Growth and Welfare Effects of Education: Evidence from Asian Countries

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Abstract

Considering the potential role of education in enhancing the socioeconomic prosperity of countries, this study examines the effect of education on economic growth and household welfare in Asian countries. Static and dynamic panel data estimation techniques were employed for analysis. The findings of the study reveal a significant positive effect of education on economic growth and household welfare, with the growth effect of male education being marginally higher than female education. Interestingly, the household welfare effect of female education is revealed to be higher than male education. These findings imply that for economic growth and household welfare enhancement in the region, female education is as important as male education. Consequent to these findings, the study emphasises the need for policy measures aimed at enhancing both access and quality of education for people of all genders in the region.

1.0 Introduction

The role of education in enhancing the economic growth and social prosperity of a nation cannot be overemphasised. This is because it aids the social and economic inclusion of people as well as strengthens the overall welfare of the family via expected higher income, thereby uplifting the financial condition of the family. Of particular importance is the role female education plays in improving national and household incomes via labour market participation and entrepreneurship.

A starting point in appraising the role of education in the economic development of a country is the dictates of the Human Capital Theory. This theory was propounded by Schultz (1962) and developed further by Becker (1964), Mincer and Polachek (1974), Pscharopoulos and Woodhall (1997), Barro (1991), Sakamota and Powers (1995) among others. The major thrust of the theory is the argument that knowledge and skills acquisition improves productivity and, by extension, national income. As noted by Olaniyan and Okemakinde (2008), education is instrumental in the growth and development of a nation; however, the extent of the effect depends on the quality of education. Apart from improving productivity levels, education promotes labour market participation, enhances entrepreneurship, improves household income and, by extension general socioeconomic well-being of a country. Further, education plays an important role in enhancing effective poverty eradication, thereby promoting societal structural transformation, and ensuring sustainable development, while also reducing unemployment, especially in developing countries (Hassan and Rafaz, 2017).

Considering the role of education in promoting economic prosperity as highlighted by the Human Capital Theory, this study examines the effect of male and female education on the economic growth and welfare of households in Asia. The contribution of this study to the literature is three-fold. Firstly, the study accounts for the potential endogeneity problem which arises because of probable reverse causality between education and economic growth[1]. Secondly, the effect of education on household welfare is examined. Lastly, the study disaggregates the role of education into male and female education.

2.0 Literature Review

The role of education in enhancing economic prosperity is entrenched in economic theory. Solow (1957) argued that an important determining factor of economic growth is technical progress; this is driven by education and innovation. Mankiw et al. (1992) identified human capital, particularly education as a key factor that contributes positively to economic growth. This model is an extension of the traditional Solow model by including a human capital component. The model noted that although savings and population growth are important determinants of economic growth as identified by the Solow model, since the accumulation of human capital is potentially correlated with both population growth and savings rate, failure to include human capital accumulation can lead to bias in estimating the effects of savings rate and population growth on economic growth. Similarly, Romer (1986) argues that knowledge is an essential input in production, and it has increasing marginal productivity. Further, knowledge comes about due to investment in human capital, its spill-over leads to technological progress thereby contributing to long-run economic growth (Abugamea, 2017). Further, education improves employability because of acquired skills; this has the potential to improve the purchasing power of households and by extension household welfare.

The empirical literature on the relationship between education and macroeconomic outcomes includes Hassan and Cooray (2015), Oztunc et al. (2015), El Alaoui (2016) and Cabeza-Garcia et al. (2018); who all employed panel analysis to examine the effect of education but the findings of the studies produced mixed results. For instance, Oztunc et al. (2015) employed the random effect model to analyse data for a panel of 11 Asia Pacific countries. The findings of the study suggest that education exerts a significant positive effect on the economic growth of the region. Similarly, Hassan and Cooray (2015) employed the endogenous and exogenous growth framework and found a positive and robust effect of education in Asia. In addition, the study argued that enhancing female education in those economies would be associated with faster growth.

