Education expansion and its returns to education in Vietnam: a two-step Heckman model analysis

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Abstract

This study investigates the impact of educational expansion on the relationship between education and its economic returns as posited by the human capital theory. Specifically, we explore how the expansion of education affects the returns to higher levels of education relative to lower ones and examine gender differences across levels of education. To achieve these objectives, we use data from the Vietnam Household Living Standards Surveys (VHLSS) conducted between 2002 and 2014, encompassing a sample of 133,600 individuals. Our empirical findings, consistent with the human capital theory, show that higher levels of education are associated with increased monetary returns, even in the context of educational expansion. Nevertheless, we observe varied gender effects resulting from the expansion of education, particularly for individuals with no or primary education. Notably, women in these educational categories tend to earn lower wages than their male counterparts. In contrast, women who have attained tertiary education have higher wage premiums than men. Overall, this study's results support the human capital theory while emphasizing the significance of considering education as a positional good and recognizing the gender-specific impacts of educational expansion.

Keywords Education return · Educational expansion · Labor market · Higher education · Heckman selection · Human capital

Introduction

Many studies have focused on examining the economic return to education for decades. In addition to the elucidation of how much an extra year of schooling affects earnings, researchers have also been interested in how the economic returns to education vary along with an expansion of education at the societal level and the mechanisms that can explain it. This research on the economic returns to education has produced a rich literature, whether in developing or developed countries. In this literature, some studies argue that the premia to education decreases as education scarcity decreases because these premia are linked to the status of education as a scarce good (Dickson & Smith, 2011; Van de Werfhorst, 2011). However, other studies support that the relative premia to education can be maintained even if there is educational expansion because the labor market penalizes individuals with lower levels of education (Bills, 2016; Smyth & McCoy, 2011). Furthermore, some researchers argue that the returns to education increase, given the higher demand for highly educated workers in the labor market (Acemoglu & Autor, 2011; Goldin & Katz, 2008).

While previous studies provided insights into the economic returns to education, there is a need to account for a critical aspect of the process. To estimate the link between education and labor market outcomes, typical studies compare the labor market outcomes of more educated individuals to those of less-educated individuals, and they usually find that the former have better outcomes than the latter (Ackah et al., 2016; Meghir & Rivkin, 2011). This is due to

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the adoption of the so-called human capital theory, which attributes an absolute value to education. However, recent evidence seems to support that education has become a relative or positional good (Bol, 2015; Ortiz & Rodriguez-Menés, 2016). This implies that in examining the returns to education, it is critical to consider both education per se and educational expansion, as the latter might influence the value of education. Nevertheless, most of the existing body of literature does not fully account for that, i.e., it focuses on only one of the two dimensions. As a result, a fundamental question remains unanswered: To what extent does the economic return to education vary depending on its combination with educational expansion? An investigation that accounts for these aspects will help determine the theory that best captures the economic value of education. In addition, the few previous studies that examined the relative value of education did not account for heterogeneity in the effect of educational expansion among levels of education or a combination of levels of education with gender (see, for example, Bol, 2015; Van de Werfhorst, 2011).

This study is inspired by the possibility that education has lost its status or part of its status as an investment in human capital and has rather become a positional good. If this is the case, the human capital model of education may have overstated the real importance of education for labor market outcomes. Consequently, there will be a need to redefine the relationship between education and labor market outcomes and related mechanisms as well.

Educational expansion in many Southeast Asian countries has been growing fast, and Vietnam is among these countries experiencing a remarkably growing educational expansion. The gross enrollment rates in universities in Vietnam have been consistently increasing, and the country is currently in the second stage of its higher education expansion. Moreover, wage employment expanded from 15% to 51% between 1993 and 2014, and the number of workers with a university degree increased from 3% to 16% between 2002 and 2014. As such, Vietnam seems to be an ideal candidate to explore the economic return to education amid an educational expansion.

This study uses Vietnam Household Living Standards Surveys (VHLSS) data from 2002 to 2014, and it answers the following research questions: (1) to what extent is the economic return to education affected by educational expansion across levels of education? (2) How much does this effect vary across levels and gender? In light of the literature,[1] we expect the premium on education to decrease because its scarcity reduces as education expands (Araki, 2020). Given that the economic value of education is linked to its status as a scarce good, this value is expected to reduce

as more and more individuals have it as a result of expansion (Bol, 2015; Van Der Meer, 2011). This typically happens because opportunities in the labor market do not expand in tandem or faster than the number of people with more and more education. Since education expansion does not occur at all levels of education at the same time, we expect differences in how it influences the education premia at different levels of education systems. The negative effect of educational expansion is expected to be more pronounced at lower levels of education, where the saturation of the labor market may lead to decreased demand for less-skilled workers.

The economic return to education has been shown to be different by gender across different levels of educational systems (Quadlin et al., 2023). While we have substantial information on this labor market dynamics in other countries (e.g., see Didier, 2021), some studies have hinted at a gender gap in the premia to education in almost all economic subsectors in Vietnam, a gap that may be due to factors such as occupational sorting or discrimination based on the gender-related role of caring for children (Chowdhury et al., 2019; Tien, 2014). The gender difference in the economic return to education in Vietnam has been explored only in a handful of studies, and the search so far has not fully accounted for the potential effect of educational expansion. Investigating gender differences in the premia of education in Vietnam is crucial to identifying whether the labor market exhibits gender-based wage gaps and whether these gaps change with increased educational expansion. Vietnam's case is interesting to study the influence of higher education expansion on gender equality in the labor market due to the recency of the process and the lack of relevant policies to close gender gaps in its labor market.

We expect the negative impact of educational expansion on economic returns to education to vary by gender. This stems from the understanding that gender-specific labor market dynamics may influence how men and women experience the changing educational landscape. The study specifically sets up and tests the following hypotheses:

Hypothesis 1 The economic return to education is negatively affected by educational expansion, but this effect varies for lower levels of education relative to higher ones, with an advantage for the latter compared to the former; and

Hypothesis 2 The economic return to education is negatively affected by educational expansion, but this negative effect varies by gender across levels of education.

This study is significant because it provides insights into the dimension of the returns to education that most previous studies did not account for. Specifically, it highlights that using the absolute value of education (as the human capital theory does) to assess its economic returns may hide

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[1] See literature review section for more details.

its "real" value. It is essential to consider education as a positional good to understand better how its economic value varies as education expands. As such, we contribute to the literature by providing evidence showing that education is increasingly becoming positional with its expansion. Consequently, the positional model of education should be given more importance than it is currently given. Additionally, the study is significant because, unlike most studies, the data it uses covers an extended period. This allows it to capture the long-term effect of educational expansion on the return to education.

Education expansion in Vietnam

Vietnam implemented a process of gradual and controlled liberalization, known as 'Doi Moi,' aimed at enhancing productivity and incentivizing major sectors of the economy. Since 1986, these policies have propelled the country to become one of the fastest-growing economies in the world, with an average annual income per capita growth of over 5%. To effectively respond to the burgeoning demand for skilled labor, Decision 201/2001/QĐ-TTg on "The Education Development Strategic Plan for 2001–2010" has underscored the pressing need to develop education in Vietnam. This strategic plan has called for a substantial increase in the number of graduates produced by the higher education system to meet the rising demand for skilled workers in the evolving economic landscape (Decision 201/2001/QĐ-TTg).

