



Government and Household Expenditure on Education: The Role of Credit Constraint

Abida Naurin¹, Ahsan ul Haq Satti², Uzma Bashir³

¹ Ph.D. Scholar in Econometrics, School of Economics, Pakistan Institute of Development Economics, Islamabad
Email: abidanaurin_15@pide.edu.pk

² Assistant Professor, School of Economics, Pakistan Institute of Development Economics, Islamabad, Pakistan
Email: ahsansatti@pide.org.pk

³ Lecturer of Management Sciences, NUML Rawalpindi, Pakistan
Email: uzma.bashir@numl.edu.pk

ARTICLE INFO

Article History:

Received: October 11, 2021

Revised: December 08, 2021

Accepted: December 16, 2021

Available Online: December 22, 2021

Keywords:

Public Education Expenditure
Panel Data Models
Panel Corrected Standard Error
PVAR
Impulse Response Function

JEL Classification Codes:

C33, D14, G51, H75, I25

ABSTRACT

Human capital accumulation is one of the most important factors of economic growth for both developed and developing nations. The central research question of this paper is to evaluate the tendency of household educational spending vis-à-vis government spending on education, given the household's credit constraints. For this purpose, use annual data of 40 countries from 2004 to 2018 in this paper. The intensity of government and household expenditures on education is a more appropriate indicator to analyze the impact of human capital on economic development. This paper has applied the Fixed effect and the random effect model. The Panel Corrected Standard error (PCSEs) model to tackle the problem of heteroscedasticity, Serial Correlation of AR (1), and Cross-sectional dependence. For testing stationarity of the variables, the second generation panel unit root test is Im-Pesaran and Shin (IPS) Test at level and difference. As a robustness test, I estimated a VAR (3) and computed the Impulse response function using Cholesky decomposition along with a 95% confidence interval. The current study concludes that the causality runs from household expenditures (HEX) to government expenditure (GEX) on education directly and not the other way round. This paper also finds a negative contemporaneous relationship between GEX and NPL at the 5% significance level. This means that as households become more credit-constrained, the government tends to spend less on education.

© 2021 The Authors, Published by iRASD. This is an Open Access Article under the Creative Commons Attribution Non-Commercial 4.0

Corresponding Author's Email: abidanaurin_15@pide.edu.pk

1. Introduction

A set of intangible resources can be considered human capital required to uplift labor productivity (Goldin (2016); Benos and Zotou (2014)). This set is comprised of many social indicators, such as increased school enrolments, new knowledge, learnings skills, and expertise through training. These are attained by education and experience (Schultz (1961); Becker (1962)). Human capital accumulation is one of the significant determinants of economic growth for both advance and developing countries. Generally, it relates to formal and informal education. Thus, educational expenditure is considered one of the most substantial forms of human capital investment, because new learning, skills, and knowledge cannot be measured easily. This study analyzed the causal relationship between the intensity of government spending on education and the intensity of household spending on education with the role of credit constraints. For this purpose, used annual data of 40 countries from 2004 to 2018. Therefore, educational spending plays a central role in the process of economic development and economic growth. The intensity of government and household expenditures on education is a more appropriate indicator to analyze the impact of human capital on economic development.

Education has appealed to the attention of labor, growth, and development economists. The emphasis of economists is different in each field; Labor economists focus on the effect of education on an individual's labor market outcome, growth economists search for links between investment in education and income growth at the macro level, and development economist focus on the impact of education in less developed countries. The first neoclassical approach, developed by Solow (1956), describes decreasing returns in human or physical capital accumulation leads to convergence. Later on, Mankiw, Romer, and Weil (1992); Barro (1991) and Barro, Mankiw, and Sala-i-Martin (1992) extend this model by including human capital as a third factor of production. Moreover, they regressed the average growth rate on numerous macroeconomic variables such as public spending on education and educational attainment per fraction of GDP. They found a significant positive relationship between educational attainment and economic growth.

Pakistan being a developing country is struggling with the economic growth and development. Through mutual collaboration of federal and provincial institutions, the country is spending huge amount every year on its education sector. In the FY2020-21, government has been able to allocate Rs.83 billion for education sector. However, there is a need to spend more on education in Pakistan to ensure productivity and economic growth by developing human capital (PBS 2020). Researchers working on causality have faced these kinds of difficulties and proposed different solutions to determine causality. The most commonly used technique to determine causation is a correlation. However, Correlation is very sensitive to data. Pierce and Haugh (1977) identify that causality cannot be conceptualized as an appropriate measure of Correlation; rather it is an indication of empirical Correlation. Later on, with the evolution of econometrics, economists tried to differentiate causal relation from empirical Correlation. Furthermore, the researcher developed several methods to test causality according to the type of data.

The following is the key notion of the study question: Is the tendency of households to spend on education a result of the government's lack of education provision, or does the government respond to the households' lack of education spending? What role does credit constraint play? The main objective of this paper is to examine the causal relationship between government spending on education and household spending on education with the presence of other confounding variables by using conventional methods and tests for panel data. This paper is organized as follows; Section 2 follows the Literature review; Section 3 demonstrates the Data and Econometric Methodology. Empirical results and Discussion are described in section 4. Finally, the Conclusion and policy recommendation is discussed in Section 5.

2. Literature Review

The majority of countries have guaranteed educational facilities, but in many underdeveloped countries, due to budgetary constraints, poor administration, and less attention from federal and local authorities, grass-roots facilities remain an unsolved matter. (Singh & Shastri, 2020). Askarov and Doucouliagos (2020) look at how remittances affect household education spending. In contrast to domestic remittances, international remittances have been proven to be a higher source of increased educational expenditure at the household level. In terms of education spending, boys and girls are treated equally in households.