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[1] There is the potential for a bi-directional causality between economic growth and education. An expansion of national income provides resources for more investment in education, hence impacting education positively. Further rising national income curbs some of the factors militating against access to education such as poverty, unpaid labour, and unemployment among others. On the other hand, education attainment improves productivity and by extension national income.

Further, Hassan and Rafaz (2017) examined the effect of education on the economic growth of Pakistan. Employing the OLS technique, the study concluded that female education positively affects female participation in the labour market and, therefore, contributes significantly to Pakistan's growth. To avoid the endogeneity issue related to the OLS technique, Hong et al (2019) adopted an instrumental variable approach. The results showed that, to stimulate inclusive growth for both developing and developed countries, increasing access to education, particularly at the primary level becomes necessary. This is premised upon the positive effect of education on economic growth that was found by the study. Cabeza-Garcia et al. (2018) examined the relationship between gender factors and the economic growth of 127 high and low-income countries. The findings of the study suggest that female access to secondary education, the labour market, and the political scene lead to a positive effect on economic growth. Whereas, the high fertility of women leads to a negative effect on growth.

On the other hand, Pegkas and Tsamadias (2017) investigated the impact of higher education on the economic growth of Greece. The findings of the study suggest a non-significant effect of education on economic growth. Similarly, El Alaoui (2016) adopts the fixed-effect model for the case of Morocco, Algeria, Tunisia, and Egypt. The study finds that, in the studied area, female primary and secondary education levels are not significant enough to stimulate growth. Only tertiary education alongside female participation in the labour market positively affects economic growth. In the same vein, Dauda (2013) included gender education in the augmented Solow model. The results obtained by applying the cointegration and vector error correction model proved the absence of a significant effect of female education on the Nigerian economy over the period 1975-2008.

On the effect of education on household welfare, Humas and Aturupane (2011) investigate the case of Sri Lanka by employing the quintile regression on data spanning 1985 to 2006. The findings of the study indicated that an increase in education improves household welfare with higher quintiles enjoying higher welfare increases. Using census data from Nepal, Fafchamps and Shilpi examined the effect of male and female education on household welfare. The findings of the study reveal a lesser influence of female education on household welfare compared to male education. In addition, Ogundari and Aromalan (2014) employed the Double Hurdle model and quantile regression to investigate the impact of education on household welfare in Nigeria. The findings of the study show a positive effect of educational attainment on household welfare, with tertiary education having a greater effect than secondary and primary education.

Studies that analysed the effect of education and labour market factors such as unemployment include Njifen (2015), who used the Blinder-Oaxaca decomposition method to investigate gender and diploma gaps in Cameroonian youth unemployment. The results reveal that, in Cameroon, even if education plays a key role in explaining unemployment, earning a diploma does not prevent unemployment. Furthermore, female youth unemployment is more prevalent compared to their male counter paths. Similarly, Nagac and Nuhu (2016) employed the logit model and found an inverted U-shaped relationship between female education and labour market participation. The study suggests that female education up to the secondary level is associated with an increase in labour force participation; however, the participation decreases as education level tends towards higher education. Similarly, employing the binary probit model for analysis, Sudarshan (2014) and Kanjilal-Bhaduri and Pastore (2018) also found an inverted U-shaped relationship between female education and labour market participation. From the review of the extant literature, there is no consensus on the role of education on economic growth and welfare, hence the need for further investigation.

3.0 Model, Methodology and Data

3.1 Model Specification

The study adopts the Mankiw et al. (1992) model which is an extension of the Solow Model by augmenting it to include a human capital component. The model emphasises the role of human capital as an important determinant of economic growth (Addi and Abubakar, 2022). In the context of this study, the human capital variable is education. The model is specified as:

$$Y(t) = \left(A(t)L(t)\right)^{1-\alpha-\beta} K(t)^{\alpha} H(t)^{\beta} \qquad (1)$$

The estimable form of the model is derived by taking the logarithm of equation (1), this produces:

$$LogY(t) = \delta LogA(t)L(t) + \alpha LogK(t) + \beta LogH(t) \qquad (2)$$

Where: Y(t) – Real GDP Per Capita.