The expansion of higher education in Vietnam can be attributed to significant reforms in the government policy framework, which underwent three major transformations. These transformations comprised the encouragement of private institutions of tertiary education, the relaxation of control on enrollment quotas, and the broadening of the higher education institution network. Preceding 1989, the absence of private universities in Vietnam was conspicuous, with the Thang Long People-Founded Learning Center standing as the inaugural non-public university to emerge within the nation. Subsequently, the government embarked on proactive measures aimed at fostering the establishment of private higher education institutions. This endeavor was significantly underscored by the Education Renovation Continuation Resolution (Resolution 04-NQ/HNTW), which orchestrated a comprehensive restructuring of the higher education system.

In 2005, Vietnam adopted Resolution No. 14/2005/NQ-CP, titled "Substantial and Comprehensive Renewal of Vietnam's Tertiary Education in 2006–2020," marking the second significant reform initiative within the higher education system. This reform initiative entailed the relaxation of stringent controls over enrollment quotas, granting higher degrees of autonomy to institutions in determining their individual enrollment limits. Concurrently, the Higher Education Reform Agenda (HERA), a resolution addressing the modernization of higher education management for the 2006–2020 period, was introduced. HERA empowered universities and colleges to independently establish their enrollment capacities, considering factors such as infrastructure and available faculty. This strategic shift has enabled many institutions to diversify their educational and training offerings, expanding their scope to meet the evolving and diverse educational demands of society.

Regarding the third significant reform, the Vietnamese government sought to establish a national network of tertiary institutions based on their specific functions and educational missions. This network is structured in a hierarchical manner, resembling a pyramid. At the base are vocationally oriented universities and colleges, followed by research-oriented universities, and finally, top-research universities at the pinnacle. The criteria for stratification encompass various factors, including an institution's role and position within the higher education system, student enrollments, program offerings, engagement in scientific and technological activities, quality of education and research, and educational quality accreditation. For example, top research universities are required to have a minimum of 30% of their faculty and researchers holding doctoral degrees, while research universities must meet a 15% threshold. No specific doctoral degree requirement is stipulated for vocationally oriented universities and colleges. Additionally, Decree No. 121/2007/QD-TTg, titled "Approving the Planning on the University and College Network in 2006–2020," envisions the inclusion of select top-research universities in the top 200 global rankings, signifying an aspiration for international recognition and excellence.

Literature review

An extensive body of literature examined the economic returns to education. Most studies in this literature adopt the human capital theory of education. This theory posits that individuals tend to make educational decisions by weighing the current cost of their investments in education and the future economic returns to that investment. When the latter outweighs the former, individuals are more likely to pursue more education because the return on their investment is higher (Card, 1995; Willis & Rosen, 1979). As a result, the human capital theory implies that economic factors are the main motivations to pursue more education, and individuals who have higher education credentials are expected to have higher monetary rewards relative to those who have lower credentials (Carneiro et al., 2011). One explanation for this absolute value of education is that individuals with higher credentials have higher skills that entail higher productivity

(obtained from schooling) in the labor market, and it is known that employers are willing to pay premia for higher productivity (Becker, 1964; Mincer, 1974). This economic decision in relation to education is widely accepted, positing education as an absolute good. From this perspective, education has an absolute value, and this value is not expected to reduce even though the scarcity of educated individuals within a society decreases as a result of educational expansion.

The human capital theory posits an absolute value for education, but the signaling theory was also developed to explain the market value of education (Arrow, 1973; Spence, 1973). This theory suggests that skills and other characteristics individuals possess and that employers seek cannot be directly observed easily, then employers use educational credentials as signals that individuals potentially possess the researched characteristics. For example, individuals' higher educational credentials are a signal of their ability to acquire new knowledge, and employers will likely hire those with this potential. In such a context, the knowledge and skills needed for the specific job will be taught in professional training. However, the signaling theory can be contrasted with what is called the social closure theory. This theory posits that the benefits of education can be due to individuals with higher educational credentials excluding those with lower credentials to secure the rewards of education, and the privileged groups would do so by establishing labor market screening systems that require high credentials and other characteristics to join a given group or get high-paid jobs (Bills, 2016; Posselt & Grodsky, 2017; Smyth & McCoy, 2011; Tholen, 2017). Both the signaling theory and the social closure theory are relative/positional approaches to the value of education, and they posit that the relative value of education persists along educational expansion.

Even though previous studies posit a persistence of the economic return to education, recent ones seem to show that educational expansion has an influence on the economic value of education. The value of educational credentials reduces along with the decrease of education scarcity that results from educational expansion. This situation will arise typically when the labor market supply does not expand at the same pace as the number of educated people that educational systems produce, i.e., a mismatch between the supply and demand in the labor market (Hanushek, 2016; Ortiz & Rodriguez-Menés, 2016). Overeducation is a concept that led to investigations into this phenomenon of the oversupply of highly educated workers in the labor market (Di Stasio et al., 2016; Nieto & Ramos, 2017; Verhaest & van der Velden, 2013). Individuals compete by trying to have as much education as possible to have a relatively good position over their peers in the labor market. Along with this competition, employers tend to establish stricter screening systems to demand higher credentials for jobs that would require fewer educational credentials (Frank, 2011; Gesthuizen et al., 2011). Subsequently, the positional model of education is often referred to as based on the queuing theory. The queuing theory shows that the labor market has a queue, and individuals are placed in this queue following ranks based on their observable characteristics, and education is the most important one among these characteristics (Thurow, 1975). Moreover, still in a conceptual queue, jobs are ranked according to certain complexities and requirements. Top-ranked jobs in this queue are expected to be assigned to individuals in the front line of the queue in the labor market. This can explain then the competition that can lead to overeducation. As a whole, the relative value of educational credentials is expected to vary.

There has been an increase in the participation of female workers in the labor market over the past decades. For example, Gaëlle (2012) shows that the percentage of working women in Vietnam has been increasing and suggests that there might be some gender differences in the returns to education. Despite their labor market participation increase, women might be affected negatively by the educational expansion, or they might be discriminated against in the labor market. Consequently, they will not be able to have the same returns as men, even with the same credentials. Ortiz and Rodriguez-Menés (2016) indeed found that gender plays a role in occupational attainment as education expands. Therefore, the dynamics related to the effect of the educational expansion on wages may have a gendered pattern.

Research provides insights into the economic value of education in the labor market. However, an essential aspect needs to be adequately accounted for: the influence of educational expansion on education premium. Most studies reviewed examined the link between education and its economic returns by focusing on education per se and considering educational expansion as a control variable or do not even include it; thus, they do not adequately account for the potential influence of educational expansion on education premia. This gap can be critical due to a mismatch between the supply and demand factors of the labor market. In addition, the few studies that investigated the positional value of education did not account for possible differences in the influence of educational expansion across education levels in combination with gender (e.g., Bol, 2015; van de Werfhorst, 2011).

