Occupation Choice Matters to the Economic Return of the School Year in Nepal. Evidence from Household Cross-Sectional Data.

Abstract

The different economic return pushes a question in the scholars' minds that the economic return depends on the school year or the occupation choices in Nepal. In this regard, this study finds the positive impact of school year on economic return as a wage. School year is endogenous; that might estimate biased results. The instrumental variable (IV) technique is applied to estimate unbiased and consistent results. Using instrumental variables on Nepalese household level microdata, an additional year of schooling increases the economic return in terms of wage by 4.3 percent. When controlling factors are considered, the percentage drops to 2.8 percent. In addition, the estimates show that education return for female's (8.9 percent) is higher than for males (2.2 percent). The choice of occupation has a substantial impact on the economic return of the school year when comparing wages among occupations on the Nepali labor market. Out of the nine occupations in Nepal, those connected to professionals have the highest return on education (21.5 percent), followed by those associated to technical and associate occupations (14.1 percent). Furthermore, a few scholars found the economic return of the school year about 6 percent by using OLS. This study also supports previous studies and confirmed the economic return of the school year has a significant positive impact using different IV techniques of estimation.

Keywords: Wage, Economic Return, Education, Nepal, Schooling year, Instrumental Variable

1. Introduction

The progress of a nation is closely linked to the human capital stock that relies on the educational system. Thus education is an essential instrument of development policy for developed and developing countries worldwide. Particularly in developing countries, education positively affects the national growth (Gross Domestic Product) by increasing productivity with the increment in human capital (Appiah, 2017). Education plays a

crucial tool in the reduction of poverty by increasing individual income and family benefits. So, almost all the countries have more focus on educational policies to improve the education system. Some have compulsory education, believing that education is one of the potent tools of countries' economic improvement (Ilter, 2017). It directly correlates with economic growth by increasing the productivity of laborers and a higher supply of skilled workers for highly technical works (Li & Miller, 2015). Based on these facts, Asravor (2021) rewrites the findings of (Patrinos, 2016) that the private rate of return to schooling for one additional year of education produces a personal rate of return to the education of about 5–8 percent per year and varies from one percent to 20 percent.

From the individual perspective, the return of education is wage/salary or economic benefits he/she received after schooling. It is the outcome of personal invest on schooling. Now, scholars have been attempting to measure the return of such investment in terms of wages. In a study, Mocan (2014) points out the education return is about 14 percent per year of schooling in Turkey, and females have a higher return than males. In a similar study, Khan & Khan (2020) find human capital is a positive factor of wage determination in Pakistan. In Iranian data, Oryoie & Vahidmanesh (2021) found overall education return is about 9 percent after controlling the household fixed effects. In addition, rural have a higher return of 10 percent than 7.8 percent of urban.

In the case of Nepal, various policies are formulated after the first initiation of the New Education Plan in 1971 to raise the educational performance like Flexible School Program, Open School Program, Education For All National Plan of Action 2000, School Sector Reform Plan 2009. Consequently, the average schooling year is increasing for both females and males since 2001 (CBS, 2011), labor force participation and share of the employed population is also growing (see detail in Appendix B). With this general background, the estimation of education return is important to measure the investment on education. This study aims to measure the return of education using modified Mincer (1974) wage equation.

This study aims to find the impact of education on wage as the return of education using the Nepal Labor Force Survey (NLFS) 2018. The study primarily focuses on the following three research questions:

[1] Does education impact the wage of employment?

- [2] What is the extent of economic return to education in Nepalese labor markets?
- [3] Does occupation choice matters to the economic return of the school year in Nepal?

This paper is divided into five sections. The first section describes the overview and the importance of the study. The second section reviews the previous studies to understand the topic and its findings and methodology. The third section briefly describes the methods applied in this study, the data sources, the selection of variables, and their description. The fourth section describes the results of the estimation. Finally, the sixth section concludes the findings. The additional information of the country background of Nepal, the other tables of results, and required information for interpretation of results are kept in Appendix A and B.