A(t)L(t) – Effective Labour (Labour Force).

K(t) – Physical Capital (Gross Fixed Capital Formation).

H(t) – Human Capital (Secondary School Enrolment as proxy).

$$\delta = 1-\alpha-\beta$$

To account for other control variables, equation (2) is augmented to the form of:

$$LogY(t) = \delta LogA(t)L(t) + \alpha LogK(t) + \beta LogH(t) + \theta LogZ(t) \qquad (3)$$

Where Z(t) is a vector of control variables which includes Foreign Direct Investment (FDI), export, import, inflation, female population, and male population.

The econometric form of the economic growth empirical model is specified as:

$$growth_{it} = \alpha + \beta_1 edu_{it} + \beta_2 inv_{it} + \beta_3 lab_{it} + \beta_4 fdi_{it} + \beta_5 expt_{it} + \beta_6 impt_{it} + \beta_7 infl_{it} + \beta_8 fem\_Pop_{it} + \beta_9 mal\_pop_{it} + \varepsilon_{it} \quad (4)$$

The econometric form of the household welfare model is specified as:

$$welfare_{it} = \alpha + \beta_1 edu_{it} + \beta_2 inv_{it} + \beta_3 impt_{it} + \beta_4 fdi_{it} + \varepsilon_{it} \quad (5)$$

Household consumption expenditure has been used widely in the literature as a measure of household welfare (see Munyegera and Matsumoto, 2016; Nguyen et al., 2018; Saing, 2018). This study also uses household consumption expenditure as a proxy for household welfare. This is premised upon the fact that the welfare of a household is to a large extent determined by their consumption of goods and services.

3.2 Estimation Techniques

To estimate the relationship between the study variables, this study employs both static and dynamic panel estimation models. Under the static panel model, fixed effect and random effect models are estimated. Considering the potential for a feedback relationship from economic growth to education which leads to the endogeneity problem (Hawkes and Ugur, 2012), the Panel Generalised Method of Moment (GMM) model is employed for analysis. Apart from correcting for endogeneity, the method also corrects for possible serial correlation in the model (Roodman, 2009). The GMM model uses instruments to correct for endogeneity, the validity of instruments is examined using the Sargan test of over-identifying restriction and the Arellano-Bond second-order serial correlation test. Studies that employed the GMM estimator to correct for endogeneity include Panizza and Presbitero (2013), Kim (2015), Inuwa et al. (2019), and Abubakar (2020) among others.

3.4 Data

This study focused on a panel of twenty-one (21) Southeast, East, and Pacific Asian countries. The countries are Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, China, Hong Kong, India, Indonesia, Japan, South Korea, Lao, Macau, Maldives, Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Timor-Leste, and Vietnam. The variables used and their measurement are presented in Table 1.

Table 1 Data Description

Variables	Measurement	Source
Economic Growth (*growth*)	Gross Domestic Product per capita in constant US Dollars.	World Bank's World Development Indicators (WDI)
Welfare	Household consumption expenditure in US Dollars.	WDI
Education (*edu*)	Secondary school enrolment ratio.	WDI

Investment (*inv*)	Gross Fixed Capital Formation in constant US Dollars.	WDI
Foreign Direct Investment (*fdi*)	Net Foreign Direct Investment inflows in US Dollars.	WDI
Import (*impt*)	Import of goods and services in US Dollars.	WDI
Export (*expt*)	Export of goods and services in US Dollars.	WDI
Inflation (*infl*)	Annual CPI inflation rate.	WDI
Labour (*lab*)	Total Labour Force.	WDI
Female Population (*fem_pop*)	Total female population.	WDI
Male Population (*mal_pop*)	Total male population.	WDI

Data on all study variables were sourced for the period 2010 to 2020. All variables except for inflation rate and FDI are converted to their logarithmic form before being used for analysis. The data properties are presented in the descriptive statistics in Table 2. From the descriptive statistics, apart from inflation and FDI, the variable with the most spread is labour, followed closely by investment. The least spread variables are male and female populations.