Data and methods

Data and variables

The dataset used in the study comes from the Vietnam Household Living Standards Surveys (VHLSS), which were collected from 2002 to 2014. VHLSS is a survey

Fig. 1 Mean of log of wages by education levels from 2002 to 2014. *Source* created by Authors using VHLSS 2002 to 2014 data
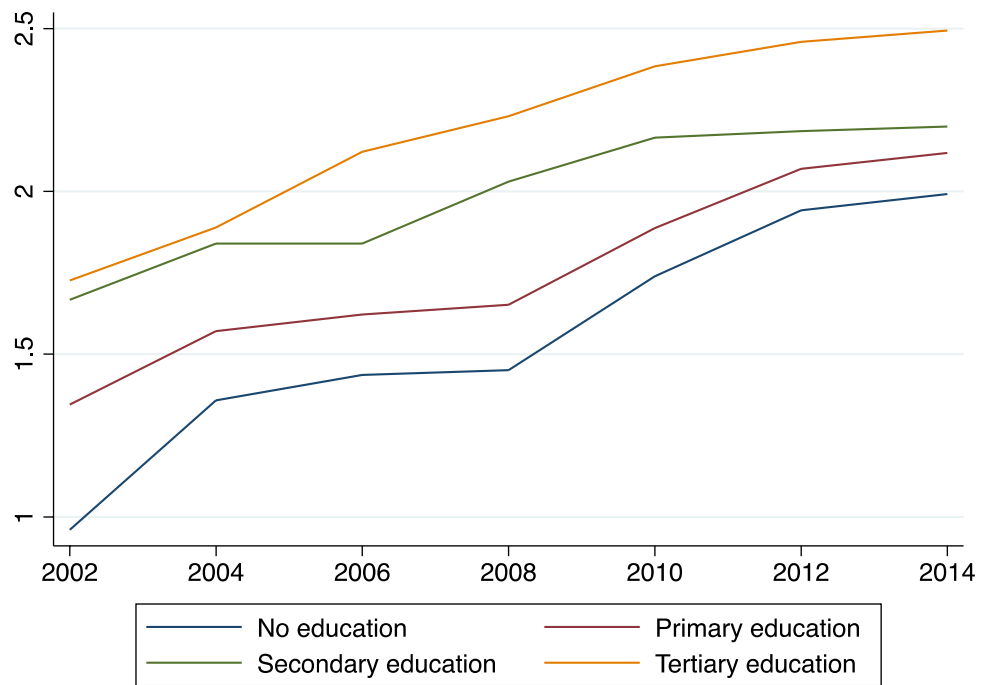
implemented in the country to collect data on household living standards. Findings obtained from analyzing the data are used to develop policies. The use of a dataset that goes back in time is crucial because it helps capture societal trends over time, an important aspect when university graduates are included in the analysis.

VHLSS captures the socio-economic characteristics of individuals, including education and employment. Though the variables provided in each round might vary slightly, variables such as education and employment are common variables across all rounds, which makes it possible to harmonize common factors for all the rounds included in the analysis. VHLSS is nationally representative of the Vietnamese population and follows a three-stage stratified cluster sampling technique. The clusters are based on the administrative division of the country, i.e., province, prefecture, and commune.

This study examines individuals between the ages of 24 and 55. It is important to use such a range for two reasons. First, individuals who go to university are likely to graduate around the age of 23, which means that they will enter the labor market at 24 (assuming that they automatically find a job). We want to include university graduates (or attainment) and individuals with lower credentials in the analysis, so choosing a lower starting age is likely to leave out university graduates, which may affect the estimations. The age of 55 refers to the regular retirement age for women in Vietnam, and since the study is also interested in gender, including as many of them as possible in the sample is important. The second reason for including this age range is that this allows to capture the differences in the effect of the factors

of interest across generations or cohorts, since education characteristics are likely to differ across them.

It is common among economists to give preference to monetary rewards as a labor market outcome (Torche, 2015), and this study adopts the economists' perspective as well. Therefore, earnings are used as a dependent variable, an essential labor market outcome that can be linked to education. Earnings are provided in their absolute amount in the dataset, but in the analysis, this amount was transformed into the natural logarithm of earnings before being used. Figure 1 gives an overview of the evolution of the mean of the natural logarithm of wages by level of education from 2002 to 2014. As expected, the higher the education level, the higher wages are. Even though the general pattern shows an increase in wages, the increase is not consistent from no education to secondary education, as there are moments years when wages slightly decrease. However, the wage increase is more consistent for tertiary education.

Important predictors included in the study are education and gender. Since education is a variable of primary interest, it is used in the study and handled in the following way: the number of years of schooling of individuals could have been used to measure education, but since this does not adequately capture each level of education, the education variable is aggregated into education attainment levels, i.e., no education, primary, secondary, and tertiary levels. This aggregation is directly provided in the dataset used. The gender variable is a dummy one, with females coded as 1 and males 0. Another variable of primary interest included in the analysis is educational expansion. We followed Ortiz and Rodriguez-Menés (2016) to operationalize this variable.

Fig. 2 Percentage of individuals with at least the same level of education by year. *Source* created by Authors using VHLSS 2002 to 2014 data
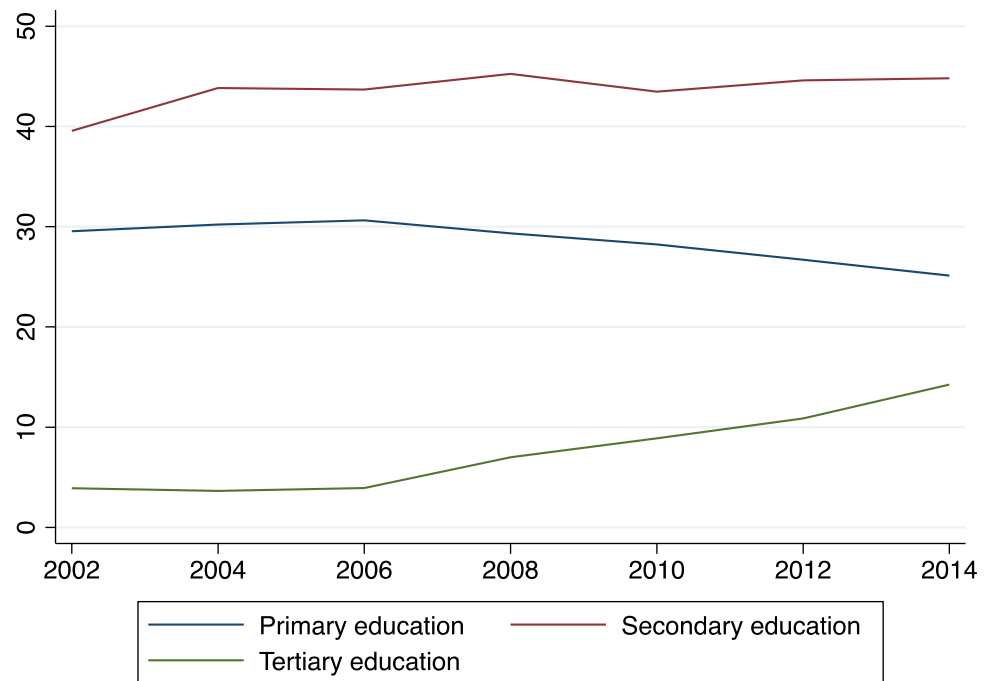
Specifically, educational expansion is expressed as the percentage of individuals with at least the same level of education for each year. The variable captures the potential decrease of the positional value of education as the number of individuals with the same level of education as the respondent increases. As such, higher scores (ranks) in this variable indicate that there is a higher number of individuals who have at least the same educational credential as the respondent, which is associated with a lower positional value or advantage for this credential. For example, the positional value of university graduation in a labor market where 30% of given members of a cohort are university graduates is higher than that of another cohort that has 50% of its members being university graduates. The positional value or advantage itself refers to an individual's relative position in a ranked or hierarchical power structure in the educational system. The different educational levels in the Vietnam's educational system are therefore used to refine this variable. Figure 2 presents the percentage of individuals with the same credentials by education level over the period covered by the data. It can be seen from it that the percentage of individuals with secondary education has moderately increased from 2002 to 2014. However, the percentage of individuals with primary education remained stable until 2006 before it started decreasing consistently. What is also noticeable from the same year is that the percentage of individuals who have tertiary education level has been increasing consistently until 2014. This confirms the tertiary education expansion policy that Vietnam has been implementing.