Kuvat and Kizilgöl (2020) analyses out-of-pocket household education spending using data from the Turkey household budget survey 2017. The data show that household income, household head educational level, and personal residence are the most important predictors of education spending. The characteristics have a favorable influence on household education spending. Household size increases and lesser access to education are both linked to decrease household out-of-pocket spending. Khalili, Arshad, Farajzadeh, Kächele, and Müller (2020) investigate the impact of drought on small farm household education spending in the Iranian province of Fars. The education expense and income of small farm households have a negative connection. Income has a less proportionate influence on education spending. Bias does not exist in boys' and girls' educational expenditure at the school level, but it does exist at the university level. Households are more likely to discourage girls from pursuing higher education while pushing males to do so.

A critical assessment of the determinants of education expenditures within Malaysian society was carried out by Abdul Jabbar and Selvaratnam (2017); Yun and Yusoff (2018). Both studies pointed out that the economic-demographics and political factors play a vital role in determining the Malaysian's public education expenditure from 1990 to 2015. The results of the study confirmed that revenue had been positively significant for the education expenditure, while in the case of budget deficit the results were negatively significant. Additionally, unemployment rate had an inverse and insignificant impact on the overall education expenditures of the country. The same studies reflected that the policy makers did not consider economic and political indicator as the decision on the education expenditure was given priority to achieve greater future goals. Both studies emphasized that the long term sustainable economic growth is dependent on the quality education expenditure and the short-term variable like poverty, unemployment, inflation, budget deficits were handled to other economic strategies while securing the allocated budget for the education sector.

Bischoff and Prasetyia (2015) analyzed the education spending determinants that involved 398 Indonesian panel data from the years 2005 to 2012 by using random effects and fixed effects models in their research study. Their results exposed that the public education expenditure gets increased due to the larger share of children population in any community. Moreover, the study further highlighted that the citizens were found unwilling to support high shares of public expenditure invested in the form of tax contributed by them because it was creating financial distress on them to pay for communal welfare.

In a study conducted in India, it has been found that when the government gives more aids and helps to educational institutions, the rate of economic growth increases. And the total amount of revenue collected from taxation allowed government to allocate higher budget for education expenditure and this action positively influence the overall GDP growth. However, it has also been found that due to the high population of school age children in the community, the spending of education budget gets lower as the total financial cost of education expenditure becomes far less than the demand present (Chatterji, Mohan, & Dastidar, 2014). Idrees and Siddiqi (2013) conducted a research based on panel analysis and identified a significant positive relationship present between the rising cost of education and economic growth due to different reasons. Firstly, the investments spent on the education sectors ensure the availability and access of learning various skills and techniques that can generate income of any kind. Secondly, there is a huge competition present in contemporary times about the quality of education and the research-oriented studies that can effectively help other people and communities. Thirdly, due to digitalization and commercialization of the education field and the increase taxes related to the services industries the total amount spend on the education sector is increased. Therefore, the market worth of well-educated and well-equipped labor is increased.

Another research on African countries revealed that in order to exercise public welfare policies and strategies, education become one of the most successful investments to alleviate poverty and positive economic growth. The study also reflected that due to the fact that population size was majorly under 14 years of age. So, the investment on the education sector become more productive as it created skilled and educated laborers and professionals. Moreover, there has been observed positive GDP growth after spending on education sector (Akanbi & Schoeman, 2010). Similarly, a study conducted in Thailand about the determinants of the education expenditure revealed that education expenditure budget was not dependent on the demographic factors. The government of Thai made it compulsory to allocate a specific budget for education irrespective of the country's economic status. Moreover, education is not compromised because of inflation or recession. The priority was education over the demographical needs of the homeland (Sagarik, 2013).

It is important to understand that education in Pakistan is related to the provincial governance. The National Finance Commission Award reveals that the provinces receive considerate amount of funds from the federal divisible pool according to the population growth rate. Then these provinces prioritize their funding according to the needs and requirements of the services sector. As education is one of the sectors of the country, its expenditure is decided according to the total budget. Through past research, it has been observed that Punjab allocated 30 percent of the funds for education. It has been observed further that the

second big budget is allocated by KPK. On the other hand, it has been observed that Sindh and Baluchistan spend less amount of budget on the education sector.

One of the commonest examples given in this regard is often of India. Chandra (2010) observed that the sole reason of India's boom in the software industry in the twentieth century is the result of the huge investments in the 1950s and 1960s in the technological and education sector. The 40-year-old investment is paying immensely in the form of multiple employment spaces and the revenue through taxation system. Moreover, it is also generating competition in the global job market. The fruitful investment in the long run on the education sector is evident. Therefore, the relationship of the economic growth and the education is vividly positive.

Study conducted in 2007 through time series analysis revealed the similar findings. The population sample was 21 OECD countries and the data was taken from 1980-2001. Results however, again confirmed that the level of economic development is directly linked with the demographic factors of the country. This implied that positive GDP growth is product of spending budget on laborers skills and education (Busemeyer, 2007). Almost same findings were confirmed by two researchers in Switzerland. Their study revealed that demographic factors create intensively competitive environment for the allocation and distribution of the funds during budget planning process. The financial constraints delimit the size of the budget for education spending in a negative way. Through empirical findings of the study, the results reflected that between young adults and elderly people the financial spending and distribution become problematic (Grob & Wolter, 2007).

