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IS IMPROVING THE WORTH OF HUMAN CAPITAL A KEY STRATEGY FOR BAHRAIN? EMPIRICAL EVIDENCE

The aim of this paper is to develop a macroeconometric model for emerging economies as in the case of Bahrain (the most open economy in GCC region) to measure the impact of human capital investment on key macroeconomic indicators (1990 through 2016). The paper also makes an attempt to forecast the effects of changes in government spending on education as a percentage of GDP on the country's key macroeconomic variables through simulation under 3 different scenarios for the next five years. The main findings point out that an increase in government spending on education over time has a positive influence on human capital in terms of increased employment along with positive effect on output, private investments and consumption whilst contributing to lower inflation rate.

Keywords: *Bahrain; macroeconomic variables; forecast scenarios; spending on education; human capital.*

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ЧИ Є ІНВЕСТУВАННЯ В ЛЮДСЬКИЙ КАПІТАЛ КЛЮЧОВОЮ СТРАТЕГІЄЮ ДЛЯ БАХРЕЙНУ? ЕМПІРИЧНІ ДОКАЗИ

У статті побудовано макроекономічну модель для економік, що розвиваються, і на прикладі Бахрейну як однієї з найбільш відкритих економік регіону Заливу продемонстровано, яким чином інвестування в людський капітал впливає на ключові макроекономічні показники (за період 1990–2016 рр.). Також зроблено спробу спрогнозувати, яким чином зміни в обсягах державних витрат на освіту як % від ВВП впливає на ключові макроекономічні показники. Представлено три сценарії потенційного розвитку протягом наступних п'яти років. Основним результатом дослідження є висновок про те, що підвищення державних видатків на освіту поступово впливає на людський капітал, в т.ч. на працевлаштування та продуктивність, а також на обсяги приватного інвестування та споживання. Водночас підвищене фінансування освіти також побічно знижує інфляцію.

Ключові слова: *Бахрейн; макроекономічні змінні; сценарії прогнозування; видатки на освіту; людський капітал.*

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ЯВЛЯЕТСЯ ЛИ ИНВЕСТИРОВАНИЕ В ЧЕЛОВЕЧЕСКИЙ КАПИТАЛ КЛЮЧЕВОЙ СТРАТЕГИЕЙ ДЛЯ БАХРЕЙНА? ЭМПИРИЧЕСКИЕ ДОКАЗАТЕЛЬСТВА

В статье построена макроэкономическая модель для развивающихся экономик и на примере Бахрейна как одной из самых открытых экономик региона Залива показано, каким образом инвестирование в человеческий капитал влияет на ключевые макроэкономические показатели (за период 1990–2016 гг.). Также сделана попытка спрогнозировать, каким образом изменения в объёмах государственных расходов на образование как % от ВВП влияет на ключевые макроэкономические показатели, представлено три сценария потенциального развития в течение следующих пяти лет. Основным результатом исследования является вывод о том, что повышение государственных расходов на образование

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постепенно влияет на человеческий капитал, в т.ч. на трудоустройство и производительность, а также на объёмы частного инвестирования и потребление. В то же время повышенное финансирование образования также косвенно снижает инфляцию.
Ключевые слова: *Бахрейн; макроэкономические переменные; сценарии прогнозирования; расходы на образование; человеческий капитал.*

Introduction and background. Capital as a lifeblood of a firm is used to refer to financial assets or financial value of physical assets recorded on a balance sheet. Unlike physical capital, human capital, as an intangible asset is the integration of actual knowledge, skills and experience possessed by employees. Human capital is important because a firm without it can't make progress or grow sustainably. How about states?

There is general consensus among economists and policymakers that human capital plays a decisive role in promoting comprehensive development of nations because human capital is directly related to human development which brings about both qualitative and quantitative progress for nations (Haq, 1996). Particularly, in today's globalized world, investment in human capital especially in emerging countries, is seen as one of the major components for flourishing economic competitiveness of firms and nations (Xiao and Tsang, 1999). This relation was first formalized by A. Smith (1776) who integrated the term in his definition of capital and concluded that human skills increase wealth of both individuals and society. Some economists such as R.M. Solow (1957), T.W. Schultz (1961), R. Lucas (1988) and P.M. Romer (1990) prescribed human capital investment in the form of education as an engine of economic growth and development. In addition, empirical analyses indicated that education has significant positive effect in determining economic growth in the long run (Maddision, 1970; Mincer, 1974; Becker et al., 1990; Barro, 1992; Thirwall, 2000; Baldacci et al., 2004; Acaroglu and Ada, 2014).