In addition to the variables of interest, control variables are also included in the study so as to obtain more robust estimates. At the individual level, we controlled for age, marital status, and work experience. Work experience is likely to affect the earnings of individuals, but since this relationship usually has a quadratic relationship with the outcome variable, the age-squared variable was created and included in the analysis as well. In addition to these individual-level factors, job-related ones were also controlled for. Specifically, the economic sectors of jobs in terms of private sector or not, self-employed or not, and also in terms of foreign company or not were included as control dummy variables. The latter one is included because foreign companies in Vietnam tend to pay higher wages than local ones. Economic sector variables help control the effect of potential fluctuations in the labor demand in some sectors (due to an increase in sector-related products). Fluctuations are likely to influence the returns to education in some specific sectors. Furthermore, a geographical dummy variable related to rural or urban is included in the analysis.

Considering changes over time, an important factor that we controlled for is cohort. This variable helps capture some other effects that come along with educational expansion. For example, along with reforms related to educational expansion, the quality of education might have increased differently over the cohorts, and this affects each cohort differently. Additionally, this variable can capture unmeasured economic trends or fluctuations over time in the labor market. Ideally, the cohort variable might be created using the actual year of entry into the labor market, but we do not have this variable in the data. Alternatively, we followed Rotman et al. (2016) to use age groups to create cohort dummies. The assumption around this approach is that the education of younger individuals, relative

Table 1 Summary statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Log wage	133,603	1.587	0.822	−3.712	8.101
Female	133,603	0.507	0.500	0	1
Married	133,603	0.786	0.410	0	1
Wage employment	133,603	0.478	0.500	0	1
Experience	133,603	17.593	7.079	1	34
Experience squared	133,603	359.639	249.596	1	1156
Number of children	133,603	0.807	0.830	0	8
Father education level	133,603	0.715	1.016	0	4
No education	133,603	0.123	0.328	0	1
Primary education	133,603	0.286	0.452	0	0
Secondary education	133,603	0.427	0.494	1	1
Tertiary education	133,603	0.072	0.258	0	1
Education expansion	133,603	50.002	20.401	7.917	63.488
Rural	133,603	0.734	0.442	0	1
Farmer/self-employed	133,603	0.669	0.471	0	1
Private sector	133,603	0.063	0.243	0	1
Foreign sector	133,603	0.023	0.149	0	1
Cohort1	133,603	0.175	0.380	0	1
Cohort2	133,603	0.164	0.370	0	1
Cohort3	133,603	0.160	0.366	0	1
Cohort4	133,603	0.162	0.369	0	1
Cohort5	133,603	0.168	0.373	0	1
Cohort6	133,603	0.172	0.377	0	1
2002	133,603	0.260	0.439	0	1
2004	133,603	0.076	0.265	0	1
2006	133,603	0.072	0.259	0	1
2008	133,603	0.071	0.257	0	1
2010	133,603	0.378	0.485	0	1
2012	133,603	0.073	0.260	0	1
2014	133,603	0.070	0.255	0	1

Source created by Authors using VHLSS (2002, 2004, 2006, 2008, 2010, 2012, 2014)

to older ones, is likely to be more affected by potential unmeasured education quality effects coming along with educational expansion. Table 1 presents the summary statistics of the variables used for the analysis, and Table A-1 in the "Appendix" summarizes the definitions of the variables used.

Empirical analysis

The Mincerian earnings equation is adopted as the framework for the analysis in this study (Mincer, 1974). According to this framework, earnings are a function of the human capital and the work experience that individuals possess. Human capital can be composed of education and training. The relationship described can be specified as follows:

$$\text{lnwage}_i = bX_i + \varepsilon_i, \tag{1}$$

where X represents a vector that includes education, experience, individual socio-economic characteristics, and other factors that affect wages; the vector X also contains interactions of variables of interest for this study. The term ε_i represents an error term that captures the factors affecting wages but were not included in the regression as they are not available. The logarithm of wage is used since many studies in economics have shown that this is a better fit than a linear wage function (Carneiro et al., 2011), and lnwage_i represents it.

An ordinary least square (OLS) approach can be adopted to estimate Eq. (1), but such an estimation is likely to suffer from bias. The relationship presented in Eq. (1) is observed only for a subgroup of the sample, that is, those individuals who are actually wage earners. In such a case, the sample cannot be treated as a random one as the outcome variable is censored. There is, therefore, a need to adjust the estimation in order to minimize the risk of bias. One of the common

methods used to deal with the sample selection bias is the Heckman two-step selection model (Certo et al., 2016). The method consists of a two-equation model, in which there is a regression model which is the one of primary interest, as expressed in Eq. (1). The other regression in the method is called the selection model and can be expressed as:

$$S_i^* = \lambda W_i + u_i, \tag{2}$$

where S_i^* represents the individual's i selection choice into wage employment. W_i is a vector of characteristics that influence the choice into wage employment, and u_i is an error term. In general, X in Eq. (1) is assumed to be a subset of W (Koné et al., 2019), which means that all factors included in the estimation of Eq. (1) are also added to other variables influencing S_i^* in the estimation of Eq. (2). In other words, the latter has at least one additional variable compared to the former. The observed part of S_i^* is a dichotomous variable S_i which is equal to 1 if the individual is a wage earner and equal to 0 if else. Consequently, the outcome variable in Eq. (1) is observed if the probability in Eq. (2) is more than zero, i.e.:

$$S_i = \begin{pmatrix} 1 \text{ if } s_i^* > 0 \\ 0 \text{ if } s_i^* < 0 \end{pmatrix}.$$

Heckman selection models are often estimated using two approaches. The first is the maximum likelihood, also called full information maximum likelihood (FIML). The second is the two-step approach, also called limited information maximum likelihood (LIML). The former does not provide estimates of the parameters in the unconditional distribution of error terms in the two equations, making the latter a preferred alternative. This is the first reason why the two-step approach is adopted by this study. The second reason for adopting the two-step approach is that even though it was checked, collinearity issues might arise between the factors of interest and the indicator of educational expansion. The two-step approach provides more robust estimates in estimations where there might be collinearity issues (Puhani, 2000).

It might be necessary to note that the estimation in the Heckman selection model starts off with the selection model, and then the main one follows. In this first step, a probit regression is used to estimate the selection process expressed in Eq. (2) and also what is known as the inverse Mills ratio (the estimated selection coefficient). In the second step, the estimated inverse Mills ratio from the first step is included as an independent variable in the regression to estimate Eq. (1). As such, Eq. (1) is estimated using OLS and will provide consistent estimate parameters.

The inverse Mills ratio in this study captures the selection effect, but it also captures other effects due to endogeneity.

In case there are no endogeneity issues in the variables, the endogeneity effect is zero, and the model is a simple estimation of the two-step model. The selection equation helps estimate the expected outcome of the full sample while holding all factors constant, including endogenous ones, also addressing potential endogeneity (Leung & Yu, 1996).

As already mentioned in the data presentation section, the analysis uses a pool of cross-sectional data from VHLSS. However, the observations in the sample that each year contains may be independent of other ones, and, importantly, the samples may not be identically distributed. Not accounting for these characteristics might lead to inconsistent estimates. Our solution with minor statistical issues for this has been to include dummy variables for each round of the collected data, though one round is used as a reference group in the actual regression (Wooldridge, 2010). Such an approach is also important as it contributes to controlling for unmeasured factors that might affect education over the years, just like the cohort dummies already mentioned do.

Results and discussion

The effect of educational expansion on the economic return to education across levels of education

This section presents the results for the analysis on the effect of educational expansion on the economic return to education across levels of education. OLS estimates are presented along with Heckman ones, but the latter is more consistent than the former. Therefore, Heckman estimates will be used for interpretation. Table 2 presents Model 1 and Model 2, and factors controlled for are discussed in the subsection Data and variables and presented in Table 1. All variables in Table 1 are included in the models estimated. Model 1 is an estimate of the direct effect of the absolute measure of education and educational expansion indicator on the dependent variable. However, Model 2 includes two-way interaction terms to capture the effect of educational expansion on the economic return for different levels of education.