Another critical finding from the study of Verbina and Chowdhury (2004) reflected that population density negatively influences the size of allocation of the education expenditure budget. Due to constantly increasing population rate, the budget allocated for the education expenditure becomes more vulnerable because of its relationship to the poverty rate and unemployment. Additionally, the study also discussed the increase in per capita revenue of the country has positive influence in the size of the allocating budget and its distribution (Verbina & Chowdhury, 2004). With the beginning of the devolution plan in the past few years, now the districts receive funds from the respective provinces. The districts later on in addition to their own resources and in the presence of the allocate funds distribute funds across various sectors which also includes Education sector. The reasons of low priority accorded to the education sector is observed especially in the development expenditures and it is one of the reasons that we observe many variations in the literacy levels among the various districts of the same province. Some researchers believed that there is a possibility that expenditures on education and literacy levels are interdependent with each other. For instance, the study conducted by Husain, Qasim, and Sheikh (2003) shows that there are large scale disparities present among Urban and rural Punjab at one side and on the other side between urban and rural Sindh on the other side in terms of literacy rates. The problem goes on because these specific districts that include Rajanpur, Muzaffargarh, Lodhran, D. G. Khan, etc., in Punjab and Mithi, Thatta, Badin, etc. in Sindh that are highly illiterate on record are also found in allocating less budgets for education expenditure purpose (Husain et al., 2003).

According to the different studies, it has been identified that the public sector expenditure on education does not equally benefit all the discreet groups of the population. There are other factors that can influence the benefits of expenditures. These factors include: income, age, gender and/or region. Husain et al. (2003) noted that the spending on the state of art coronary care services are selectively beneficial for rich people because of affordability factor; while financing in unemployment insurance company will help in empowering the poor.

Also, it is observed that the access to the publicly provided education services may vary because of race, gender, caste, region and religion factors as well. Government expenditure will not be able to reach such groups since the chances of service utilization rates in such cases are lower than the privileged groups. For example, researches by Al-Samarrai and Zaman (2007) in Malawi; Sabir, Ahmed, and Lodhi (2003); Shahin (2001) in Côte d'Ivoire and Selden and Wasylenko (1992) in Peru States have been able to establish the fact that females of school-age group are less privileged in terms of having fewer benefits as compare to men in getting education. While, it is observed that the competition between populations of different ages may vary the benefit of expenditures. It has been observed that a higher allocation of

funds for pension is beneficial to only elderly people because they lack the ability to earn at this point of time. On the other hand, funding of a school meal is of significance to the young ones only (Husain et al., 2003).

Another perspective raised in this regard is that public spending on education can be progressive or regressive in nature. For instance, studies, like Gupta, Hanges, and Dorfman (2002) reflected that in the countries like Columbia, Ecuador, Malaysia, Philippine and Pakistan, there is progressive benefit linked with the expenditure on primary and secondary education, health care, public transport and infrastructure. Which is according to Kawamura et al. (2001) is possible due to the following reasons. Firstly, the spending on primary education especially in rural areas and less developed sectors; the results will be definitely progressive in nature.

Another determinant is the state of the running economy of the country. If the country is going through economic crisis, then the treatment towards education expenditure is different especially in the context of Pakistan. Researches from the world also ensured this factor that economies prefer to benefit from instantly from their investments as compared to long term investment plans. A research study conducted by Tilak (1989) reflected that the economic state of the country directly participates in allocating the size of the budget. The precarious economic state can contribute in less allocation of the total budget in the education sector as compare to the stable economic state. The study further concluded that the most common vulnerable budget area is education in the time of recession. Tilak (1989) gave various reasons for that purpose. Firstly, the investment on education sector is seen as long-term investment by the government. So, it is overlooked in the developing countries where poverty rates are high and employment rates are low. Secondly, during the critical time of inflation, the allocation on education sector seems impractical to most of the policy makers. Thirdly, the intangible benefits of education are not viewed as productive to the economic growth activity. The state of the economic activity of the country is significant contributor in determining the size of allocated budget (Tilak, 1989).

A study highlighted that in OECD countries since 1960, it has been surveyed that the influence of demographic factors along with economic state fluctuations control the total budget allocation for education expenditure (Castles, 1989). In the similar vein, a study conducted by Falch and Falch and Rattsø (1997) proposed that the role to total number of elderly people out of total population, public debt, unemployment and inflation contribute in fluctuating allocation of education budget. He further explained that economy fluctuations at macroeconomic level contribute in intensifying the chances of vulnerability for the education sector especially in the developing countries (Falch & Rattsø, 1997). On the other hand, while analyzing the impact of demographic factors on the political functionality of spending budget in education sector, Poterba commented that elderly population as compared to school age children population hinders the huge investment on the education sector. It is because of the fact that government has to place subsidies for elderly people because of their inactive role in the development of economic growth. While population of school age children is controllable factor in the budget (Poterba, 1997).

However, a study conducted through cross section analysis by McMahan in 1970 highlighted that the expenditure on public education is directly related to the demand, cost of production and tax behavior of individuals. Additionally, the study also highlighted several indicators that contribute in the overall expenditure of the education sector. These include: number of pupils per teacher, school age population of children, substitutions of public schools. The study confirmed population of school age children as a significant factor. Another significant point highlighted in the study the state of employment and the state aids are two factors that contribute in designing the size of allocated budget of education expenditure (McMahan, 1970).

The aforementioned studies refer to the fact that the size of the allocation of the education budget can directly contribute to the long-term growth and economic development of the country. Moreover, emerging countries are still struggling to achieve the status of a developed country and the only practical way to achieve this position is through spending on the education sector which will contribute to long-term economic growth.

3. Data and Methodology

Panel data offer both opportunities and challenges for causal inference. One key advantage of panel data over cross-sectional data is that it allows researchers to better handle the effects from unobserved time-invariant factors. At the same time, a key problem in analyzing panel data is to account for possible serial correlations in the error terms for each individual. It is also the aim of underlying study to present models and methods for analyzing panel data, with particular attention paid to examine how the various models and methods handle causality issues. As a result, it is necessary to investigate whether conventional causality technique is better suited for determining the real causal link between government and household spending on education with the involvement of credit constraints.