Bahrain as one of the most open economies together as well as Islamic financial hub has also put investment in human capital (HCI) as one of the key priorities so as to achieve sustainable economic growth. For this purpose, the country made primary education compulsory for all citizens and more recently launched some further reforms in education establishing new colleges, organizing teacher training programs, developing vocational programs etc. Moreover, the country concentrates on the quality of education to enhance human capital efficiency; therefore, Quality Assurance Authority for Education and Training (QAA) was established and quality standards were set throughout the country. In accordance with Bahrain's Economic Vision 2030, Tamkeen was established so as to provide support to enterprises and individuals to enhance their productivity and growth. According to the Ministry of Education's statistics, the education sector experienced robust growth during the study period of time, expending by the cumulative 280% between 1990 and 2016. Government spending on this sector (at current prices) raised from 55.7 mln BD in 1990 to 193.4 mln BD in 2016, pushing up the share of education in GDP from 2.3% to almost 4% (Ministry of Education of Bahrain, Annual Reports).

The purpose of this study is to measure the impact of human capital investment on Bahrain's economic growth through the period of 1990 and 2016. This study is unique due to the fact that it covers both a broad period and fills a gap in the existing literature on emerging countries. To achieve this goal, we adopt the gross secondary

education enrollment as an indicator of human capital, while government spending on education as % of GDP serves a proxy for human capital investment. The rest of study is organized as follows: Data, model and structure specification are presented in Section 2. Model estimation and accuracy are shown in Section 3, whereas model simulation is discussed in Section 4 and conclusion is drawn and recommendations are made in Section 5.

Data, model selection and structure specification. The current study uses annual data covering the period from 1990 through 2016. Primarily sources of data are statistical bulletin, annual reports, balance of payments reports and economic indicators reports issued by the Central Bank of Bahrain (CBB), while the missing observations are gathered from the database of the World Bank (WB).

The method is based on analytical and econometric approaches in order to be able to construct a macroeconometric dynamic model linking HCI and economic growth. In this section, we outline the theoretical specifications of the macroeconometric dynamic model which relies on the Keynesian framework emphasizing the aggregate demand side as well as the neoclassical growth theory focusing on the aggregate supply side. The main feature of the model is its reliance on long-term time series data and solid empirical base, while its structural equations are estimated econometrically and are very rich in economic details (Valadkhani, 2005). The model consists of 15 equations, 10 of which are behavioral equations and 5 are identities. Additionally, the model includes 21 variables in total, 12 of which are endogenous and 9 are exogenous variables also included as predetermined (lagged).

We employ the ordinary least squares (OLS) method to compute each equation. The model utilizes a single equation approach for each sector, where sector specific equation is chosen by running several regressions and then selecting the best one on the basis of goodness of fit and signs and significance of the parameters.

The following are the structural specifications of the model:

Production function. The neoclassical theory of production argues that aggregate supply is the function of aggregate physical and human capital, aggregate labor and aggregate knowledge and technology (Kim, 1988; Lucas, 1987). Accordingly, output ($RGDP_t$) will be the function of labor (Lb_t) measured by yearly employed labors, physical capital formation (KF_t) that counted by gross capital formation and human capital (HK_t) measured by gross secondary education enrollment.

Demand for labors. The demand for labor (DL_t) in Bahrain is the function of labor force (Lb_t) that includes youth who either graduated, or got more training and skills, and the lag of human capital (KF_{t-1}) as explanatory variables.

Human capital. The previous empirical studies show that human capital (KF_t) depends mainly on income (Yc_t), human capital investment (HKI_t) measured by government spending on education as % of GDP, and the lag of human capital (HK_{t-1}).

Consumption. Consumption represents the major component of the aggregate demand. Consumption consists of both private and public consumption, where public consumption is taken as a policy variable. Based on Keynesian consumption function and wealth effect private consumption (Com_t) is the function of disposable income (Dy_t), real interest rate (R_t) as a proxy of opportunity cost of consumption,

broad definition of money balance (MS_t) as a proxy of wealth effect, and lagged of private consumption (Com_{t-1})

Investment. Gross investment is disaggregated into private investment and public investment, whereas public investment is a policy variable; private investment (Inv_t) represents the key variable for achieving and sustaining higher economic growth. Investment decisions mainly depend on investing in long lived capital assets and future expectations. Taking into account the classical and Keynesian theories of investment, the explanatory variables of private investment are: income (Yc_t), real interest rate (R_t), public investment (GI) that mostly concentrates on the provision of infrastructure, and bank credit to the private sector (Crd_t).

Net Exports. Bahrain is an open small economy and mostly is a price taker at world markets; the change in the world price may affect Bahrain domestic production level, which, in turn, affects exports levels. Exports (XP_t) may depend on the effective exchange rate ($EFEX_t$) and world income ($WGDP_t$), while imports (MP_t) may depend on the effective exchange rate, domestic income (Yc_t), and lag of imports (MP_{t-1}).

Prices. The general price level (P_t) can be expressed as a weighted average of tradable and non-tradable goods prices. The price of tradable goods (PT_t) is determined exogenously at the world market where it may depend on import prices (mPP_t) and effective exchange rate, while the price of non-tradable goods (PNT_t) is assumed to be affected by domestic monetary market (broad money) and domestic income. These explanatory variables are in line with the monetarist and structuralist theories of inflation (Moser, 1995).