Model 1 shows that as the level of education increases, wages are also increasing. Compared to individuals with no education, the positive effect of education levels on wages is consistent from primary to tertiary education. It can even be observed that the higher the level of education, the higher the expected economic returns. Moreover, an important point that Model 1 is also showing, and that is focused in this study, is the direct effect of educational expansion on wages. Estimates show that as the percentage of individuals with the same level of education increases, the wages are expected to decrease. In other words, an increase of individuals with the same level of education across all levels of

Table 2 The effect of educational expansion on the return to education across levels

Variables	Model 1 OLS	Model 1 Heckman	Model 2 OLS	Model 2 Heckman
Education expansion	−0.001***	−0.001***	0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Primary education	0.120***	0.114***	0.383***	0.430***
	(0.012)	(0.012)	(0.034)	(0.034)
Secondary education	0.423***	0.381***	0.465***	0.385***
	(0.021)	(0.022)	(0.054)	(0.052)
Tertiary education	0.511***	0.468***	0.522	−0.428
	(0.019)	(0.020)	(0.340)	(0.314)
Primary education * educational expansion			−0.004***	−0.005***
			(0.001)	(0.000)
Secondary education * educational expansion			0.000	0.001
			(0.001)	(0.001)
Tertiary education * educational expansion			0.001	0.016***
			(0.006)	(0.005)
Pairwise comparisons across levels of education				
Primary vs. no education				−0.005***
				(0.000)
Secondary education vs. no education				0.001
				(0.001)
Tertiary education vs. no education				0.016***
				(0.005)
Secondary education vs. primary education				0.006***
				(0.001)
Tertiary education vs. primary education				0.021***
				(0.005)
Tertiary education vs. secondary education				0.015***
Constant	0.629**	0.625**	0.647**	0.623**
	(0.316)	(0.305)	(0.316)	(0.305)
Observations	59,273	122,921	59,273	122,921
R^2	0.338		0.339	

Standard errors in parentheses. No education is the base for different levels of education

***$p<0.01$, **$p<0.05$, *$p<0.1$

the educational system is negatively associated with wages. Overall, these results indicate that while education measured as of its absolute value seems to have a positive effect on its economic return, education measured as of its positional value has a negative effect on its economic return.

To fully test Hypothesis 1, there is a need to check whether the negative effect of educational expansion on the economic return to education has heterogenous effects across levels of educations. The estimates in Model 2 from Table 2 suggest that there is heterogeneity of the effect of educational expansion on the economic return to education across the different levels of education. Specifically, results in that table indicate that relative to individuals with no education (the base group), the negative effect of educational expansion on the returns to education is higher for individuals with primary education. However, this negative effect of

educational expansion on the economic return to education is lower for individuals with secondary and tertiary education relative to those with no education. Figure 3 displays the slope of each level of education as a function of educational expansion level, and it allows us to know at what level of educational expansion the differences between groups are significant. The level No education is chosen as a reference group, then the changes in the slopes of each level of education presented are relative to the base group. The figure confirms that the slope of primary education relative to no education is decreasing, and this is consistent across all values of educational expansion. Likewise, the slope of tertiary education relative to no education is increasing. However, the slope of secondary education relative to no education remains stable. Considering these, it can be said that this graph reaffirms the results presented in Table 2.

Fig. 3 Average marginal effect of educational expansion on the economic return to education by levels. *Source* created by Authors using VHLSS 2002 to 2014 data
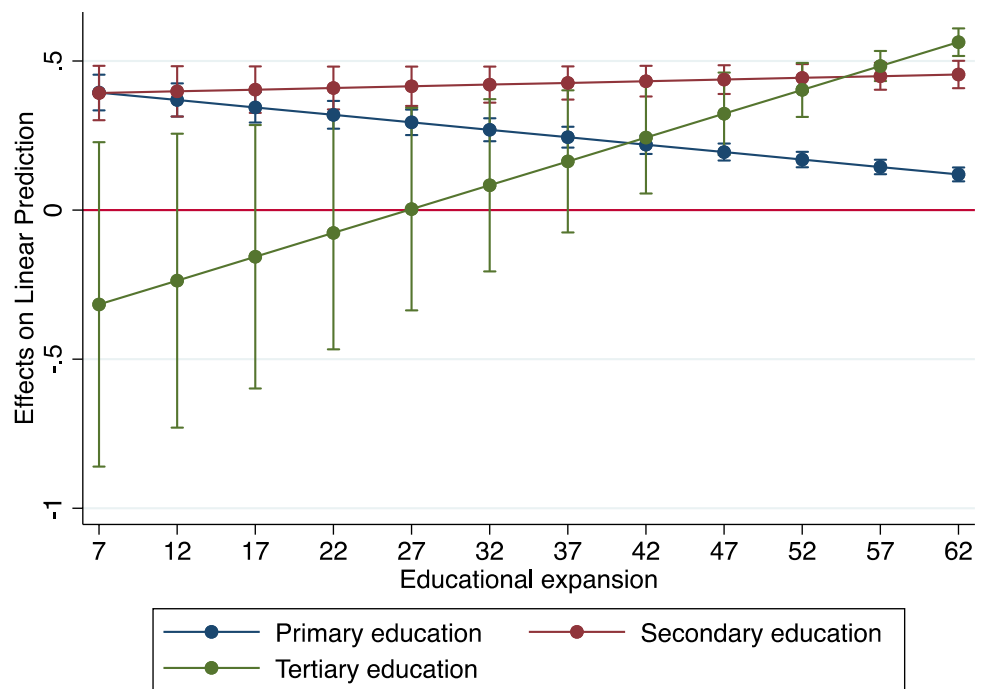
In order to understand differences in the effect of educational expansion on the economic return to education when considering different combinations of levels of education, we included pairwise comparisons across levels of education in Table 2. The comparisons indicate that this effect varies consistently for all possible combinations of higher levels of education compared to lower ones, and almost all higher levels of education have an advantage over lower levels. The estimates are all statistically significant (except when comparing individuals with secondary education to those without education). The overall results confirm our Hypothesis 1, which posited that the effect of educational expansion on the returns to education varies for lower levels of education relative to higher ones, with a variation showing an advantage for individuals with higher credentials relative to those with lower credentials.

The effect of educational expansion on the economic return to education across levels of education and gender

The effect of educational expansion on the returns to education varies for lower levels of education relative to higher ones, with an advantage of higher levels over lower ones. However, gender might also have a role to play along with education levels. In order to check this, a three-way interaction between gender, level of education, and educational expansion was created and tested. Similar to the findings in the research question, Heckman estimates presented in Model 1 in Table 3 show a direct positive effect of education

on wages and a negative effect of educational expansion on wages. Additionally, the model suggests that women earn less than men from a direct effect perspective. This is consistent from the perspective of a two-way interaction between gender and educational levels and also between gender and educational expansion. Yet, these results do not say anything about the role of gender in the effect of the educational expansion of wages in combination with levels of education. The three-way interaction presented in Model 2 (Table 3) shows it. The interactions of the combinations with both primary and tertiary education are statistically significant, which confirms the heterogeneity of the effect of educational expansion on wages in combination with levels of education and gender. Results on more detailed combinations of levels of education and gender are presented in Table A-2 in the "Appendix", but we only present those of main interest in this section.