2. Literature Review

This section briefly describes the previous studies that are related to this study. Human Capital Theory explains the individual's gain of education and training in the return of investment in the human resources, and education and schooling are the investments for human capital for increasing labor productivity (Nafukho et al., 2004). The Mincer, in 1974, developed the Mincer wage equation for estimating the return of such investment in terms of wage. The Mincer wage model is acceptable mainly by many scholars to estimate the effect of education on wage.

$$Wage = f(education, experience)$$
(3.1)

Human capital includes education and job experience; they mainly affect the wage (Asravor, 2021). But, many scholars suggest including other factors that also impact the wage determinant, for example, socio-demographic factors like marital status, age, geography (Oryoie & Vahidmanesh, 2021; Akanda, 2010; Heywood & Parent, 2012; Kim & Polachek, 1994). Khan & Khan (2020b) suggest that measuring the schooling effect on

wage using Mincer simple wage equation (as OLS) gives spurious results due to endogeneity of schooling variable. Furthermore, the estimates are undervalued. In this situation, the authors apply parent education as an instrumental variable (IV) to address the endogeneity issue. Using primary survey data in Pakistan, they find one additional year of schooling increase the wage by 9.51 percent points which is higher than the OLS estimates of 8.25 percent points. In another similar study, Asravor (2021) estimates the schooling return using spouse's level of education as an IV on primally collected data from Ghana, the female's return of schooling is higher (6.4 percent) than men's (5.3 percent).

This study has to consider the endogeneity issue of schooling based on the previous literature while using the OLS. The study can use experience or age as a proxy of experience and IV of schooling year to estimate the impact of education on schooling wage. Parent education can be used as an instrument variable because children's schooling can be affected by the parent's education. The parents with higher education might invest more in children's education, and they have a higher number of years of schooling and vice versa. And the parent's education does not affect the dependent variable wage of children. This framework gives the parent's education an exogenous variable and provides more reliable estimates than traditional OLS.

3. Data and Methodology

Data

This empirical study will be based on the secondary dataset of the Labor Force Survey (NLFS) 2018 conducted by the Central Bureau of Statistics (CBS) Nepal. CBS is one of the sole official data-producing agencies in Nepal since 1961. NLFS data series is one of the main survey series conducted by CBS since 1998. This study will use crosssectional data of the third series of labor force Surveys conducted in 2017-2018. It is a stratified random sample survey covering the whole country with a total sample size of 18,000 households. It is one of the latest surveys conducted by the Nepalese government related to labor and fills the data requirement of the study. So, this study selects NLFS 2018 dataset for this study.

The survey was restricted to observation 4,797, who are working for paying jobs in the last seven days of the study, whose age is 15 -65 years, and has parental education information. Due to the missing code of relationship with children and parents, this survey finally accepts the 4,797 observations for the analysis.

This study estimates the education return in terms of the wage that the individual received. The wage is a kind of the return of investment on schooling. So, the study takes individual hourly wages as a dependent variable. The unit of measurement of wage is taken in Nepalese Rupees (NRs).

Many Scholars follow the Mincer (1974) wage model that suggests the education and working experience are determinants of wage (Peet et al., 2015; Nafukho et al., 2004). Following the previous studies and finding the essential factors that might impact the wage from a national perspective, the following independent variables were taken for the study.

Variable Name	Variable Description
ln(wage)	Individual's hourly wage in NRs. (Dependent Variable)
School Year	The number of schooling years
Experience	Individuals work experience
Experience ²	Square of individual's potential experience
Female	If an individual is a female, female =1, otherwise 0
Married	If an individual's marital status is married, Married=1, otherwise 0
Father Education	The number of schooling years of father
Mother Education	The number of schooling years of Mother
Weekly Working hours	The individual's average weekly working hours
Permanent	If an individuals type of job is permanent, Permanent=1 otherwise 0
Region	It is the categorical variable representing seven provinces
Social Customs (Caste)	It is a categorical variable of 20 major caste
Occupations	It is a categorical variable of occupations (Appendix Table A1)

The Table 3.2 shows the summary of the primary variables that are used to estimate the education outcome. The study uses 4,797 observations; out of the total observations, 13 percent are Females. The average year of schooling is 9.5 years. The monthly average wage is NRs. 18,881 (Nepalese currency), which is equivalent to \$ 170.8 (USD 1 = NRs. 110.5 on 30th December, 2018). The average age of individuals between 15 to 65 years old is 33.3 years.