In order to complete the model, 5 additional identities are added comprising:

1. The total real output as the sum of domestic absorption (DA_t) and net exports (NX_t).

2. The total gross investment which is the sum of private investment and public investments.

3. Net exports as the difference between exports and imports of goods and services.

4. Real interest rate which equals to the difference between nominal interest rate (i) and inflation rate (P*).

5. The inflation rate that equals to percentage change in the general price level.

From the above, we argue that the model captures different linkages that exist in economy and economic activities as follows:

a. Production affects consumption, investment, government expenditure, net exports, and price level.

b. Government spending on education as % of GDP affects human capital and real output.

c. Real interest rate affects private consumption and private investment along with real output.

d. Public investments influence private investments and both affect the economy through various channels.

e. Effective real exchange rate influences net exports, general price level and private investments.

f. Foreign price level is the indicator of general price level through price of goods imported.

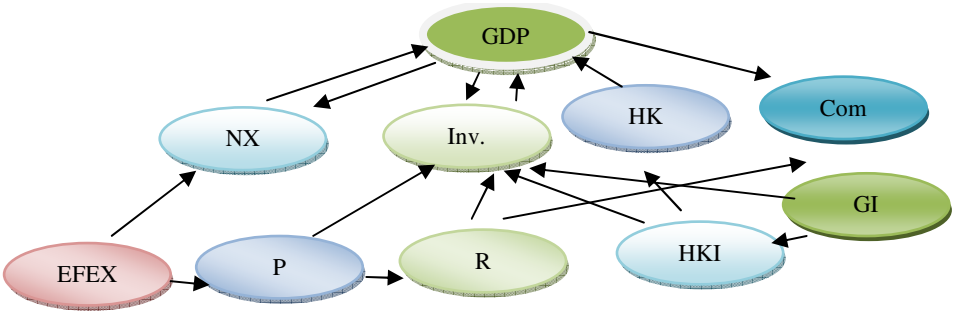

Figure 1. **Linkages in the model,** *authors'*

Estimation strategy and results. Behavior equations in the model are estimated using OLS regression. We commence with the Augmented Dickey Fuller (ADF) unit root test to examine time series properties of the data (Dickey and Fuller, 1979). Results can be seen in Table 1. According to them, the variables are non-stationary at level however, they are stationary at the first difference which indicates that all the variables are integrated of degree one I(1).

In order to assess the appropriateness of the estimated equations we employ a set of diagnostic tests such as Lagrange Multiplier (LM) for series correlation, ARCH and White tests for heteroscedasticity, Jarque-Bera (JB) for residual normality, and Remsay's Reset for functional specification (Smith, 1985). Table 2 illustrates the estimated equations along with the results of the diagnostic tests.

Performance of all estimated equations is then evaluated to examine how estimated equations are linked to each other with plausible coefficients of the variables and how close historical data series are (Makridakis, 1993). Validity of the current model is checked by the Mean Absolute Percent Error (MAPE), the Theil inequality coefficient (U) in addition to correlation factor. The first two measures are scaled invariant and can be used to assess the forecasting performance of the model directly (Welfe, 2011).

The outcomes of production function estimation are presented in Equation (1) which shows that labor force, capital stock and lagged of human capital have significant positive effect on the output. The impact of labor force and capital stock is more significant with reference to human capital. The marginal product of labor is 0.375 which is relatively small, compared to capital stock; this could be due to the fact that most production of Bahrain depends mainly on capital intensive techniques. The estimated equation fits the data well as indicated by the diagnostic statistics. ADF statistics is equal to -3.81, higher than the critical values which confirm the long-term relationship between output and its determinants. Overall, the production function results are quite satisfactory.

The estimated labor demand function is shown in Equation (2). It can be observed that labor force and human capital lagged by one year influence labor demand positively. ADF statistics is -3.31 which is significant at the 10% level of significance and confirms a valid long-term relationship between variables.

Table 1. **ADF test results,** *authors'*

Variables	**$RGDP_t$**	**Lb_t**	**KF_t**	**HK_t**	**DL_t**	**HKI_t**	**Com_t**	**Dy_t**
Level	-1.98(1)	-2.65(1)	-2.19(0)	-2.33(2)	-2.09(1)	-2.88(2)	-2.62(1)	-1.39(1)
Frist Difference	-3.29(2)***	-4.51(2)*	-3.71(1)**	-3.87(1)**	-3.47(0)***	-3.81(1)**	-4.12(2)**	-3.42(2)***
Variables	**Yc_t**	**R_t**	**MS_t**	**Inv_t**	**GI_t**	**Crd_t**	**XP_t**	**$WGDP_t$**
Level	-1.55(1)	-2.88(2)	-2.18(1)	-3.11(3)	-2.71(1)	-2.19(0)	-2.56(1)	-2.61(1)
Frist Difference	-3.28(2)***	-3.93(1)**	-3.86(2)**	-4.41(2)*	-3.24(0)***	-3.35(1)***	-3.74(2)**	-3.45(2)***
Variables	**$EFEX_t$**	**MP_t**	**P_t**	**mPP_t**	**PT_t**	**PNT_t**		
Level	-2.11(1)	-3.01(1)	-1.56(0)	-1.98(2)	-1.32(1)	-1.91(0)		
Frist Difference	-3.39(2)***	-4.63(2)*	-3.29(1)***	-4.03(2)**	-3.56(1)***	-3.31(1)***		

ADF critical values (constant + trend): * 1% = -4.37, ** 5% = -3.6 and *** 10% = -3.24. Numbers in parentheses are lag length, which are augmented up to the maximum of 4 lags, the optimal lag length is determined based on the Schwarz information criterion (SIC).