Table 2 Summary Statistics

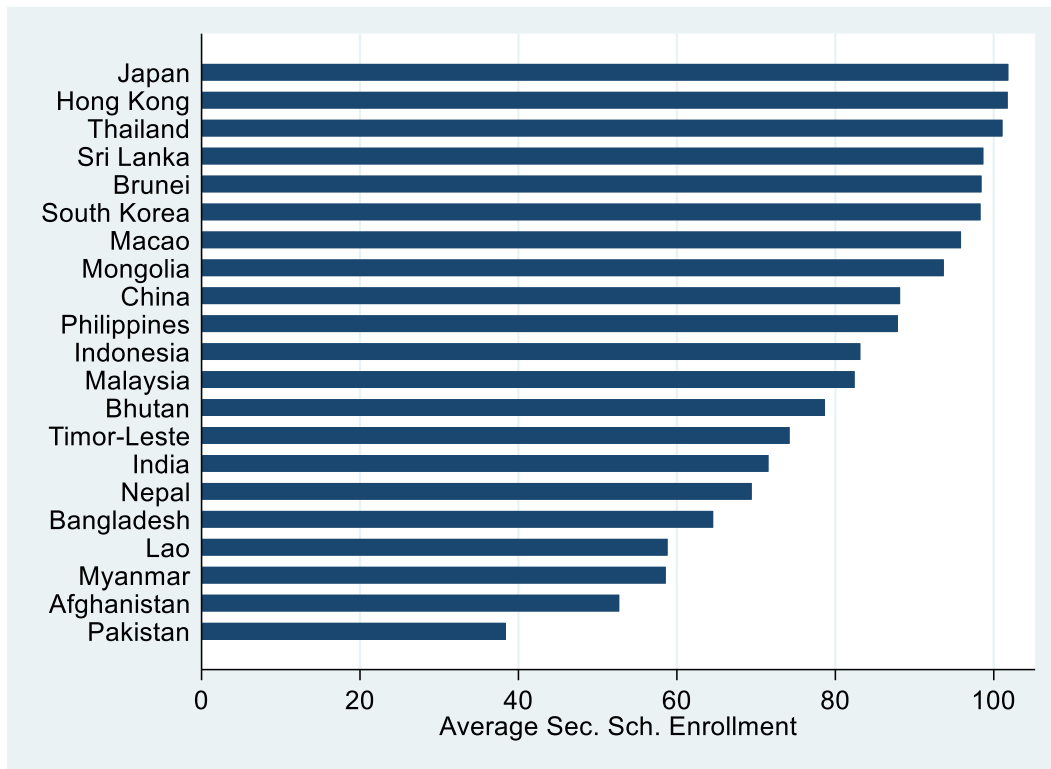| Variable	Mean	Standard Deviation
GDP Per Capita	8.427565	1.401158
Investment	24.16092	2.172074
Labour	16.26036	2.291532
Export	3.376105	0.8789916
Import	3.60575	0.6459643
Welfare	25.06736	2.471216
Education	4.351407	0.2773212
Male Population	3.911976	0.0318352
Female Population	3.911074	0.03145
FDI	2.23E+10	5.44E+10
Inflation	4.212916	3.308146

Figure 1. Average Secondary School Enrolment Ratio (2010-2020)

Figure 1 presents the average secondary school enrolment ratio of the respective Asian countries included in the study over the period 2010 to 2020. From the chart, the countries with the highest enrolment secondary school enrolment are Japan, Hong Kong and Thailand. This probably explains the high economic prosperity in the respective countries, especially the top two countries. Conversely, the countries with the relatively lowest secondary school enrolment are Myanmar, Afghanistan and Pakistan. The chart shows in descending order the relative importance given to education in the respective countries with the countries at the bottom end of the spectrum being relatively less prosperous.