To properly understand how the effect of educational expansion varies as a function of the interaction of gender and levels of education, we estimated its slope and presented estimations in Table 4. Each cell in the table indicates the educational expansion slope for the given combination of gender and level of education. Gender differences by simple contrast between males and females are also presented in Table 4. The results indicate that the gender difference in the effect of educational expansion on wages is statistically significant for individuals with no education, and the educational expansion slope for females is smaller than that of males at this level. Moreover, there is a statistically significant gender difference in the educational expansion

Table 3 The effect of educational expansion on the returns to education by education levels and gender

| Variables	Model 1 OLS	Model 1 Heckman	Model 2 OLS	Model 2 Heckman
Female	−0.167***	−0.195***	−0.213***	−0.252***
	(0.006)	(0.007)	(0.017)	(0.018)
Primary education	0.120***	0.114***	0.287***	0.340***
	(0.012)	(0.012)	(0.040)	(0.039)
Secondary education	0.423***	0.381***	0.444***	0.376***
	(0.021)	(0.022)	(0.078)	(0.072)
Tertiary education	0.511***	0.468***	1.049**	−0.088
	(0.019)	(0.020)	(0.444)	(0.408)
Female * primary education			0.220***	0.241***
			(0.048)	(0.046)
Female * secondary education			0.062	0.098
			(0.094)	(0.085)
Female * tertiary education			−1.407**	−1.428**
			(0.638)	(0.585)
Educational expansion	−0.001***	−0.001***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Female * educational expansion			0.000	−0.001**
			(0.000)	(0.000)
Primary education * educational expansion			−0.003***	−0.004***
			(0.001)	(0.001)
Secondary education * education expansion			−0.001	−0.000
			(0.001)	(0.001)
Tertiary education * educational expansion			−0.009	0.009
			(0.007)	(0.007)
Female * primary education * educational expansion			−0.003***	−0.002*
			(0.001)	(0.001)
Female * secondary education * educational expansion			0.001	0.002
			(0.002)	(0.002)
Female * tertiary education * educational expansion			0.026**	0.028***
Constant	0.629**	0.625**	0.650**	0.501*
	(0.316)	(0.305)	(0.316)	(0.304)
Observations	59,273	122,921	59,273	122,921
R^2	0.338		0.340	

Standard errors in parentheses

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 4 Differences in the effect of educational expansion by level of education and gender

	No education	Primary education	Secondary education	Tertiary education
Male	0.0000	−0.0043***	−0.0002	0.0093
	(0.0003)	(0.0005)	(0.0012)	(0.0068)
Female	−0.0008***	−0.0066***	0.0013	0.0361***
	(0.0003)	(0.0006)	(0.0010)	(0.0075)
Difference	−0.0008***	−0.0023***	0.0011	0.0267***
	(0.0003)	(0.0008)	(0.0015)	(0.0097)

Standard errors in parentheses

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Fig. 4 Fitted values of wages as a function of age, education level, and gender. *Source* created by Authors using VHLSS 2002 to 2014 data
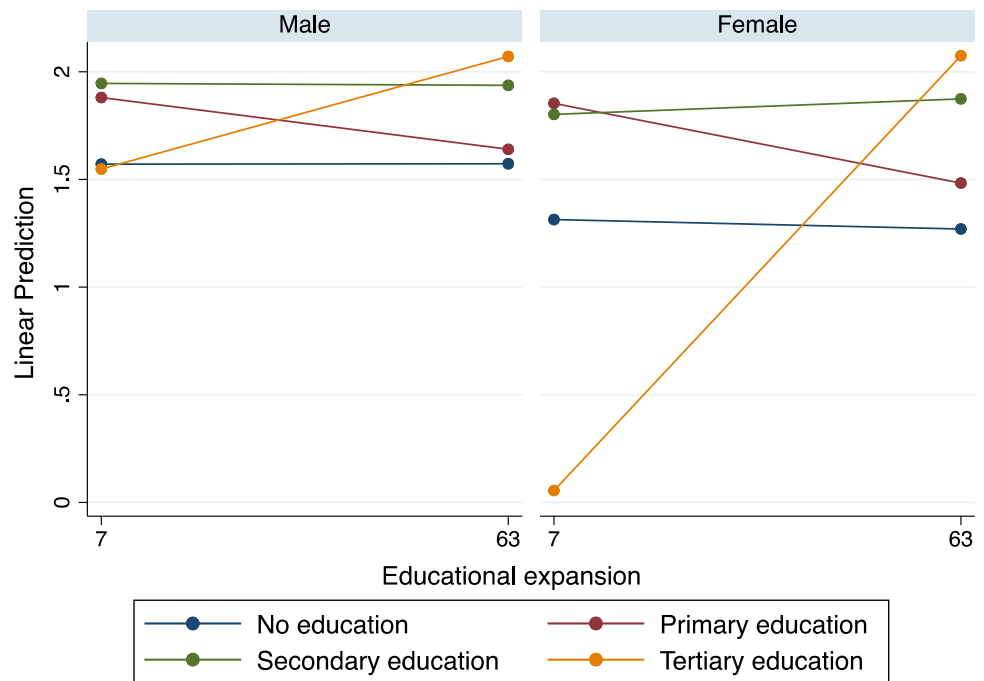
slope for individuals with primary education, still with a smaller slope for females. However, the gender difference in the educational expansion slope is not statistically significant for individuals with secondary education. As for individuals with tertiary education, there is a statistically significant educational expansion gender-based slope difference, with the slope of females higher than that of males. To confirm these results and also see their consistency across levels of educational expansion, we plotted Fig. 4. It shows that no education and primary education slopes for females are lower than those of males, but secondary education is almost no different, somehow confirming why it is not statistically significant. However, at the tertiary education level, the slope of females is very steep relative to that of males, which confirms the advantage that females have over males at this level of education.

In summary, the comparison of the slope for females in relation to that of males is significant for the levels of education analyzed, except for secondary education. The differences by gender show a general pattern that varies consistently across levels of education, so it can be accepted that the effect of educational expansion varies as a function of the interaction with gender and levels of education; hence our Hypothesis 2 is accepted.

Discussion

This study examined how the economic value of education varies with a combination of education levels and gender as educational expansion increases. While previous research has explored the link between education and its economic

returns, it has typically overlooked the concurrent influence of these multifaceted factors, which may interact to shape the returns on educational investment. Our study investigates how educational expansion affects the economic returns to education, comparing various levels of education in a pairwise approach. Furthermore, we analyze how these returns are modulated by gender dynamics, offering a comprehensive examination of the variations in the economic value of education across gender lines amidst educational expansion.

Findings revealed that educational expansion in itself negatively affects the economic value of education, but this negative effect is lower for individuals who have attained higher levels of education relative to those who have lower levels. In other words, even though educational expansion might reduce the returns to education, for people who acquire higher credentials, the negative effect of educational expansion is reduced. This finding is inconsistent with Ortiz and Rodriguez-Menés (2016), who found in the case of Spain that as education expands, its economic return is lower for individuals with higher credentials relative to those with lower credentials. However, this finding is consistent with the patterns of findings that support the human capital theory, that is, higher credentials will yield higher economic returns (even in the background of educational expansion). Vietnamese labor market seems to present a plausible explanation for the findings that show a persistent economic return to education. Many socioeconomic reforms have contributed to a change in the Vietnamese labor market structure from an informal sector and agriculture-dominant employment to one with an increasing share of employment in formal sectors like construction, industry, and services (Gaëlle, 2012).

The economic expansion that came with these changes contributed to increasing the demand for highly skilled workers and justifying the relative importance of higher credentials in the labor market. Previous studies seem to confirm this mechanism, as they found that the premium to education increases across levels of education in a context of high demand for more educated workers (Acemoglu & Autor, 2011; Goldin & Katz, 2008).