	Ν	Mean	St.Dev	Min	Max
Female	4,797	.134	.341	0	1
Age	4,797	33.266	11.017	15	65
Schooling Year	4,797	9.512	4.855	0	22
Married	4,797	.760	.427	0	1
Monthly Wage	4,797	18,881.03	10,367.81	1000	200,000
Hourly Wage	4,797	108.199	122.079	8.333	5,250
Weekly Working Hours	4,797	48.693	12.963	1	116
Permanent	4,797	.162	.368	0	1
Father's Schooling Year	3,823	8.210	3.899	0	16
Mother's Schooling Year	1,873	8.298	3.925	0	16
Education Level:					
Primary Education	4,797	.450	.498	0	1
Secondary Education	4,797	.385	.487	0	1
Tertiary Education	4,797	.165	.371	0	1
Occupations:					
Manager	4,797	.009	.093	0	1
Professionals	4,797	.014	.116	0	1
Technical and Professional	4,797	.165	.371	0	1
Clerical Support	4,797	.065	.247	0	1
Service and Sale	4,797	.059	.235	0	1
Skilled Ag Forestry	4,797	.093	.291	0	1
Craft and Trades	4,797	.012	.110	0	1
Plant and Machine	4,797	.246	.431	0	1
Elementary	4,797	.090	.286	0	1

Table 3.2: Descriptive Statistics

Similarly, among all observations, 76 percent are married. The average year of schooling of fathers and mothers are 8.2 and 8.3, respectively. Besides, 45 percent of observation has a maximum primary education, whereas 15.6 percent have an undergraduate degree, and 0.9 percent have graduate or above educational achievement. Among the working population, 16.2 percent have permanent jobs. The average weekly working hours is 48.7.

Methodology

Peet et al. (2015) suggested the Mincer's basic model of income is a function of human capital, education, and job experience as given:

$$w_i = \alpha_0 + \alpha_1 s_i + \alpha_2 exp_i + \alpha_3 exp_i^2 + \epsilon_i$$
(3.1)

Where w_i is the wage of individual *i*; s_i represents individual's schooling year (education); exp_i is years of job experience, exp_i^2 is square of an individual's experience. The term ε_i is an error term in the model which includes other factors that might impact the wage. The coefficient α_1 , α_2 , and α_3 are used for measuring the rate of return to schooling, experience, and experience square. If $\alpha_1 > 0$ shows the number of schooling years has positive impacts on the return and vice versa. In this study, the direct information of work experience is not available in the dataset. So, the potential work experience is calculated as follows:

$$Experience = (Age - SchoolYear - 6),$$

Here, *age* is individuals competed for age, *SchoolYear* is the number of completed schooling years, and 6 is the base year of starting schooling. Based on this background, this study applies the following Ordinary Least Square (OLS) regression equation (3.2) to measure the education return.

$$lnwage_{i} = \alpha + \beta SchoolYear_{i} + X_{i}\gamma + \epsilon_{i}$$
(3.2)

Xi is a vector of other factors that affect wages such as experience, married, working hours, job type, social behavior/factors (caste), regional area, occupation dummies.

The primary treatment variable SchooYear is endogenous, which means it is also affected by some other factors, that is, *Cov* (*SchoolYear*, ϵ_i) $\neq 0$, and OLS estimates are biased and inconsistent. Two-Stage Least Square (2SLS) method can be applied to address this issue, using an Instrumental variable Z of SchoolYear, which must be uncorrelated with an error term and high correlation with SchoolYear, i.e., *Cov* (Z_i , ϵ_i) = 0 and *Cov* (*SchoolYear_i* , Z_i) $\neq 0$ (Wooldridge, 2015). Introducing an Instrumental variable provides unbiased and consistent estimation. According to Wooldridge (2015), the first stage, the endogenous variable SchoolYear, is regressed on the instrumental variable, and the SchoolYear is estimated as;

$$SchoolYear_{i} = \pi + \omega Z_{i} + X'_{i}\rho + \mu_{i}$$
(3.3)

In the second stage, plugging the estimated value $SchoolYear_l$ in equation (3.3) as

$$lnwage_{i} = \delta_{0} + \theta \, SchoolYear_{i} + X'_{i} \, \varphi + \tau_{i} \tag{3.5}$$

where, τ_i is a composite error that is uncorrelated with $SchoolYear_i$, and **X**'s s. The estimated value of θ is unbiased and consistent impacts of the school year on wage.