4.0 Findings and Discussion

In this section, the results obtained from the estimated static and dynamic models are presented and discussed.

4.1 Findings of Static Panel Models

The result of the estimated static panel models - Random Effect (RE) and Fixed Effect (FE) models are discussed here. The results are presented in Table 3.

Table 3 Result of Estimated Economic Growth Static Panel Models

Variables	Fixed Effect	Random Effect
Education	0.0509	0.0508
	(0.0915)	(0.0938)
Investment	0.490***	0.592***
	(0.0428)	(0.0423)
Labour	0.0909	0.415*
	(0.249)	(0.250)
FDI	4.15e-13	6.04e-13
	(5.51e-13)	(6.00e-13)
Exports	0.158***	0.203***
	(0.0321)	(0.0328)
Imports	-0.439***	-0.428***
	(0.0444)	(0.0468)
Inflation	0.00135	-0.00344
	(0.00342)	(0.00349)
Population	-0.250	-1.082***
	(0.333)	(0.233)
Intercept	0.402	6.548***
	(3.424)	(0.856)

*** , ** and * signifies significance at 1%, 5%, and 10% respectively.
Standard errors are in parentheses.

Table 3 presents the result of the estimated static economic growth models. From the estimates of both the fixed and random effect models, the effect of education on economic growth, though positive, is statistically insignificant. The insignificant effect estimate could be because both estimators do not correct for the potential endogenous relationship between education and economic growth. Other variables of the model such as exports, exports, and investment have a significant positive effect on the economic growth of Asian economies. This implies that an increase in the variables is associated with an expansion of the economic growth of Asian counties. On the other hand, imports and population negatively influence economic growth, implying that an increase in these variables depresses the economic growth of the Asian economies. Considering the weakness of both the fixed and random effect of not controlling for the potential endogeneity problem in the model, the inferences of the study cannot be based on the findings of both models. To control for endogeneity, the Panel GMM model is estimated, and the result is presented in Table 4.

4.2 Accounting for Endogeneity

In this section, the result of the estimated Panel GMM economic growth model is discussed.

Table 4 Estimates of Panel GMM Economic Growth Model

Variables	(1)	(2)	(3)	(4)	(5)
Lag Per Capita GDP	0.763***	0.753***	0.768***	0.598***	0.878***
	(0.0486)	(0.0476)	(0.0509)	(0.0857)	(0.150)
Education	0.487***	0.459***	0.532***	0.772***	0.555***
	(0.106)	(0.0941)	(0.126)	(0.151)	(0.170)
Investment	0.156***	0.152***	0.156***	0.266***	-0.0597
	(0.0444)	(0.0424)	(0.0467)	(0.0719)	(0.174)
Labour	-0.167***	-0.167***	-0.166***	-0.280***	0.0185
	(0.0439)	(0.0420)	(0.0461)	(0.0728)	(0.168)
FDI	2.00e-12***	1.63e-12***	2.25e-12***	2.01e-12**	1.77e-12
	(4.94e-13)	(4.85e-13)	(5.29e-13)	(7.86e-13)	(1.51e-12)
Export	0.0817***	0.0895***	0.0758***	0.111***	0.102***
	(0.0143)	(0.0147)	(0.0143)	(0.0250)	(0.0280)
Import	-0.140***	-0.162***	-0.125***	-0.180***	-0.185***
	(0.0258)	(0.0286)	(0.0245)	(0.0435)	(0.0322)
Inflation	5.98e-05	-0.00175	0.00153	-0.000965	-0.000916
	(0.00273)	(0.00260)	(0.00296)	(0.00351)	(0.00585)
Male Population	0.749	-0.0314	1.316**	0.295	-0.0115
	(0.637)	(0.703)	(0.641)	(0.914)	(0.0130)
Female Population	-0.970	-0.0959	-1.623**	-0.673	0.0147
	(0.678)	(0.735)	(0.701)	(0.953)	(0.0204)
Sargan Test Prob.	0.280	0.312	0.206	0.555	0.513
Arellano-Bond Test Prob.	0.226	0.250	0.219	0.483	0.689