Table 2. **Model estimation results,** *authors'*

Equation (1)											
$RGDP_t$		**2.03**		**0.375 Lb_t**		**0.504 KF_t**		**0.121 HK_{t-1}**			
				(0.097)*		(0.261)***		(0.064)***			
F-stat	8.95	Std. Error	0.025	Adj.R^2	0.746	DW test	1.83	LM Test	0.266	ARCH test	0.364
White test	0.612	Chow test	0.178	ADF	-3.81**	JB test		Ramsey test			
Equation (2)											
DL_t		**2.33**		**0.751 Lb_t**		**0.651 HK_{t-1}**					
				(0.343)*		(0.301)***					
F-stat	10.35	Std. Error	0.056	Adj.R^2	0.864	DW test	1.85	LM Test	0.431	ARCH test	0.955
White test	1.48	Chow test	0.241	ADF	-3.31***	JB test		Ramsey test			
Equation (3)											
HK_t		**1.03**	**0.561 Yc_t**		**0.837 HKI_t**		**0.841 HK_{t-1}**				
			(0.224)**		(0.322)*		(0.362)**				
F-stat	18.12	Std. Error	0.066	Adj.R^2	0.781	DW test	1.92	LM Test	0.061	ARCH test	0.744
White test	1.24	Chow test	0.974	ADF	-4.23*	JB test	0.401	Ramsey test	0.054		
Equation (4)											
Com_t		**2.21**		**0.791 Dy_t**		**0.093 MS_t**		**-0.013 R_t**		**0.364 Com_{t-1}**	
				(0.231)**		(0.031)		(-0.006)***		(0.128)**	
F-stat	12.36	Std. Error	0.53	Adj.R^2	0.771	DW test	2.13	LM Test	1.21	ARCH test	0.486
White test	1.37	Chow test	0.341	ADF	-3.4***	JB test	0.373	Ramsey test	0.142		
Equation (5)											
Inv_t		**1.19**		**0.156 Yc_t**		**-0.01 R_t**		**0.146 GI_t**	**0.138 Crd_t**		**0.218 Inv_{t-1}**
				(0.066)**		(-0.005)***		(0.065)**	(0.064)**		(0.058)*
F-stat	16.18	Std. Error	0.048	Adj.R^2	0.821	DW test	1.97	LM Test	2.01	ARCH test	0.862
White test	1.09	Chow test	0.237	ADF	-4.19**	JB test	0.098	Ramsey test	0.091		
Equation (6)											
XP_t		**1.54**	**0.013 $WGDP_t$**		**0.078 $EFEX_t$**		**0.340 XP_{t-1}**				
			(0.006)* **		**(0.041)*** **		**(0.116)***				
F-stat	23.8	Std. Error	0.051	Adj.R^2	0.854	DW test	2.16	LM Test	1.83	ARCH test	0.567
White test	1.04	Chow test	0.618	ADF	-5.23*	JB test	0.361	Ramsey test	0.482		

Continuation of *Table 2*

Equation (7)											
MP_t		**2.69**	**0.201 Yc_t**		**-0.424 $EFEX_t$**		**0.495 MP_t**				
			(0.109)***		(-0.182)**		(0.178)**				
F-stat	22.36	Std. Error	0.036	Adj.R^2	0.674	DW test	2.13	LM Test	0.025	ARCH test	0.622
White test	1.76	Chow test	0.478	ADF	-4.77*	JB test	0.219	Ramsey test	0.156		
Equation (8)											
PT_t		**3.41**	**-0.027 $EFEX_t$**		**0.492 mPP_t**						
			(-0.012)**		(0.239)**						
F-stat	24.81	Std. Error	0.140	Adj.R^2	0.692	DW test	1.68	LM Test	1.94	ARCH test	1.089
White test	1.04	Chow test	0.156	ADF	-3.71*	JB test	0.029	Ramsey test	0.746		
Equation (9)											
PNT_t		**1.21**	**-0.015 Yc_t**		**0.041 MS_{t-1}**						
			(-0.006)***		(0.016)**						
F-stat	19.16	Std. Error	0.341	Adj.R^2	0.853	DW test	2.26	LM Test	0.213	ARCH test	0.624
White test	1.43	Chow test	0.523	ADF	-3.43***	JB test	0.607	Ramsey test	0.542		
Equation (10)											
P_t		**2.11**	**-0.052 Yc_t**		**0.077 MS_{t-1}**		**-0.033 $EFEX_t$**		**0.063 mPP_t**		
			(-0.022)**		(0.017)*		(-0.015)***		(0.035)***		
F-stat	21.14	Std. Error	0.068	Adj.R^2	0.861	DW test	2.201	LM Test	1.412	ARCH test	1.05
White test	1.71	Chow test	0.634	ADF	-3.39**	JB test	0.376	Ramsey test	0.531		

All variables are taken in logarithmic form, Durbin-Watson Statistic: 5% Significance Points of dL and dU.