Instrumental Variable and its Validity

Finding the instrumental variable is not easy; however, many scholars suggest that parental education is good for child education. This study follows the previous studies of (Khan & Khan, 2020b; Asravor, 2021) for IV selection. The parental education is an appropriate IV for the schooling year in this study. It satisfies the three necessary conditions for a good IV. Firstly, independent exogenous condition; parent education is not affected by children's wage determining variables. Secondly, the exclusion restriction condition holds because it can not directly affect the outcome variable (children's wage). Thirdly, it should be relevant, and it is examined and confirmed by first-stage regression results in Appendix Table A2.

Further, parent education is strongly correlated with children's school year because higher educated parents might have higher income and invest more in children's education. They are more conscious about a child's better education that increases their education level and vice versa. So, parental education is one of the suitable instrumental variables for children's education. In this study, the father's and Mother's years of schooling are used as an instrument variable (IV) for individual schooling years.

4. Results and Discussion

Ordinary Least Square (OLS) Estimation

The OLS results for equation (3.2) are presented in Table 4.1 columns (1) to (3). The result shows that education has significant positive impacts on the wage. In column (1), the Mincer wage model shows that one additional year of schooling increases the salary by 4.5 percent, keeping other factors fixed. Also, including other controls, the

schooling year has significantly positive impacts on wages. However, it decreases with increasing control factors. Using occupational, regional, and social costumes (castes) as additional control variables might impact income; one additional year increases in schooling year increases the wage by 3.1 percent

Dependent Variable = ln(hourly wage), Instrumental Variable (IV) =Parental Education							
	(1)	(2)	(3)	(4)	(5)	(6)	
	OLS1	OLS2	OLS3	IV1	IV2	IV3	
Schooling Year	0.045***	0.025***	0.031***	0.043***	0.022***	0.028***	
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.007)	
Experience	0.029***	0.017***	0.015***	0.027***	0.013***	0.013***	
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	
Experience ²	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Female		-0.324***	-0.290***		-0.331***	-0.305***	
		(0.025)	(0.024)		(0.027)	(0.028)	
Married		0.110***	0.097***		0.131***	0.119***	
		(0.022)	(0.021)		(0.028)	(0.027)	
Working Hours		-0.021***	-0.022***		-0.021***	-0.021***	
		(0.001)	(0.001)		(0.001)	(0.001)	
Permanent		0.156***	0.212***		0.182***	0.221***	
		(0.019)	(0.021)		(0.026)	(0.024)	
Occupation Effects			Yes			Yes	
Social Caste Effects			Yes			Yes	
Regional effects			Yes			Yes	
Constant	3.649***	4.969***	4.844***	3.694***	5.030***	4.865***	
	(0.036)	(0.055)	(0.069)	(0.055)	(0.080)	(0.111)	
Observations	4797	4797	4699	3890	3890	3824	
R ²	0.136	0.354	0.429	0.135	0.348	0.433	
F-Statistics				1082.016	2032.450	759.211	

Table 4.1: Regression Results Using OLS and IV

Robust standard errors in parentheses, * p<0.10 ** p<0.05*** p<0.01

Two-Stage Least Square (2SLS) Estimation

Using parental schooling year (father's and mother's schooling years) as an IV of child's schooling year in column (4) to column (6) of Table 4.1, the study finds schooling year has significant positive impacts on the wage. The IV estimates of wage with basic human capital education year, experience, and square of experience are 4.3, implying that one additional year of schooling increases an individual's wage by 4.3 percent. The estimate is statistically significant at one percent level. After controlling other occupational, social and regional effects in column (6), one additional year of schooling increases the wage by

2.8 percent, which is also statistically significant at one percent. The study also finds a low education return rate in Nepal compared to the average 7.6 percent of developing countries (Peet et al., 2015b). This table (column 6), also shows the wage disparity between female and male workers. Female workers earn 30.5 percent less than the men's earnings.