Our findings provide insights into the returns to education over time as they highlight that the traditional patterns of the return to education have changed. In other words, this study contributes by providing empirical evidence to support that the returns to education have changed from the traditional patterns of being higher for primary education to being higher for tertiary education (Patrinos, 2019). These findings imply that the human capital theory does not fully explain the return to education because it predicts that additional schooling leads to higher earnings at all levels due to individual productivity (Truong et al., 2021).

Moreover, this study underscores the limitation of assessing the economic returns of education solely through the lens of its absolute value, as is often done in studies employing the human capital theory. It contends that this approach may obscure the intrinsic value of education, necessitating a conceptualization of education as a positional good. This conceptual shift enhances our comprehension of how the economic value of education evolves amidst its expansion. Consequently, another of our contributions to the scholarly discourse is that we provide empirical evidence indicating a growing positional nature of education during its expansion. This implies a need to focus more on the positional model of education within the academic discourse.

Higher credentials are expected to produce higher economic rewards, but the patterns of these returns vary by gender. The findings from this study reveal that women have lower returns for no education and primary education levels, and the results are statistically significant. However, secondary and tertiary education attainment indicates a higher return to education for women, even though the results are statistically significant for only tertiary education. These findings suggest that the returns to education are lower for women at no and primary education but higher for tertiary education. The decreasing return to education for women at lower levels can be explained by the fact that there is a highly increasing number and labor participation of women at these levels. Gaëlle (2012) shows that in Vietnam, compared to men, women with low credentials (no education to secondary education) are more likely to be unemployed, have low-level jobs, or drop out of school earlier. Consequently, gender inequality in education returns will negatively affect women with lower credentials, while those with high credentials will benefit from education wage premia. This finding contributes to the literature by reinforcing the

view that the economic return of education is higher for females than for males, but it specifies at which educational level, at least in the case of Vietnam. Dougherty (2005) highlighted that this may be explained by the fact that education increases women's skills and productivity and, at the same time, reduces the inequality in male and female earnings attributable to factors such as discrimination, tastes, and circumstances. However, our study suggests that this dynamics seems more plausible for individuals with higher education.

Vietnam has had some gender development programs and strategies, which might also explain the finding on the higher return of education for women at the tertiary education level. For example, the Comprehensive Poverty Reduction and Growth Strategy (CPRGS) is a policy that involves gender perspectives in all the fields it covers. Moreover, the National Action Plan for the Advancement of Women 2001–2005 and 2006–2010 is a gender development plan that the country implemented. This improvement in the wages of women with tertiary education might be attributable to gender-related policies. However, it is important to mention that gender pay gap reduction is not an important part of the framework of these policies. As such, Pham and Reilly (2007) pointed out that the effect of continuous structural change in the labor market for women and their wages was unclear, and the government needed to focus on wage disparities explicitly. Unfortunately, this approach was not followed by the government, which might explain why women have lower wages than men at lower levels of credentials. In such a context, our study reinforces the Vietnamese government's need to develop policies that give an important objective of addressing gender wage disparities in the country, or at least include this objective as a main one in its overall socio-economic development framework. This is needed and should focus on women at lower levels of the educational structure.

Conclusion

Recent findings on the returns to education suggest a decrease in the premia to education. This can be attributable to educational expansion, which reduces education scarcity and its economic value. This seems to contradict the human capital view of the returns to education, making it relevant to examine the extent to which this applies across levels of education and also how gender interacts in the process.

In this study, we assessed the possibility that the relationship between education and wages has been affected by educational expansion. To explore the possibility, we followed existing literature to develop an indicator of educational expansion, and we examined two main points: first, we examined how educational expansion affected the returns

to higher levels of education relative to lower ones; second, we assessed the explored the possibility that the effect of educational expansion on the returns to education across levels of education might be different by gender. Our results suggest that educational expansion does not negatively affect the economic return of higher levels of education relative to lower levels; that is, higher levels of education have higher returns than lower ones. This finding is partly in line with the human capital theory, which expects higher credentials to be related to higher economic value in the labor market. Therefore, acquiring higher credentials might need to be encouraged in Vietnam because higher credentials still have higher monetary rewards in the labor market. This might involve expanding scholarship programs, reducing financial barriers, and promoting awareness about the long-term economic benefits of higher education. This might be good news for the government because it has been putting much effort into expanding education, mainly at the tertiary level.

We have also found that educational expansion has different effects on the economic value of education by gender at different levels of education. In the background of educational expansion, women with no education and those with primary education have lower wages than men with similar credentials. In contrast, women with tertiary education have higher wage premia than men with the same level of education. The study highlights observed wage gaps between men and women during educational expansion, particularly among individuals with no or primary education. Additionally, the study suggests the imperative for interventions aimed at mitigating gender-specific challenges, including the correction of stereotypes, the enhancement of training opportunities for women, and the promotion of workplace equality. By addressing these issues, policymakers can strive to rectify gender-based economic imbalances and create an environment that facilitates equitable opportunities for both men and women across various education levels.

Our study provides insights into how educational expansion might affect wages, and the use of various rounds of VHLSS gives a long-term perspective of the portrait presented for the Vietnamese context. 'Doi Moi' reforms that started in the late 1980s have been implemented for an economic restructuring of Vietnam, and studies such as the current one (accounting for long periods) are needed to gain better insights into the effects of these reforms.

Despite its insightful findings, the study should not be over-emphasized because its scope is limited. For example, we did not examine the effect of educational expansion on occupational returns to education, along with potential gender differences across levels and types of education. Heterogeneity based on various factors might exist, meaning that other factors might also play a role in the effect of educational expansion on the returns to education. These are factors that need investigation in order to provide a better view of the effect of educational position on the premia to education. Additionally, even though Heckman selection model assumptions were met (e.g., the statistically significant variable of interest in the first stage equation and the statistically significant λ in the second stage equation), the methodology does not provide magic to solve all potential endogeneity issues (Certo et al., 2016). Consequently, if valid instruments are available, further studies can compare their results with those from this study by using methods such as instrumental variables (IV) or a combination of Heckman with IV as proposed by Schwiebert (2015).

Declarations

References

Acemoglu, D., & Autor, D. (2011). Skills, tasks and technologies: Implications for employment and earnings. *Handbook of Labor Economics, 4b*, 1043–1171.

Ackah, C., Adjasi, C., Turkson, F., & Acquah, A. (2016). Education, skill, and earnings: Further evidence from Ghana. *Learning to Compete WP, 16*, 1–8.

Araki, S. (2020). Educational expansion, skills diffusion, and the economic value of credentials and skills. *American Sociological Review, 85*(1), 128–175. https://doi.org/10.1177/0003122419897873

Arrow, K. J. (1973). Higher education as a filter. *Journal of Public Economics, 2*(1973), 193–216. https://doi.org/10.1016/0047-2727(73)90013-3

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis with special reference to education*. National Bureau of Economic Research.

Bills, D. B. (2016). Congested credentials: The material and positional economies of schooling. *Research in Social Stratification and Mobility, 43*(2016), 65–70. https://doi.org/10.1016/j.rssm.2016.03.002

Bol, T. (2015). Has education become more positional? Educational expansion and labor market outcomes, 1985–2007. *Acta Sociologica, 58*(2), 105–120. https://doi.org/10.1177/0001699315570918

Card, D. (1995). *Using geographic variation in college proximity to estimate the return to schooling. Essays in honor of John Vanderkamp*. University of Toronto Press.