* Significance at 1%, ** Significance at 5%, *** Significance at 10%.

Equation (3) signifies that output growth and increasing government spending in education stimulate human capital. Diagnostic tests do not indicate any misspecification problem. ADF statistics is -4.23 revealing that the long-run relationship between the variables.

Equation (4) reports estimation of the private consumption function. It can be seen from the results that real disposable income exerts positive and significant impact on real private consumption function. Marginal propensity to consume (MPC) is equal to 0.79, which implies that Bahraini people spend 79% of their income on consumption. This means that marginal propensity to save (MPS) out of real disposable income is relatively small (0.21). Real interest rate exerts negative impact on private consumption; however, the magnitude of this variable is very small. The results also show that real money supply has positive effect on real private consumption. ADF statistics is -3.4 which is higher than the critical value at 10% level of significance and supports the long-run relationship between real private consumption and the independent variables.

Estimated real private investment function is demonstrated in Equation (5) which indicates where real output, bank credit to the private sector and government investment show positive effect on real private investment. The positive and significant coefficient of real output supports the idea of accelerator principle in determination of private investments. The coefficient of government investment is positive and significant, that is, government investment has crowding effect on real private investment, whereas Bahrain's government plays the leading role in influencing private sector activities. The positive sign of bank credit to private sector's coefficient supports the view that supply of funds is an important factor in investment decisions. Besides, it implies that well developed financial market is essentially to mobilize funds for investment purpose. The coefficient of real interest rate is negative and significant supporting the view that capital cost is one of the main factors in investment decisions. However, the effect of real interest rate is very small (-0.01) which clarifies higher real interest rate exerts very weak effect on real private investments. The presence of interest rate in the private investment function also represents a channel through which monetary policy shocks are transmitted to the real sector. The corresponding value of ADF statistics for residuals stationarity is -4.19, which yield significance at the 1% level of significance. Additionally, the diagnostic tests associated with the model do not detect any specification problem.

The results of export function in Equation (6) clearly point out that all the variables possess expected sign and are significant. The coefficient of the world income possesses theoretical expected positive sign. Effective real exchange rate influences exports positively too. The positive coefficient of foreign income suggests that increase in foreign economic activity would boost real demand for exports, while the positive coefficient of effective real exchange rate implies that raising the effective real exchange rate by one unit will lead to exports increase by 0.078 units, which affects positively the trade balance. Furthermore, exports lagged by one year were taken as an independent variable to capture the partial adjustment effect of exports. The model passes all the diagnostic statistics and the ADF statistics for residuals stationarity is equal to -5.23, which is significant at 1% level of significance.

Empirical outcomes of the import function are shown in Equation (7). The results signify that real income positively affects the import demand due to favorable environment and stable policies of the country, while import prices have negative affect. Effective real exchange rate also shows negative effect meaning that it may weaken imports. ADF statistics yields the statistic equal to -4.77, which is significant at 1% level and confirms the long-term relationship among the study variables. The overall fit of the model is good as indicated by the diagnostic statistics.

The results of general price level are illustrated in Equations (8)–(10) which clearly support that imports prices, real money supply and effective real exchange rate are the main factors accelerating inflationary pressure in Bahrain. The impact of real money supply is 0.077% on domestic price level, followed by import prices (0.063%) and effective real exchange rate (0.033%). On the other hand, the coefficient of real output is 0.052 implies that an increase in real GDP would significantly decrease the inflationary pressure by 0.052%. The results are consistent with the views of monetarist and structuralists. ADF statistic is equal to -3.39, significant at 5% level. Overall, the model fits well as indicated by the diagnostic tests.

The MAPE and the Theil inequality coefficient (U) for the key macroeconomic variables are shown in Table 3 illustrating that the model is able to track the historical development of Bahrain economy reasonably well. The MAPE coefficients, both static and dynamic, for most of the behavioral equations is reasonable and lays within the range 1–5% which implies the dynamic stability of the complete model. The coefficient of U is less than unity and closest to zero for most of endogenous variables which indicate that the model is best fit for future policy simulation. This is also clear by the correlation coefficients which show high correlation between actual and estimated series. More importantly, the marginal forecast errors could be traced by inspecting the sum of the two proportion statistics which are variance proportion and bias proportion. The overall forecasting ability of the estimated equations is satisfactory and the model has a good forecasting ability.