*** , ** and * signifies significance at 1%, 5%, and 10% respectively.
Standard errors are in parentheses.

Table 4 presents the results of the estimated economic growth panel GMM models. The results of five differently specified GMM models are presented. The result of the aggregate (male and female) education model is presented under model 1, while the result of the disaggregate female and male education models are presented under models 2 and 3, respectively. Further, the lag effect of all the variables is captured under model 4, while the sub-sample model[2] is presented under model 5. From the result of the aggregate model (model 1), education exerts a significant positive effect on the economic growth of Asian economies. This finding implies that an increase in educational attainment is beneficial for economic prosperity, in line with the dictates of the Human Capital Theory and the result of Hassan and Rafaz (2017) and Hong et al. (2019). A possible explanation for this finding could be that education improves the skill and technical know-how of the people, which, in turn, enhances productivity and, by extension, economic growth. Similarly, education improves the know-how of people to be self-employed, thereby leading to higher production of goods and services. This finding underscores the significant role of education in propelling economic growth. From the result of model 2, female education exerts a significant positive effect on the economic growth of Asian economies implying that an increase in access to education by females is growth stimulating. This could be associated with the productivity-enhancing effect of education. This finding aligns with the result of Hassan and Cooray (2015) and Oztunc et al. (2015), Similarly, the effect of male education on economic growth is also positive. This is presented under model 3. These findings underscore the importance of both male and female education for enhancing economic prosperity. Interestingly, the magnitude of the positive effect of male education, denoted by the size of the coefficient, is not significantly higher than female education. This shows that female education is as important as male education for growth stimulation.

Considering that the effect of macroeconomic variables on economic growth might not be contemporaneous but rather with a lag, the study examined the lagged effect of education and other variables on the economic growth of Asian countries; this is presented under model 4. From the result of the lag model, education exerts a significant positive effect on economic growth. This implies that an increase in access to education exerts a desirable future growth effect. Interestingly, the magnitude of the lag effect of education on economic growth exceeds the contemporaneous effect going by the size of the coefficient of both models. The Asian

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[2] Here, the high-income countries based on World Bank classification (Japan, Hong Kong, and South Korea) are excluded from the model estimations.

economies included in the study consist of countries with varying levels of development. To confirm the robustness of the results, a sub-sample model where the high-income countries (based on World Bank classification) are excluded from the sample is estimated. The result is presented under model 5. From the result of the sub-sample model, education maintains a significant positive effect on economic growth. This implies that, even if the highly developed nations are not considered, education in low- and middle-income countries spurs economic growth. Therefore, the findings of the study are robust.

The other variables of the model such as investment, exports, FDI, and male population, influence the stimulation of economic growth. This implies that an increase in all the variables is growth-stimulating. On the other hand, an increase in importation in Asia economies depresses economic growth so also is the female population. The negative effect of the female population on growth might be explained by the paucity of economic-active opportunities facing females in some countries. The negative effect of labour force expansion on economic growth is counterintuitive although it aligns with the finding of Tsani et al. (2013). To examine the validity of the instruments used by the GMM model to correct for endogeneity, the Arellano-Bond test for second-order serial correlation and the Sargan test of identifying restrictions are employed. From the result, presented in the bottom part of Table 4, the insignificance of the Arellano-Bond test signifies the absence of a second-order correlation between the instruments and the errors. Further, the insignificance of the Sargan test confirms the validity of the instruments used in the model.