In this paper, the annual data over the period 2004 to 2018¹ for all countries are available data for variables. This panel data set is explored from *UNESCO*, the data bank of the World Bank *World development indicators*, and the data bank of *IMF's International Financial Statistics* online database. Note that HEX_{it} is the Initial household funding of secondary education, (% of GDP) and GEX_{it} is Government expenditure on education, total (of % of GDP). Here, BNL_{it} is bank nonperforming loans to total gross loans (%) as a proxy of Consumer credit constraints. Further, this study also employs other four potential determinants of public expenditures on education is Consumer price index (2010 = 100), Population density, GDP per capita (constant 2010 US\$), and Unemployment, total (% of the total labor force) (modeled ILO estimate). The summary statistics of all variables are reported in Table 1. The figures of the below table show that the means and standard deviations of variables.

Table 1: Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std.Dev.
$LnHEX_{it}$	-1.182	-0.966	1.5247	-6.778	1.397
$LnGEX_{it}$	1.443	1.498	2.147	0.412	0.349
$LnNPL_{it}$	1.524	1.405	4.090	-0.581	0.8163
$LnCPI_{it}$	4.629	4.637	5.947	3.809	0.2412
$LnPOP.Den_{it}$	4.437	4.717	7.322	0.963	1.277
UNP_{it}	6.529	5.890	26.091	0.130	3.945
Observations	600	600	600	600	600

Note: Annual data for the period 2004-2018; 40 countries

4. Econometric Methodology

This paper investigates the causality between household spending on education and government spending on education. In doing so, we take into account the ability of households to borrow as it may affect the causality both directly and indirectly. Approximately, the ability to borrow by credit risk as it is expressed by non-performing loans. Thus, the latter is incorporated as a mediator estimating the causality. This paper has applied Fixed effect and Random effect model and the Panel corrected standard error (PCSEs) model to tackle the problem of heteroscedasticity, Serial Correlation of AR (1), and Cross-sectional dependence. For testing stationarity of the variables used second generation panel unit root test that is Im-Pesaran and Shin (IPS) Test at level and difference. For co-integration analysis, Pedroni's cointegration test and Panel ARDL model i.e., Pooled Mean Group (PMG) estimation for heterogeneous panel data is used. This model (PMG) is used for long-run, short-run causality, and the error correction term (ECT). As a robustness test, estimated a VAR (3) and computed the Impulse response function using Cholesky decomposition along with 95% confidence interval.

In this analysis, adopt a rather heuristic approach to the problem by estimating directly and separately each equation included in equation (1) using cross-country data. Although we include several control variables, to alleviate further concerns for biases due to omitted

¹ Due to data constraint, the current research used panel data from 2004 to 2018. Data on the variable of HEX_{it} is not available for up to 2021 for this panel set of countries. The countries in our panel are the following: Argentina, Australia, Austria, Burundi, Cambodia, Cameroon, Chile, Colombia, Cyprus, Czech Republic, Denmark, El Salvador, France, Ghana, Guatemala, Iceland, India, Indonesia, Israel, Italy, Kazakhstan, Kuwait, Latvia, Lebanon, Lithuania, Malawi, Malta, Mexico, Nepal, Pakistan, Paraguay, Peru, Poland, Portugal, Slovak Republic, Slovenia, Spain, Tajikistan, Uganda, Ukraine.

variables, we also add fixed effects in the regressions. The latter enables us to control for the effects of time-invariant unobserved heterogeneity. Note that whether there is a direct or indirect effect at all depends on the statistical significance of the estimated coefficients. Then, after obtaining estimates for the three equations and assuming $N = 3$ (according to the BIC criterion) the dynamic components of those equations can be written as a VAR (3) process, the regressions are specified as follows.

$$\hat{B}_0 Y_t = \sum_{j=1}^3 \hat{B}_j Y_{t-j} + \epsilon_t \tag{1}$$

Where $Y_t = [HEX_t \ GEX_t \ NPL_t \ CPI_t \ POP_t \ UNP_t]'$ is country-invariant, $\hat{B}_0, \hat{B}_1, \dots, \hat{B}_3$ are matrices that include the estimated parameters of the previous regressions:

$$\hat{B}_0 = \begin{bmatrix} 1 & \hat{\beta}_{2,0}^{HEX} & \hat{\beta}_{3,0}^{HEX} & \hat{\beta}_{4,0}^{HEX} & \hat{\beta}_{5,0}^{HEX} & \hat{\beta}_{6,0}^{HEX} \\ \hat{\beta}_{1,0}^{GEX} & 1 & \hat{\beta}_{3,0}^{GEX} & \hat{\beta}_{4,0}^{GEX} & \hat{\beta}_{5,0}^{GEX} & \hat{\beta}_{6,0}^{GEX} \\ \hat{\beta}_{1,0}^{NPL} & \hat{\beta}_{2,0}^{NPL} & 1 & \hat{\beta}_{4,0}^{NPL} & \hat{\beta}_{5,0}^{NPL} & \hat{\beta}_{6,0}^{NPL} \\ \hat{\beta}_{1,0}^{CPI} & \hat{\beta}_{2,0}^{CPI} & \hat{\beta}_{3,0}^{CPI} & 1 & \hat{\beta}_{5,0}^{CPI} & \hat{\beta}_{6,0}^{CPI} \\ \hat{\beta}_{1,0}^{POP} & \hat{\beta}_{2,0}^{POP} & \hat{\beta}_{3,0}^{POP} & \hat{\beta}_{4,0}^{POP} & 1 & \hat{\beta}_{6,0}^{POP} \\ \hat{\beta}_{1,0}^{UNP} & \hat{\beta}_{2,0}^{UNP} & \hat{\beta}_{3,0}^{UNP} & \hat{\beta}_{4,0}^{UNP} & \hat{\beta}_{5,0}^{UNP} & 1 \end{bmatrix}'$$