Table 3. **Accuracy of the model (1990–2016),** *authors'*

Equations		$RGDP_t$	DL_t	HK_t	Com_t	Inv_t
Correlation		0.997	0.996	0.969	0.991	0.978
MAPE	Static	4.561	2.153	1.609	1.345	3.87
	Dynamic	4.68	2.943	1.557	1.267	4.023
Theil inequality coefficient	Static	0.013	0.004	0.025	0.010	0.027
	Dynamic	0.017	0.016	0.031	0.014	0.035
Equations		XP_t	MP_t	PT_t	PNT_t	P_t
Correlation		0.994	0.988	0.981	0.993	0.987
MAPE	Static	4.239	2.98	2.912	2.067	1.781
	Dynamic	4.056	3.261	3.045	3.14	1.872
Theil inequality coefficient	Static	0.019	0.004	0.009	0.028	0.001
	Dynamic	0.024	0.010	0.014	0.033	0.005

Model simulation and discussion. Estimation of the model shows that human capital investment has played a vital role in supporting or/and enhancing economic growth in the Kingdom of Bahrain during the examined period.

In this section as a further step, effects of changes in government spending on education over the period of 2017 to 2021 on different macroeconomic variables such

as: real GDP, private investments and net exports are simulated. In this process, we take one shock and 3 scenarios into consideration which are:

- The first one represents the initial scenario (or the base) that shows the current situation in Bahrain economy where the government spending on education as % of GDP stays consistent from year to year, at 4% of GDP.
- The second one is the pessimistic scenario that assumes that government spending on education as % of GDP declines to 3%.
- The third one is the optimistic scenario supposing the government spending on education as % of GDP rises to 5% of GDP representing the average percentage in industrial countries over the studied period.

Simulation effects are computed using the deviation of major economic variables from the baseline during 2017–2021 and are shown in Figures 2–7. The rest of this section will show the effect of each scenario on the macroeconomic variables on one hand, and compare among the three scenarios on the other.

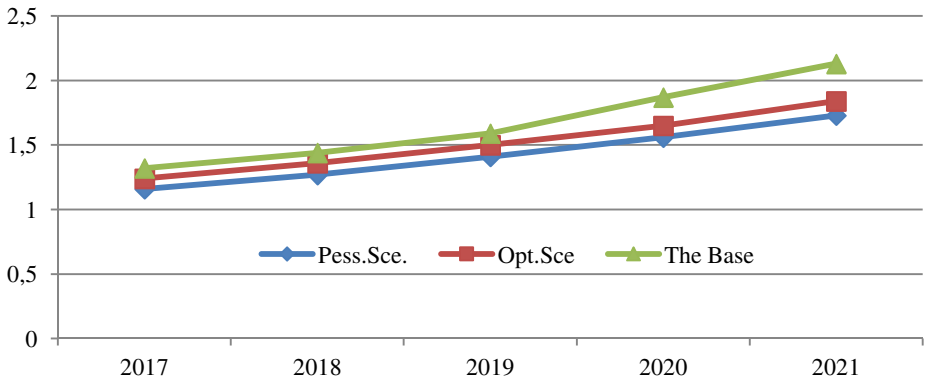

Figure 2. **RGDP growth rate during 2017–2021 under three scenarios,** *authors'*

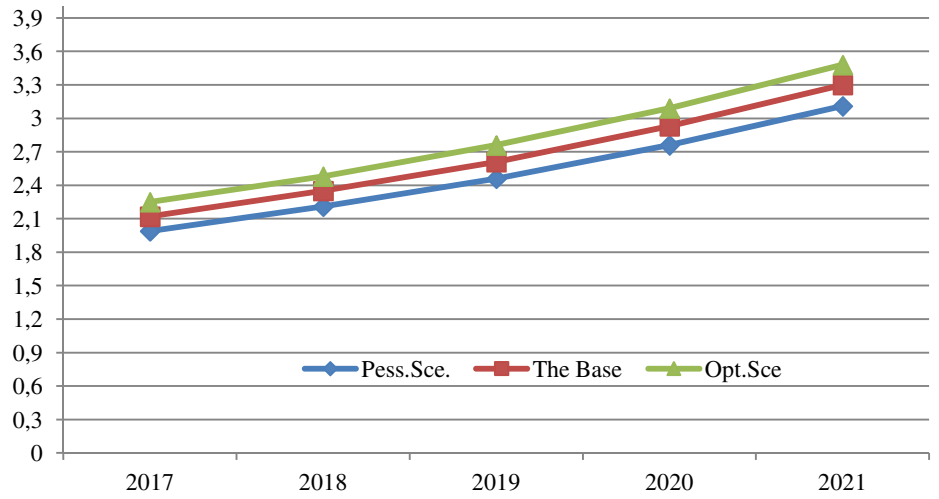

Figure 3. **Demand for labor growth rate during 2017–2021 under three scenarios,** *authors'*