1		、 · · · ·	8,	
	(1)	(2)	(3)	(4)
	Female	Male	Female	Male
Schooling Years	0.034**	0.021***	0.089***	0.022***
	(0.013)	(0.004)	(0.031)	(0.007)
Experience	0.040***	0.011***	0.044***	0.009***
	(0.010)	(0.003)	(0.010)	(0.003)
Experience ²	-0.001***	-0.000**	-0.001***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Married	-0.068	0.186***	-0.053	0.174***
	(0.059)	(0.031)	(0.055)	(0.029)
Working Hours	-0.024***	-0.020***	-0.026***	-0.021***
	(0.002)	(0.001)	(0.002)	(0.001)
Permanent	0.384***	0.155***	0.359***	0.187***
	(0.080)	(0.026)	(0.075)	(0.025)
Occupation Effects			Yes	Yes
Region Effects			Yes	Yes
Constant	4.582***	5.017***	3.937***	4.926***
	(0.241)	(0.083)	(0.406)	(0.113)
Observations	542	3348	539	3285
R ²	0.324	0.339	0.439	0.438
F-Statistics	172.286	1867.340	46.958	726.796

Table 4.2: Returns to Year of Schooling by Gender

Dependent variable = ln (hourly wage)

Robust standard errors in parentheses, * p<0.10 ** p<0.05*** p<0.01

Table 4.2 column (1) shows that female's return to schooling is higher than the males with and without controlling occupations, regional effects. With other controls, female return to education is 8.9 percent while the male has 2.2 percent, and the results are significant at one percent. In the meantime, married women return to education 6.8 percent less than unmarried women, although the difference is statistically insignificant. In a similar vein, married men are 17.5 percent more likely to return than unmarried men. In both of the cases of permanent and temporary jobs, permanent job holders have significantly higher return than temporary job holders.

In Table 4.3, the study analyzes the wage return in the top nine Nepali occupations. Out of the nine occupations in Nepal, it reveals that those related to professionals have the highest return on education (21.5 percent), followed by those related to technical and associate occupations (14.1 percent).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	occ1	occ2	occ3	occ4	occ5	0006	occ8	occ9
Schooling Year	0.063	0.215***	0.142***	0.062***	0.068**	0.048***	-0.006	0.014
Ū.	(0.058)	(0.073)	(0.022)	(0.014)	(0.026)	(0.018)	(0.010)	(0.018)
Experience	-0.005	-0.043	0.014	0.036***	0.013	0.031*	0.009	0.025
-	(0.105)	(0.027)	(0.009)	(0.012)	(0.017)	(0.016)	(0.010)	(0.020)
Experience ²	0.000	0.001*	0.000	-0.001***	-0.000	-0.001**	-0.000	-0.001
*	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female	-0.185	0.582	-0.190**	-0.044	-0.171	-0.087		-0.385
	(0.274)	(0.489)	(0.086)	(0.114)	(0.134)	(0.110)		(0.244)
Married	-0.564***	0.233	0.034	0.074	-0.064	0.389***	0.240*	0.312
	(0.190)	(0.652)	(0.100)	(0.123)	(0.141)	(0.119)	(0.134)	(0.217)
Working Hours	-0.021***	-0.015	-0.013***	-0.023***	-0.022***	-0.018***	-0.021***	-0.017***
0	(0.003)	(0.010)	(0.003)	(0.004)	(0.005)	(0.002)	(0.002)	(0.003)
Region effects	yes	yes	yes	yes	yes	yes	yes	yes
Social effects	yes	yes	yes	yes	yes	yes	yes	yes
Constant	5.607***	2.852**	2.579***	4.464***	4.712***	4.098***	5.568***	4.518***
	(1.849)	(1.126)	(0.418)	(0.350)	(0.562)	(0.322)	(0.228)	(0.413)
Observations	25	43	408	163	111	162	371	175
R ²	0.951	0.589	0.566	0.474	0.458	0.520	0.410	0.314