4.3 Effect on Household Welfare

As indicated in the introduction, the study extends the analysis to examine the impact of education on household welfare. Doing this provides insight into how education could not only affect the macroeconomy but also the household level. The GMM model is also employed to estimate the welfare models, and the results are presented in Table 5.

Table 5 Estimates of Household Welfare Model

Variables	(1)	(2)	(3)
Lag Welfare	1.151	1.109	1.205
	(0.707)	(0.683)	(0.735)
Education	0.634***	0.645***	0.581***
	(0.160)	(0.151)	(0.164)
Investment	-0.202**	-0.221***	-0.178**
	(0.0781)	(0.0775)	(0.0788)
Import	0.434***	0.444***	0.417***
	(0.0967)	(0.0945)	(0.0992)
FDI	2.83e-13	2.74e-13	2.72e-13
	(8.67e-13)	(8.46e-13)	(8.94e-13)
Sargan Test Prob.	0.818	0.823	0.805
Arellano-Bond Test Prob.	0.474	0.437	0.507

*** , ** and * signifies significance at 1%, 5%, and 10% respectively.
Standard errors are in parentheses.

Table 5 presents the result of the estimated household welfare model. Under this, the result of the effect of aggregate, female, and male education models are presented in models 1, 2, and 3 respectively. From the result of model 1, an increase in educational attainment influences an increase in household welfare in Asian countries. A rationale for this finding could be that being educated improves the skills of individuals, thereby providing the opportunity for higher income for the household. An increase in household income is, by extension, associated with increased welfare. In addition, education equips individuals to be self-employed, hence earning higher incomes and improved welfare. In model 2, the effect of female education on welfare is also positive, implying a stimulating effect of female education on household welfare. A possible explanation for this is that, when females are educated just like their male counterparts, their chance of receiving higher income increases due to acquired skills acquired, hence increasing the entire household income and, by extension, welfare. The effect of male education in model 3 mirrors the result of the aggregate and female education models. Interestingly, the magnitude of the effect of female education on male education is slightly higher, thereby underscoring the relative importance of female education for household welfare in the region. A rationale for this finding could be that female education potentially improves the income opportunities of women; this complements the income of the men, thereby improving household

welfare. Besides, considering that men in traditional societies have relatively more dependents outside their households compared to women, an increase in female income is likely to make a relatively higher impact on household welfare. An increase in importation provides alternatives for households to consume from, thereby increasing welfare. Investment, on the other hand, is negatively related with consumption. This finding is not surprising considering that an increase in investment is in most instances accompanied by a reduction in consumption, hence a potentially lower welfare. The insignificance of the Arellano-Bond test signifies the absence of a second-order correlation between the instruments and the errors. Further, the insignificance of the Sargan test confirms the validity of the instruments used in the model.

5.0 Conclusion

This study examined the effect of education on economic growth and household welfare in a panel of Asian economies. The findings of the estimated models indicated a stimulating effect of education on the economic growth of the region. The result is robust to the disaggregation of education into male and female education. Interestingly, the magnitude of the effect of male education on economic growth does not significantly differ from the effect of female education, thereby implying that, as far as economic growth is concerned, female education is as important as male education. The findings of the study also suggest that education also influences an increase in household welfare with female education having a relatively greater effect than male education.

To improve growth and household welfare in the region, the study recommends the need for policy efforts towards improving access to education by people of all gender in the Asian region, especially female education, which faces more challenges. This could be achieved by eliminating bottlenecks militating against education such as cultural factors, distance to schools, availability of schools, and child marriages among others. Similarly, the focus of policymakers should not only be on access to education but also the quality of education. This can be achieved via adequate educational funding, employment of qualified teachers, training, and retraining of teachers, and the provision of learning materials and infrastructure.

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