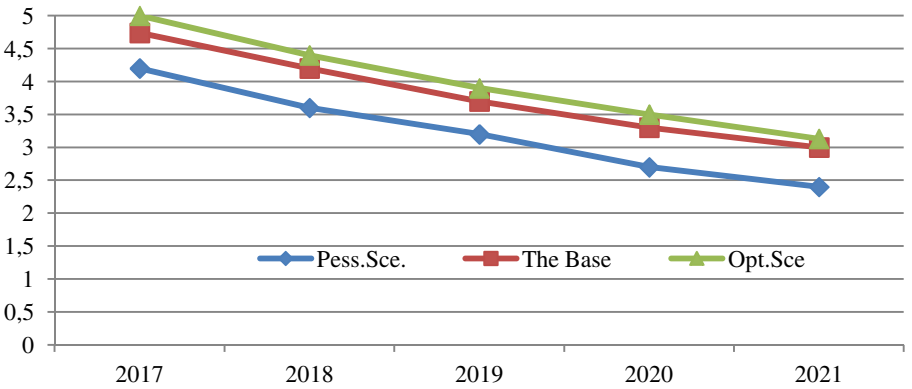

Figure 4. **Human capital changes during 2017–2021 under three scenarios,** *authors'*

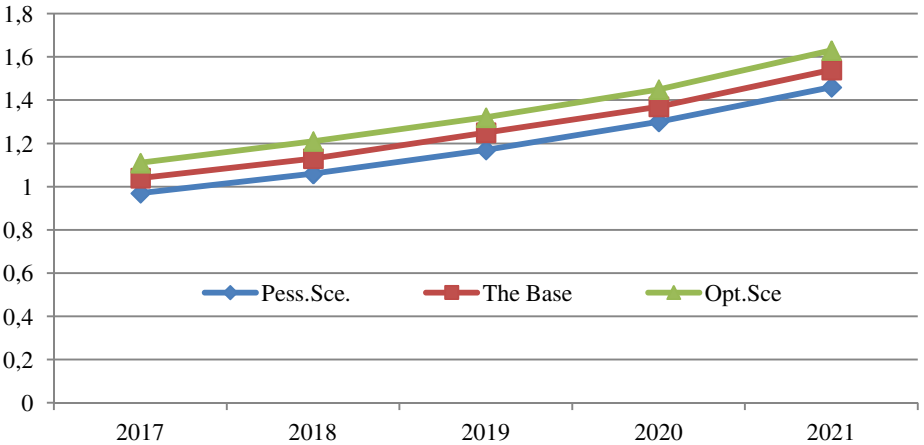

Figure 5. **Private consumption changes during 2017–2021 under three scenarios,** *authors'*

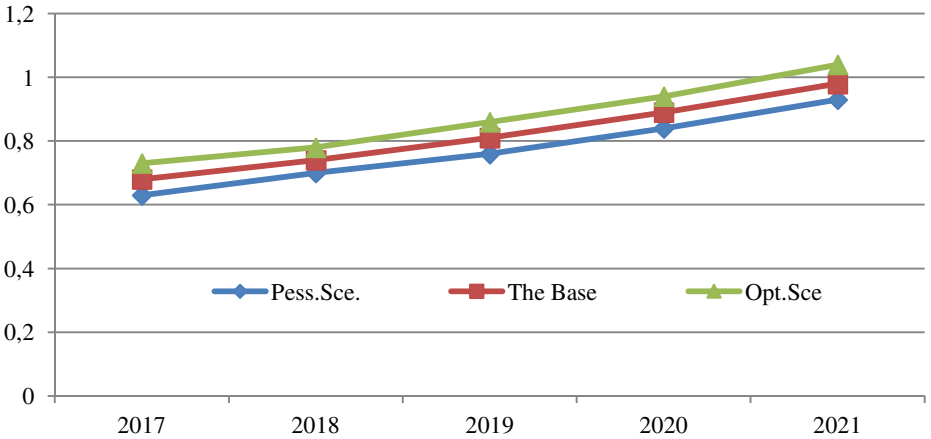

Figure 6. **Private investment changes during 2017–2021 under three scenarios,** *authors'*

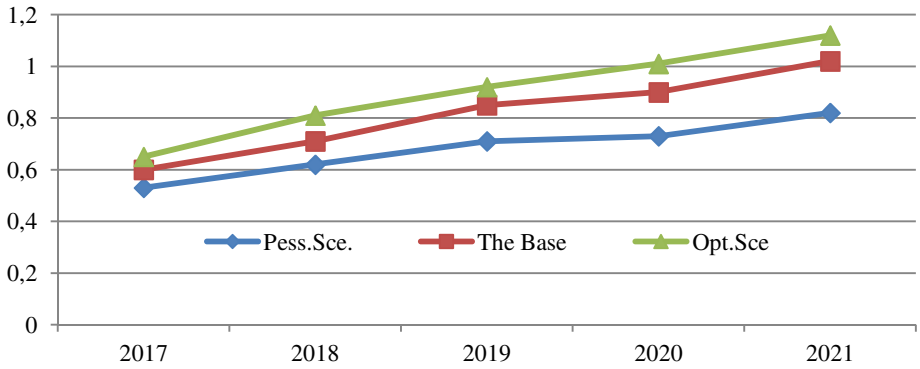

Figure 7. **Imports rate of changes during 2017–2021 under three scenarios,** *authors'*