$$\hat{B}_j = \begin{bmatrix} \hat{\beta}_{1,j}^{HEX} & \hat{\beta}_{2,j}^{HEX} & \hat{\beta}_{3,j}^{HEX} & \hat{\beta}_{4,j}^{HEX} & \hat{\beta}_{5,j}^{HEX} & \hat{\beta}_{6,j}^{HEX} \\ \hat{\beta}_{1,j}^{GEX} & \hat{\beta}_{2,j}^{GEX} & \hat{\beta}_{3,j}^{GEX} & \hat{\beta}_{4,j}^{GEX} & \hat{\beta}_{5,j}^{GEX} & \hat{\beta}_{6,j}^{GEX} \\ \hat{\beta}_{1,j}^{NPL} & \hat{\beta}_{2,j}^{NPL} & \hat{\beta}_{3,j}^{NPL} & \hat{\beta}_{4,j}^{NPL} & \hat{\beta}_{5,j}^{NPL} & \hat{\beta}_{6,j}^{NPL} \\ \hat{\beta}_{1,j}^{CPI} & \hat{\beta}_{2,j}^{CPI} & \hat{\beta}_{3,j}^{CPI} & \hat{\beta}_{4,j}^{CPI} & \hat{\beta}_{5,j}^{CPI} & \hat{\beta}_{6,j}^{CPI} \\ \hat{\beta}_{1,j}^{POP} & \hat{\beta}_{2,j}^{POP} & \hat{\beta}_{3,j}^{POP} & \hat{\beta}_{4,j}^{POP} & \hat{\beta}_{5,j}^{POP} & \hat{\beta}_{6,j}^{POP} \\ \hat{\beta}_{1,j}^{UNP} & \hat{\beta}_{2,j}^{UNP} & \hat{\beta}_{3,j}^{UNP} & \hat{\beta}_{4,j}^{UNP} & \hat{\beta}_{5,j}^{UNP} & \hat{\beta}_{6,j}^{UNP} \end{bmatrix}, \text{ for } j = 1, 2, \dots, N.$$

As long as the inverse of the matrix \hat{B}_0 exists, the reduced form is given by;

$$Y_t = \sum_{j=1}^3 \hat{\Gamma}_j Y_{t-j} + u_t \tag{2}$$

Where $\hat{\Gamma}_j = \hat{B}_0^{-1} \hat{B}_j$ and $u_t = \hat{B}_0^{-1} \epsilon_t$. Can be further written as;

$$X_t = \Pi X_{t-1} + \lambda_t \tag{3}$$

Where $X_t = [Y_t \ Y_{t-1} \ Y_{t-2}]'$, $\lambda_t = [u_t \ 0_6^1 \ 0_6^1]'$ and;

$$\Pi = \begin{bmatrix} \hat{\Gamma}_1 & \hat{\Gamma}_2 & \hat{\Gamma}_3 \\ I_6 & 0_6 & 0_6 \\ 0_6 & I_6 & 0_6 \end{bmatrix},$$

Where 0_6^1 6 x 1 vector of zeros is, 0_6 is a 6 x 6 matrix of zeros and I_6 is a 6 x 6 identity matrix. As long as all eigenvalues of Π are strictly less than one in modulus, can be written as a moving average process;

$$X_t = [I_{18} - \Pi L]^{-1} \lambda_t = \lambda_t + \Pi \lambda_{t-1} + \Pi^2 \lambda_{t-2} + \dots + \Pi^j \lambda_{t-j} + \dots \tag{4}$$

It follows that the percentage dynamic response of HEX to a 1% innovation in GEX is given by the first element of $\Pi^j \lambda$, where $\lambda = [\hat{B}_0^{-1} \epsilon^2 \ 0_6^1 \ 0_6^1]'$ and $\epsilon^2 = [0 \ 1 \ 0 \ 0 \ 0 \ 0]'$. In other words, we can plot the first element of $\Pi^j \lambda$ as a function of j. Likewise, the percentage dynamic response of GEX to a 1% innovation in HEX is given by the second element of $\Pi^j \lambda$, where $\lambda = [\hat{B}_0^{-1} \epsilon^1 \ 0_6^1 \ 0_6^1]'$ and $\epsilon^1 = [1 \ 0 \ 0 \ 0 \ 0 \ 0]'$. Plotting these dynamic responses will quantify the causality $GEX \rightarrow HEX$ and the causality $HEX \rightarrow GEX$, respectively. To quantify the indirect effect of GEX on HEX via NPL, we can set $\hat{\beta}_{2,j}^{NPL} = 0$ for $j = 0, 1, 2, 3$ and recomputed the response and then compare them with the previous. Likewise, for indirect effect of HEX and GEX via NPL.

5. Empirical Results and Discussions

5.1 Panel Unit Root Test

For testing stationarity of the variables used second generation panel unit root test that is the Im-Pesaran and Shin Test (1997) at level and difference. This test IPS concludes that $LnGEX_{it}$, $LnHEX_{it}$, $LnBNL_{it}$ and $LnCPI_{it}$ are stationary at level and difference as well at the 5% level of significance. While other control variables $LnPOP_{it}$, and UNP_{it} are non-stationary at level then become stationary at the first difference of the variables.