Table 4.3: Returns to Year of Schooling by Occupations (IV Results)

Robust standard errors in parentheses, * p<0.10 ** p<0.05*** p<0.01

Note: occ1, occ2, ..., occ9 are major occupations in Nepal (see Appendix A)

The Table 4.3 shows that married employees have higher return in the occupation of Skilled agriculture, forestry, and fishery workers (38.9 percent) than unmarried, in contrast its lower in mangers occupations (56.4 percent). Working hours has inverse impact on wage in all occupations in Nepal. Similarly, permanent jobs return (5.4 percent) higher than temporary jobs (2.4 percent) by three percentage points (see Appendix Table A3). The 2SLS model and results are verified as given in Appendix B.

5. Conclusion and Policy Recommendation

The study finds significantly optimistic estimates of education impacts on wage. The study estimates the effect using different models. According to Mincer's traditional wage equation, the study's result indicates that, on average, each year of completed schooling is correlated with a 4.3 percent increase in income in Nepal. Further, including others wage affecting factors in the estimation model, it reduced to 2.8 percent. However, the result is lower than 7.6 percent, as Peet et al. (2015) suggested for developing counties. The study notices that, there is an unfair distribution of wages between men and women, as women earn 30.5 percent less than men. However, despite this, women receive a higher return on their education at 8.9 percent compared to men's 2.2 percent. This highlights a significant disparity in the wages paid to men and women in Nepal. Similarly, the permanent job holders have a higher return than temporary workers. Also, the result is heterogeneous across occupations. The Professional and related occupations have 21.5 percent, which is highest among other occupations.

Finally, this study recommends that policymakers invest in education that has positive impacts on the returns. The return is lower with compared to other developing countries, so government should consider on this labor return issue. The government of Nepal should strengthen labor laws and regulations to ensure that workers are paid fairly for their work, according to their level of education. This can help reduce the wage gap between workers with different levels of education and promote greater economic equality.

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Appendix A

SN	Occupations
1	Managers
2	Professionals
3	Technical and associate professionals
4	Clerical support workers
5	Service and sale workers
6	Skilled agriculture, forestry, and fishery workers
7	Craft and related workers
8	Plant and machine operators and assemblers
9	Elementary occupations
10	Others (Armed force)

Table A1: Occupation Category

Table A2: First Stage Result for Parental Education as an IV

	(1)	(2)	(2)
	(1)	(2)	(3)
	OLS1	OLS2	OLS3
Parent Schooling Years	0.743***	0.631***	0.349***
	(0.014)	(0.014)	(0.012)
Exp	-0.262***	-0.289***	-0.203***
	(0.015)	(0.015)	(0.012)
Exp2	0.002***	0.003***	0.001***
	(0.000)	(0.000)	(0.000)
Female		-0.575***	-1.109***
		(0.151)	(0.124)
Working Hours		-0.039***	-0.009***
<u> </u>		(0.004)	(0.003)
Permanent		2.955***	1.019***
		(0.137)	(0.121)
Occupation Effects		. ,	Yes
Region Effects			Yes
Social Effects(Caste)			Yes
			(0.415)
Constant	7.415***	10.222***	10.641***
	(0.211)	(0.288)	(0.479)
Observations	3890	3890	3824
R ²	0.555	0.617	0.765
adj. R ²	0.554	0.616	0.763
F-statistics	1612,57	1040.86	398.7

Robust standard errors in parentheses, * p<0.10 ** p<0.05*** p<0.01

	(1)	(2)		
	Permanent Jobs	Temporary Jobs		
Schooling Year	0.054***	0.024***		
	(0.011)	(0.008)		
Experience	0.015***	0.011***		
	(0.006)	(0.003)		
Experience ²	-0.000	-0.000**		
	(0.000)	(0.000)		
Female	-0.133***	-0.328***		
	(0.045)	(0.031)		
Married	0.062	0.132***		
	(0.053)	(0.030)		
Working Hours	-0.017***	-0.022***		
	(0.002)	(0.001)		
Occupation Effects	Yes	Yes		
Region Effects	Yes	Yes		
Social Customs Effects	Yes	Yes		
Constant	4.512***	5.259***		
	(0.208)	(0.189)		
Observations	700	3124		
R ²	0.576	0.382		
F-statistics	217	570		