Initial scenario (Base). When the country keeps spending 4% of GDP annually on education during the period, expected growth rate of enrolment increases to 4.74% in year 2017, and throughout the following years the enrolment rate continues to rise at decreasing rate which is 2.96% in 2021. Employment in 2017 responds to this shock with the rise of 2.12% and 3.3% in 2021. The rise in human capital brings about increase in GDP by 1.24% in 2017 and 1.84% at the end of 2021. The effect of higher GDP creeps into private consumption, private investment, imports, and general price level. Private consumption increases from 1.04% in 2017 to 1.54% in 2021. Private investment responds to this shock by increasing from 0.68% to 0.98%. A 0.61% increase in imports of goods and services is counted reaching 1.02% in 2021. This may cause a negative effect on the balance of trade for the country. On the other hand, price level may fall by 1.8% in 2017 and it may continue to decline throughout the forecasting period.

This scenario indicates that increasing government spending on education by 4% of GDP for a 5-year period raises human capital and employment by 3.77% and 2.66% on average respectively thus positively affecting output and economic growth which expected to raise by 1.52% on average, while private consumption, private investment and imports of goods and services jump by 1.25%, 0.82% and 0.76% on average respectively. The model predicts that inflation rate will fall by 1.5% on average over the period of 2017–2021.

Pessimistic approach. Say, fiscal tightening may happen due to sharp decline in oil prices, the country may be obliged to cut its spending on education by 3% of GDP annually. Enrollment rate responds to this shock decreasingly growing from 4.2% in 2017 to 2.4 % in 2021. Employment increases by 1.99% in 2017 and 3.11% in 2021. This shock keeps GDP growing 1.16%, 1.27, 1.41, 1.56 and 1.73% respectively. Private consumption increases by 1.57% from baseline and reaches 2.39% in 2021. Private investment increases from 0.97% to 1.46%. Imports of goods and services respond to this shock by slightly increasing from 0.53% in 2017 to 0.82% in 2021. Deviation in general price level from to baseline declines by 1.2% in 2017 and continues over the simulated period.

This scenario demonstrates that human capital and employment come along and a rise in these parameters results in GDP growth which is 1.43% on average while it

brings about decrease in general price level which is 1.61% on average for the period of 2017–2021. Private consumption, private investment and imports rise on average by 1.19%, 0.78% and 0.69% respectively. As a result, GDP growth rate under the second scenario is relatively smaller than the first scenario while declining in general price level is almost equal on average under both scenarios.

Optimistic approach. What if the country decides to set the bar high to catch the world standards, that is annual spending on education is 5% of GDP? Under this optimistic scenario, increase in human capital directly affects both demand for labor and employment. 2.25% increase in employment is recorded in 2017 and 3.48% in 2021. GDP growth rate which is 1.32% in the baseline surges by 2.13% primarily due to employment and multiplier accelerator principle. Higher GDP positively influences private consumption that rises from 1.11% in 2017 to 1.63% in 2021. This shock also causes an increase in private investments, from 0.73% to 1.04%. It is observed that overall economic activities are heating. Import of goods and services nearly double from 0.65% to 1.12%. Price of non-tradable goods and general price levels decline relative to the baseline during the simulated period.

In this scenario, the reason for GDP growth by 1.67% due to the fact that growing employment by 2.81% which reduces the general price level by 1.9% on average, while private consumption, private investment and imports rise by 1.34%, 0.87% and 0.79% on average respectively over the studied period.

Figures 2 through 7 illustrate the results of simulation process under these three scenarios. As illustrated in Figure 2, government spending on education has positive effect on economic growth under all scenarios, however, the stated effect is unsurprisingly higher under optimistic scenario whereas increase in GDP under pessimistic scenario is lesser than under the initial scenario. Figure 3 reveals that demand for labor growth rate under optimistic scenario is greater than under others. Figures 4 through 7 support the previous results.

Conclusion and recommendations. This paper attempts to develop a macroeconometric model for emerging economies in the case of Bahrain, the most open economy in the GCC region that is established in a dynamic aggregate demand-aggregate supply framework so as to measure the impact of human capital investment on the key macroeconomic indicators. The paper also strives to forecast the effects of changes in government spending on education as a percentage of GDP on the country's basic macroeconomic variables through simulation built on three different scenarios. Scenarios are applied and deviations in indicators for each scenario are observed over the period from 2017 to 2021.

The main finding which emerges from model simulations is that increase in government spending on education over time has a positive influence on human capital in terms of higher employment along with positive effect on output, private investments and consumption whilst making a contribution to reduce inflation rate.

In conclusion, this paper recommends to adopt the last scenario where GDP growth rate, enrolment and employment rates are higher on average relative to the others; decline in inflation rate is larger. Although this study can be useful for policy makers to find out some paths to evaluate the key macroeconomic variables associated with spending on education, applicability of the estimation methodology depends

on data availability. In addition, it is believed that larger time horizon could generate more robust results.

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