Table 2 represents the estimators of Pooled OLS, Fixed Effect Model, and Random Effect Model with their standard errors in parentheses. The Hausman test to check which model (Fixed effect or Random effect) is appropriate according to our panel data set. The p-value of the Hausman test is 0.0000 statistically significant which concludes that the fixed effect model is appropriate for this panel data set. Therefore, again regressed the fixed effect model. After it, checked the diagnostic test for Cross-sectional dependence that is the Pesaran CD test (2004). This diagnostic test examined whether the residuals are correlated across entities. Here, the p-value 0.000 rejects the null hypothesis and concludes that there is a presence of cross-sectional dependence across the members of the Panel. Therefore, the Panel Corrected Standard error model has been used to tackle the problems of heteroscedasticity, serial Correlation of AR (1), and cross-sectional dependence.

Table 2: Pooled, Fixed Effect, Random Effect, and Panel Corrected Standard Error (PCSE) Model

Models	Pooled Effect	Fixed Effect	Coefficient-values			
			Random Effect PCSE	Random Effect PCSE	[95% Conf. Interval]	-PCSE
	$LnGEX_{it}$	$LnGEX_{it}$	$LnGEX_{it}$	$LnGEX_{it}$		
$LnHEX_{it}$	- 0.188**	-0.203	-0.243	-0.028*	-0.058	0.003
$LnNPL_{it}$	0.043***	-0.012**	-0.008	- 0.053***	-0.089	-0.014
$LnCPI_{it}$	-0.078	-0.339**	-0.145	0.063	-0.074	0.201
$\Delta LnPOP_{it}$	0.001***	0.005***	0.002***	0.015	-0.016	0.048
ΔUNP_{it}	- 0.008***	-0.001	-0.025*	0.000	-0.001	0.001
Constant	0.897*	-0.447*	1.395	1.133***	0.485	1.781
R Squared	0.275	0.174	0.215	0.491	Rho	0.8661

Note: *** 1% significance level; ** 5% significance level; * 10% significance level, Annual data for the period 2004-2018; whole sample, 40 countries. Number of observations 600

According to the Panel corrected standard error model in Table 2, the obtained value -.02862 tells us that there is a negative statistically significant relationship at 5% level between government expenditures on education (GEX_{it}) and household expenditure on education (HEX_{it}). There is also a negative contemporaneous relationship i.e., -.05345 statistically significant at 1% level between GEX_{it} and NPL_{it} which means that as households become more credit-constrained, the government tends to spend less on education. Approximately, there is credit constraints with the share of non-performing loans which means that the higher the share of non-performing loans the more credit-constrained the households as the banks are less willing to lend them.

5.2 Panel Co-Integration Analysis

Pedroni's panel cointegration test is displayed in table 3. The results of this test contain seven statistics i.e., panel and group statistics most of them are statistically significant at the 5 % level of significance which accomplishes the presence of cointegrated relationships among $LnGEX_{it}$, $LnHEX_{it}$, $LnBNL_{it}$, $LnCPI_{it}$, $LnPOP_{it}$, Den_{it} , and UNP_{it} .

5.3 Pooled Mean Group (PMG) Estimation for heterogeneous panel data.

This model (PMG) is used for long-run and short-run coefficients which implies long-run and short-run causality respectively. These coefficients and the error correction term both show strong causality among variables. The PMG model assumed that long-run coefficients are the same across all countries in the panel. Here, the most important thing is the long-run

coefficients of the PMG model presents in table 3. This shows long-run coefficients are statistically significant at a 1% level to indicate long-run causal relationships exist among variables $LnGEX_{it}$, $LnHEX_{it}$, $LnBNL_{it}$, $LnCPI_{it}$, $LnPOP.Den_{it}$ and UNP_{it} . Though, the PMG also shows short-run coefficients at the difference of independent variables and the error correction term (ECT). The PMG model also assumed that short-run coefficients and ECT are not the same for each country in the panel. ECT is negative -0.6770 and statistically significant at 1 % level of significance which shows the existence of a cointegration relationship among panel variables and also indicates that any deviation from long-run equilibrium is corrected at 67% speed of adjustment. ECT gives a joint causal effect among the variables.

Table 3: Pedroni’s Cointegration Test and Pooled Mean Group (PMG) Estimation

Pedroni’s Cointegration Test			
Panel v-statistic	-3.676***	Group rho-statistic	7.539**
Panel rho-statistic	5.238**	Group t-statistic	-17.55***
Panel t-statistic	-13.06***	Group ADF-statistic	3.973***
Panel ADF-statistic	2.951		

Pooled Mean Group Estimation (PMG)			
Dependent variable	$dlnGEX_{it}$		
Long-run	Coefficients	Short-run	coefficients
$LnHEX_{it}$	-0.079***	ECT	-0.677***
$LnNPL_{it}$	0.001	$dlnHEX_{it}$	-0.061
$LnCPI_{it}$	-0.149***	$dlnNPL_{it}$	-0.0323
$LnPOP.Den_{it}$	0.524***	$dlnCPI_{it}$	-0.973**
UNP_{it}	-0.017***	$dlnPOP.Den_{it}$	-0.633
		$dUNP_{it}$	-0.016

Note: *, **, *** indicate statistical significance at the 10%, 5%, 1% level, respectively.

5.4 Panel VAR (3) and Impulse Response Function.

As a robustness test, estimated a VAR (3) and computed the Impulse response function using Cholesky decomposition along with 95% confidence interval. The error terms of VAR (3) are often called impulses or shocks.

Figure 1: VAR (3) and Impulse Response Function.

