the opposite effect.

Because of the limited data available, this study does not look into other aspects of education in the locality such as teachers' qualifications and characteristics of learners. Meanwhile, these characteristics can provide additional data that can more deeply explain the differences in education across regions and the underlying causes of the indicators mentioned in the research model. Future research can examine this critical issue.

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Endnotes

[1]https://www.gso.gov.vn/