Carneiro, P., Heckman, J., & Vytlacil, E. (2011). Estimating marginal returns to education. *American Economic Review, 101*(6), 2754–2781. https://doi.org/10.1257/aer.101.6.2754

Certo, S. T., Busenbark, J. R., Woo, H., & Semadeni, M. (2016). Sample selection bias and Heckman models in strategic management research. *Strategic Management Journal, 37*(13), 2639–2657. https://doi.org/10.1002/smj.2475

Chowdhury, I., Johnson, H., Mannava, A., & Perova, E. (2019). Gender gap in earnings in Vietnam: Why do Vietnamese women work in lower paid occupations? *Journal of Southeast Asian Economies, 36*(3), 400–423. https://doi.org/10.1596/31485

Dickson, M., & Smith, S. (2011). What determines the return to education: An extra year or a hurdle cleared. *Economics of Education Review, 30*(6), 1167–1176. https://doi.org/10.1016/j.econedurev.2011.05.004

Didier, N. (2021). Does the expansion of higher education reduce gender gaps in the labor market? Evidence from a natural experiment. *International Journal of Educational Development, 86*, 102467. https://doi.org/10.1016/j.ijedudev.2021.102467

Di Stasio, V., Bol, T., & Van de Werfhorst, H. G. (2016). What makes education positional? Institutions, overeducation and the competition for jobs. *Research in Social Stratification and Mobility, 43*, 53–63. https://doi.org/10.1016/j.rssm.2015.09.005

Dougherty, C. (2005). Why are the returns to schooling higher for women than for men? *Journal of Human Resources, XL*(4), 969–988. https://doi.org/10.3368/jhr.xl.4.969

Frank, R. H. (2011). *The Darwin economy: Liberty, competition, and the common good*. Princeton University Press.

Gaëlle, P. (2012). *Recent labor market performance in Vietnam through a gender lens*. Policy Research Working Paper No. 6056. World Bank.

Gesthuizen, M., Solga, H., & Künster, R. (2011). Context matters: Economic marginalization of low-educated workers in cross-national perspective. *European Sociological Review, 27*(2), 264–280. https://doi.org/10.1093/esr/jcq006

Goldin, C., & Katz, L. F. (2008). *The race between education and technology*. Harvard University Press.

Government of Vietnam. (2014). *Resolution No. 14/2005/NQ-CP Dated November 02, 2005, on Substantial and Comprehensive Renewal of Vietnam's Tertiary Education in the 2006–2020 Period*. Government.

Hanushek, A. (2016). Will more higher education improve economic growth? *Oxford Review of Economic Policy, 32*(4), 538–552. https://doi.org/10.1093/oxrep/grw025

Koné, S., Bonfoh, B., Dao, D., Kone, I., & Fink, G. (2019). Heckman-type selection models to obtain unbiased estimates with missing measures outcome: Theoretical considerations and an application to missing birth weight data. *BMC Medical Research Methodology, 19*, 1–13. https://doi.org/10.1186/s12874-019-0840-7

Leung, S. F., & Yu, S. (1996). On the choice between sample selection and two-part models. *Journal of Econometrics, 72*(1–2), 197–229. https://doi.org/10.1016/0304-4076(94)01720-4

Meghir, C., & Rivkin, S. (2011). Chapter 1: Econometric methods for research in education. In E. A. Hanushek, S. Machin & L. Woessmann (Eds.), *Handbook of the economics of education* (Vol. 3, pp. 1–87). Elsevier B.V.

Mincer, J. (1974). *Schooling, experience, and earnings*. National Bureau of Economic Research.

MOET. (2005). *Vietnam higher education renovation agenda: Period 2006–2020*. Ministry of Education and Training.

Nieto, S., & Ramos, R. (2017). Overeducation, skills and wage penalty: Evidence for Spain using PIAAC data. *Social Indicators Research, 134*(1), 219–236. https://doi.org/10.1007/s11205-016-1423-1

Ortiz, L., & Rodriguez-Menés, J. (2016). The positional value of education and its effect on general and technical fields of education: Educational expansion and occupational returns to education in Spain. *European Sociological Review, 32*(2), 216–237. https://doi.org/10.1093/esr/jcv085

Patrinos, H. A. (2019). *The changing pattern of returns to education: What impact will this have on inequality?* Policy Research Working Paper No. 8866. https://doi.org/10.1596/1813-9450-8866

Pham, T., & Reilly, B. (2007). The gender pay gap in Vietnam, 1993–2002: A quantile regression approach. *Journal of Asian Economics, 18*(5), 775–808. https://doi.org/10.1016/j.asieco.2007.04.001

Posselt, J. R., & Grodsky, E. (2017). Graduate education and social stratification. *Annual Review of Sociology, 43*, 353–378. https://doi.org/10.1146/annurev-soc-081715-074324

Prime Minister of Vietnam. (2001). *Strategy for Educational Development 2001–2010 Issued Together with Decision No. 201/2001/QĐ dated December 28, 2001 of the Prime Minister*. Prime Minister.

Puhani, P. (2000). The Heckman correction for sample selection and its critique. *Journal of Economic Surveys, 14*(1), 53–68. https://doi.org/10.1111/1467-6419.00104

Quadlin, N., VanHeuvelen, T., & Ahearn, C. E. (2023). Higher education and high-wage gender inequality. *Social Science Research, 112*, 102873. https://doi.org/10.1016/j.ssresearch.2023.102873

Rotman, A., Shavit, Y., & Shalev, M. (2016). Nominal and positional perspectives on educational stratification in Israel. *Research in Social Stratification and Mobility, 43*(2016), 17–24. https://doi.org/10.1016/j.rssm.2015.06.001

Schwiebert, J. (2015). Estimation and interpretation of a Heckman selection model with endogenous covariates. *Empirical Economics, 49*, 675–703. https://doi.org/10.1007/s00181-014-0881-z

Smyth, E., & McCoy, S. (2011). The dynamics of credentialism: Ireland from bust to boom (and back again). *Research in Social Stratification and Mobility, 29*(1), 91–106. https://doi.org/10.1016/j.rssm.2011.01.002

Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics, 87*(1973), 355–374. https://doi.org/10.2307/1882010

Tien, N. D. L. (2014). *An analysis of labour market returns to education in Vietnam: Evidence from the National Labour Force Survey 2012*. Turin School of Development Working Paper No. 3. International Training Centre of the ILO.

Tholen, G. (2017). Symbolic closure: Towards a renewed sociological perspective on the relationship between higher education, credentials and the graduate labour market. *Sociology, 51*(5), 1067–1083. https://doi.org/10.1177/0038038516641857

Thurow, L. C. (1975). *Generating inequality*. Basic Books.

Torche, F. (2015). Analyses of intergenerational mobility: An interdisciplinary review. *ANNALS of the American Academy of Political and Social Science, 657*(1), 37–62. https://doi.org/10.1177/0002716214547476

Truong, T. H., Ogawa, K., & Sanfo, J. B. M. (2021). Educational expansion and the economic value of education in Vietnam: An instrument-free analysis. *International Journal of Educational Research Open, 2*, 100025.

Van de Werfhorst, H. G. (2011). Skills, positional good or social closure? The role of education across structural–institutional labour market settings. *Journal of Education and Work, 24*(5), 521–548. https://doi.org/10.1080/13639080.2011.586994

Van der Meer, P. H. (2011). Educational credentials and external effects: A test for the Netherlands. *Research in Social Stratification and Mobility, 29*(1), 107–118.

Verhaest, D., & van der Velden, R. (2013). Cross-country differences in graduate overeducation. *European Sociological Review, 29*(3), 642–653. https://doi.org/10.1093/esr/jcs044

Willis, R. J., & Rosen, S. (1979). Education and self-selection. *The Journal of Political Economy, 87*(5), S7–S36.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press.