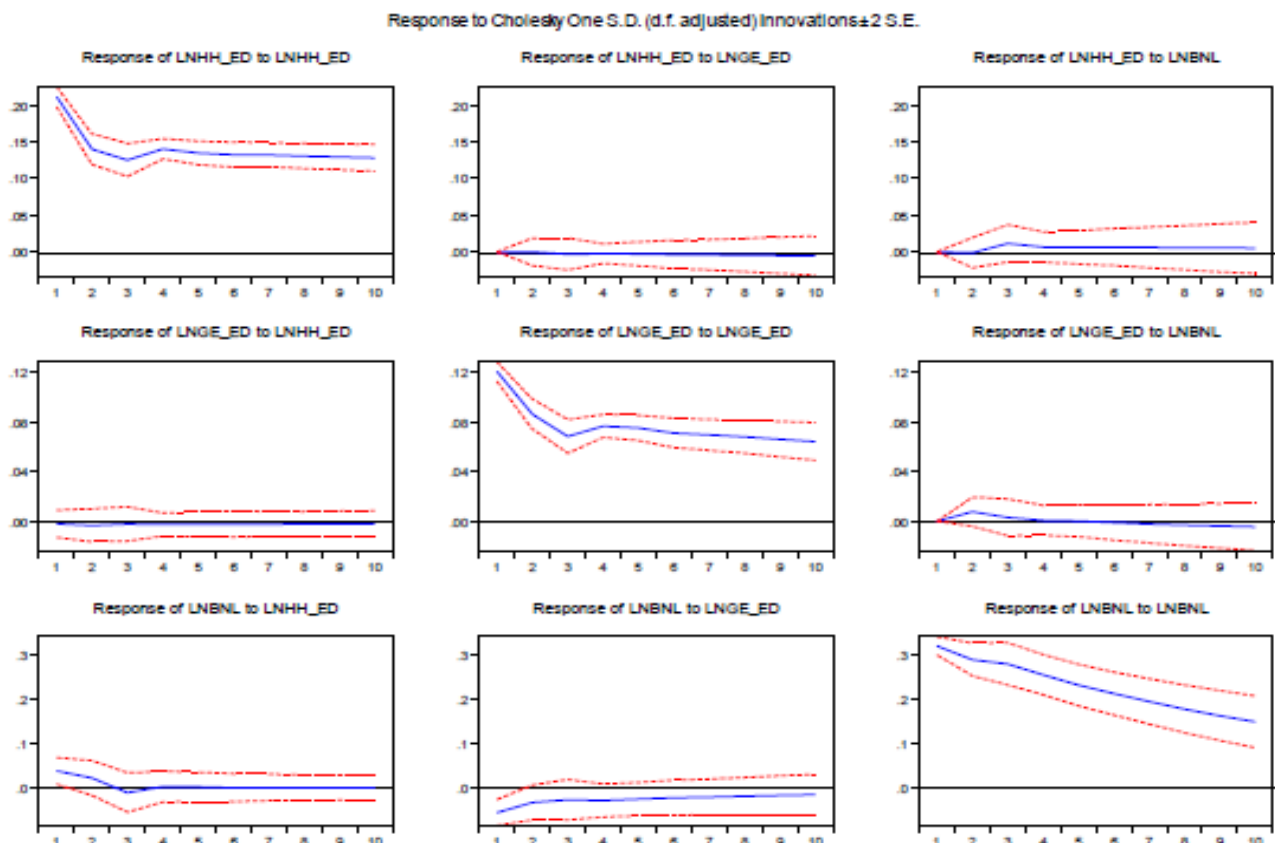


Figure 1 shows the responses of $LnHEX_{it}$ to a standard deviation shock of $LnGEX_{it}$ and the response of $LnNPL_{it}$ to a standard deviation shock of $LnHEX_{it}$ as onwards. A one standard deviation shock to government spending on education temporarily decreases the household spending on education. This negative response gradually rises until the third period when it hits its steady state value which in period 3 to in periods 5. Afterwards, the response of household spending on education is further decrease below its steady state in period 6.

And again, hits its steady state value in period seven, still remains in the negative region. It concludes that response of household spending to a standard deviation shock to government spending on education decrease in the short-run and also significantly decrease in the long run. One standard deviation shock to household spending on education initially decreases bank non-performing loans from the period 0 to 2. Afterwards it increases in period 3, 4 and hits its steady state value in period 5 and remains in positive region till period 10. So, it concludes that the response of Bank non-performing loans (Credit constrained) to a standard deviation shock to household spending is negative in the short-run and positive in the long run.

6. Conclusion

The central research question of this paper is to assess the tendency of household educational spending vis-à-vis government spending on education, given the household's credit constraints. For this analysis used the annual pane data from the period of 2004 to 2018 for all countries which available data. All variables are expressed in logarithm, apart from the unemployment rate and thus coefficients in the regressions refer to elasticities.

For cointegration analysis, Pedroni's cointegration test and Panel ARDL model i.e., Pooled Mean Group (PMG) estimation for heterogeneous panel data is used. This model (PMG) shows statistically significant causality for long-run, short-run with the error correction term (ECT). The ECT is negative -0.6770 and statistically significant at 1 % level which shows the existence of a cointegration relationship among panel variables and also indicates that any deviation from long-run equilibrium is corrected at 67% speed of adjustment. ECT gives a joint causal effect among the variables.

Dynamic panel data estimation two-step system GMM is applied by using lagged values of the regressors as instruments. From this analysis finally it can be concluded that the causality clearly runs from HEX to GEX directly and not the other way round. This paper also finds a negative contemporaneous relationship between GEX and NPL at the 5% level of significance which means that as households become more credit constrained, the government tends to spend less on education. This result might be viewed as counterintuitive as one would expect that as households become more credit constrained, the government would step in and increase its investment in education given that households will be unable to invest themselves. The findings of current research suggest that this is not the case because the intensity of family education spending has a delayed impact on the proportion of nonperforming loans. When households invest substantially in education, they often do so by over borrowing, leaving them unable to repay their debt (i.e. the loans are non-performing). Because a large investment was made in past years via household over borrowing, which resulted in non-performing loans, the government responds by cutting education expenditure.