Table A3: Returns to Year of Schooling by Type of Job (IV estimation)

Robust standard errors in parentheses, * p<0.10 ** p<0.05*** p<0.01

Appendix **B**

B1. Country Background

B.1.1 Educational Background

Nepal is a landlocked country situated between India on the east, south, and west, and China on the north. Geographically, it is divided into mountains, hills, and Terai, which are fertile plains. According to the National Population Census 2011 (CBS, 2011), the country has a total population of 26.5 million, with close to 50.3 percent residents in the Terai, 43 percent in the hills, and 6.7 percent in the mountains. In addition, the population is shared among females 50.1 percent and males 49.1 percent. Since 1990, when the country transitioned from an authoritarian to a democratic administration, it

emphasized education and its advancement. Currently, the school system is divided into five-level: 1) Primary level (grade 1-8, age 5-12 years), 2) Secondary level (grade 9-10, age 13-14 years), 3) Higher secondary level (grade 11-12, age 15-16 years), 4) Undergraduate (age 17-20 years), and 5) Graduate and more (age 21-22 years).

B.1.2 Labor Situation in Nepal

The Nepalese labor market is not equally distributed between male and female workers. Out of the working-age population, 125 women for 100 men, 59 women for 100 men are employed (NLFS, 2018). According to the NLFS 2018 report, the national labor force participation rate and employment-to-population were 38.5 percent and 34.2 percent. Within the age group 25-34 years, the labor force is highest (27.7 percent) followed by age group 35-44 years and the employed population is also according to these proportion. The highest share of the employed population 27.3 percent in the age group 25-34 years. Table B1 shows that the distribution of labor market indicators by education attainments. The employment-population ratio for males is almost equal between the labor force having at least secondary education and having no secondary education, but it is high for tertiary education. In contrast, the employment-population ratio for the female is lower than male among the population with and without secondary education.

Education Level	Employment-Population ratio			Labor force participation rate			Unemployment rate		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Total	48.3	22.9	34.2	53.8	26.3	38.5	10.3	13.1	11.4
No Secondary Education	46.4	20.6	31.5	51.6	23.7	35.5	10	13	11.1
Secondary Education	49	36.3	43.1	57	43.8	50.9	14	17.1	15.3
Tertiary	67.4	52.1	61.8	73.9	56.4	67.5	8.7	7.7	8.4

Table B1: Labor market indicators by education level and sex.

Source: Nepal Labor Force Survey Report 2019, (CBS, 2019)

The unemployment rate is higher for females with secondary education and no secondary education than tertiary education. The labor market is male-dominated to

female presence. However, the secondary school enrollment rate for a female is increasing. Similarly, 37 percent of the labor force is engaged in the formal sector (CBS, 2019).

B2. Model Test

Under identification Test :

Each model used in Table 5.1 column (3)-(6) is examined to under-identify the variable test. The result shows for all models used in Table 5.1, Table 5.4, and Table A3 in Appendix that the instrument variable is not under-identified. The Kleibergen-Paap rk LM statistic is applied for all 2SLS techniques, and found null hypothesis for under-identification of variable is rejected.

Over identification Test

The Sargan-Hansen test is applied to examine the overidentifying restrictions of IV. The result found exact identification of IV and exogenous variables. So it is no worries about this issue.

Weak identification test

For the weak identification of IV, firstly, the first stage regression results are analyzed and found that the IV is strongly associated with exogenous variable (See Table A2 in Appendix) and have sufficient value of F statistics to take IV. Secondly, the Cragg-Donald Wald F statistic and Kleibergen-Paap rk Wald F statistic for all the models using IV's are higher than then Critical values, which show the selected IV is good for the endogenous variable.

Endogeneity test of endogenous regressors

The endogeneity of each endogenous variable is tested by using STATA commands "endog()."After plugging IV in all the models, the null hypothesis of endogeneous of regressor is failed to reject, which impels the regressor is exogeneous.