References

- Abdul Jabbar, N., & Selvaratnam, D. P. (2017). Analysis of the determinants of education expenditures in Malaysia. *Journal of International Business, Economics and Entrepreneurship (JIBE)*, 2(1), 1-10.
- Akanbi, O. A., & Schoeman, N. J. (2010). The determinants of public expenditure and expenditure on education in particular in a selection of African countries: economics. *South African Journal of Economic and Management Sciences*, 13(1), 50-61.
- Al-Samarrai, S., & Zaman, H. (2007). Abolishing school fees in Malawi: The impact on education access and equity. *Education Economics*, 15(3), 359-375.
- Askarov, Z., & Doucouliagos, H. (2020). A meta-analysis of the effects of remittances on household education expenditure. *World Development*, 129, 104860.
- Barro, R. J. (1991). Economic growth in a cross section of countries. *The quarterly journal of economics*, 106(2), 407-443.

- Barro, R. J., Mankiw, N. G., & Sala-i-Martin, X. (1992). *Capital mobility in neoclassical models of growth* (0898-2937). Retrieved from
- Becker, G. S. (1962). Investment in human capital: A theoretical analysis. *Journal of political economy*, 70(5, Part 2), 9-49.
- Benos, N., & Zotou, S. (2014). Education and economic growth: A meta-regression analysis. *World Development*, 64, 669-689.
- Bischoff, I., & Prasetyia, F. (2015). *Determinants of local public expenditures on education: empirical evidence for Indonesian districts between 2005 and 2012*. Retrieved from
- Busemeyer, M. R. (2007). Determinants of public education spending in 21 OECD democracies, 1980–2001. *Journal of European Public Policy*, 14(4), 582-610.
- Castles, F. G. (1989). Explaining public education expenditure in OECD nations. *European Journal of Political Research*, 17(4), 431-448.
- Chandra, A. (2010). *Does government expenditure on education promote economic growth? An econometric analysis*. Retrieved from
- Chatterji, M., Mohan, S., & Dastidar, S. G. (2014). Determinants of public education expenditure: Evidence from Indian states.
- Falch, T., & Rattsø, J. (1997). Political economic determinants of school spending in federal states: Theory and time-series evidence. *European Journal of Political Economy*, 13(2), 299-314.
- Goldin, C. D. (2016). Human capital.
- Grob, U., & Wolter, S. C. (2007). Demographic change and public education spending: A conflict between young and old? *Education Economics*, 15(3), 277-292.
- Gupta, V., Hanges, P. J., & Dorfman, P. (2002). Cultural clusters: Methodology and findings. *Journal of world business*, 37(1), 11-15.
- Husain, F., Qasim, M. A., & Sheikh, K. H. (2003). An analysis of public expenditure on education in Pakistan. *The Pakistan development review*, 42(4), 771-780.
- Idrees, A. S., & Siddiqi, M. W. (2013). Does public education expenditure cause economic growth? Comparison of developed and developing countries. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, 7(1), 174-183.
- Kawamura, T., Shirasawa, K., Ishikawa, N., Lindfors, A., Rasmus, K., Granskog, M., . . . Vaikmäe, R. (2001). Time-series observations of the structure and properties of brackish ice in the Gulf of Finland. *Annals of Glaciology*, 33, 1-4.
- Khalili, N., Arshad, M., Farajzadeh, Z., Kächele, H., & Müller, K. (2020). Effect of drought on smallholder education expenditures in rural Iran: Implications for policy. *Journal of environmental management*, 260, 110136.
- Kuvat, Ö., & Kizilgöl, Ö. A. (2020). An analysis of out of pocket education expenditures in Turkey: logit and tobit models. *Ege Academic Review*, 20(3), 231-244.
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, 107(2), 407-437.
- McMahon, W. W. (1970). An economic analysis of major determinants of expenditures on public education. *The Review of Economics and Statistics*, 242-252.
- Pierce, D. A., & Haugh, L. D. (1977). Causality in temporal systems: Characterization and a survey. *Journal of econometrics*, 5(3), 265-293.
- Poterba, J. M. (1997). Demographic structure and the political economy of public education. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, 16(1), 48-66.
- Sabir, S., Ahmed, S., & Lodhi, N. (2003). Morphological and biochemical variation in Sea buckthorn *Hippophae rhamnoides* ssp. *turkestanica*, a multipurpose plant for fragile mountains of Pakistan. *South African journal of botany*, 69(4), 587-592.
- Sagarik, D. (2013). An Analysis of the Determinants of Education Expenditure in T hailand. *Asian Politics & Policy*, 5(2), 227-248.
- Schultz, T. W. (1961). Investment in human capital. *The American economic review*, 51(1), 1-17.
- Selden, T. M., & Wasylenko, M. J. (1992). *Benefit incidence analysis in developing countries* (Vol. 1015): World Bank Publications.
- Singh, D., & Shastri, S. (2020). Public expenditure on education, educational attainment and unemployment nexus in India: an empirical investigation. *International Journal of Social Economics*.
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics*, 70(1), 65-94.

- Tilak, J. B. (1989). The recession and public investment in education in Latin America. *Journal of interamerican studies and world affairs*, 31(1-2), 125-146.
- Verbina, I., & Chowdhury, A. (2004). What determines public education expenditures in Russia? 1. *Economics of Transition*, 12(3), 489-508.
- Yun, W. S., & Yusoff, R. (2018). The determinants of public education expenditure in Malaysia. *Jurnal Ekonomi Malaysia*, 52(2), 109-122.