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ORIGINAL ARTICLE

Investigating the Direct and Interactive Impact of Government Health Expenditure and Institutional Quality on Iran's Economic Growth

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A B S T R A C T

Background: Health expenditure is crucial for strengthening human capital, which stimulates economic growth through technological progress and labor productivity. In Iran, health expenditure includes maintaining health and well-being of the workforce, along with the expansion of public and higher education, which impacts economic growth and development. The aim of this study is to examine the direct and interactive effects of health expenditure and institutional quality on Iran's economic growth.

Method: This study examines the short-run and long-run impacts of public healthcare expenditure on and institutional quality on Iran's economic growth during the period 2000-2022 are investigated using the autoregressive distribution lag (ARDL) method.

Results: The findings demonstrate that enhanced institutional quality has significantly contributed to Iran's economic growth during the study period. While health expenditure alone exhibited no statistically significant effect on economic growth, the interaction term between health spending and institutional quality yielded a positive and significant coefficient. This suggests that health investments foster economic growth only when coupled with robust institutional frameworks, highlighting the conditional role of governance in mediating health-economic outcomes. The results also demonstrated that in the period studied, household consumption expenditure, Trade openness levels and labor force exerted a statistically significant positive influence on Iran's economic growth trajectory.

Conclusion: Considering the results of this study, which indicate a positive interactive effect of institutional quality on the relationship between health expenditure and economic growth, it is recommended to Iranian economic policymakers to plan to improve institutional quality indicators. In order for government health expenditure to contribute to economic growth, it is essential that resources be allocated effectively and efficiently. Educational and health policies should be designed in a way that not only they do not have negative effects in the short term, but also help to improve the quality of the workforce and promote public health in the long- term.

Keywords: Government Health Expenditure, Institutional Quality, Economic Growth, Iran

Introduction

Health is the most important human capital and an important indicator of living standards (1). Therefore, access to health services is always considered a high priority for governments (2). Government investment in health through increased health spending leads to reduced mortality rates (3), increased life expectancy (4), increased happiness and well-being (5), increased labor productivity (4), and economic growth (7).

Two competing hypotheses dominate the discourse on the nexus between health expenditure and economic growth: the "health-led growth

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hypothesis" and the "income-driven health hypothesis." The former posits that health capital is a critical determinant of income, asserting that enhanced population health or elevated health investments catalyze economic expansion (8). Conversely, the latter conceptualizes health as a derivative of income, identifying per capita income as the primary variable explaining cross-national disparities in healthcare expenditure magnitude and allocation (9). This bidirectional causality framework contends that rising incomes amplify demand for higher-quality and more accessible health services (10). Empirical analyses across South Asia (11), Sub-Saharan Africa (12), and a global panel spanning Europe, the Middle East, Africa, and Asia (13) have scrutinized these hypotheses, yielding heterogeneous evidence on their relative explanatory power.

Institutions consist of beliefs, behaviors, traditions, and legal norms and regulations that form a coordinating complex around a core. In this sense, good institutions are seen as creating motivational structures that reduce uncertainty, encourage efficiency, and thus help improve economic performance and affect economic growth (14).

Institutional quality establishes a framework for economic activities within a country that can influence productive activities in society by shaping a motivational structure; It affects economic growth by affecting transaction costs through reducing uncertainty in the economy towards productive activities, building trust and promoting mutual cooperation.

Institutional deficiencies in governance mechanisms precipitate volatile health expenditures, resulting in ambiguous health status-service relationships. Middle-income and low-resource nations frequently lack systematic documentation of critical indicators such as hospital-acquired infection rates and surgical waste volumes, attributable to deficient regulatory enforcement and implementation capacity.

Economic growth is recognized as one of the most important macroeconomic factors for governments, and identifying the factors affecting economic growth has attracted the attention of economists. Preliminary studies related to economic growth suggest that differences in economic growth rates across countries are due to differences in basic factors of production and the level of technology. In contrast, theoretical and empirical studies indicate that in addition to physical capital and the level of technology, government health expenditure as an indicator of human capital has had a significant impact on the economic growth of countries. Accordingly, it is observed that one of the most vital measures of a country's development is its healthcare system. This study investigates the causal mechanisms linking healthcare expenditure to economic growth within Iran’s macroeconomic framework. While recent scholarly attention has increasingly focused on health capital as a driver of development, existing literature inadequately addresses the moderating role of institutional quality in shaping the health expenditure-growth nexus. The research seeks to address this persistent knowledge gap arising from insufficient empirical scrutiny of (1) the bidirectional relationship between health investments and economic outcomes, and (2) the influence of multidimensional institutional frameworks on this dynamic. By integrating governance indicators into the analysis, the study advances context-specific policy formulations for optimizing health-driven growth strategies in emerging economies.

Materials and Methods

This quantitative study investigates the impact of government health expenditure and institutional quality on Iran's economic growth utilizing descriptive analytical methods. Based on previous studies, especially the article by Farouk et al. (2022), equation (1) has been specified as an empirical model.

$$GDP_t = \alpha + \beta_1 HE_t + \beta_2 HC_t + \beta_3 LE_t + \beta_4 LF_t + \beta_5 TR_t + \beta_6 INS_t + \beta_7 HE_t * INS_t + \varepsilon_t$$

According to Equation (1):

GDP_t: Logarithm of Gross Domestic Product per

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capita as an indicator of economic growth

HE_t : Health expenditure [2]

HC_t : Household consumption expenditure [3]

LE_t : Life expectancy at birth [2]

LF_t :Labor force population [2]

TR_t : Trade openness degree

INS_t : Institutional quality index

$HE_t * INS_t$: Interactive effect effect of health expenditure and institutional quality

The data for this study were collected through library methods and from the World Bank website for the period 2000-2021.In many economic and financial models, the effects of distributional variables are subject to significant lags. For example, the effect of an expansionary monetary policy on the variables of interest appears with delay. Lagged effects convey that if the value changes, its effect will appear in later periods. Models that are presented to examine lagged effects are known as models with self-distributional lags. One of the newest methods for these studies is the autoregressive distributional lags (ARDL) method. In the ARDL model, the dependent variable is affected by the lags of the independent variables. The use of traditional econometric methods for empirical studies is based on the stationarity of variables. However, many time series variables are non-stationary. Non-stationarity of time series variables leads to spurious regressions. According to the theory of cointegration, modern econometrics should use methods that take into account the problem of stationarity and cointegration of time series variables to estimate the regression coefficients of time series variables. Therefore, in applied econometrics, various approaches are used to estimate the long-term relationship between time series variables when the variables are stationary, such as the ARDL model of Pesaran and Shin (1999) and Santos et al. (15). The econometric model in which the lags of the variables are as seen in Equation (2) is the dynamic econometric model.

$$Y_t = aX_t + bX_{t-1} + cY_{t-1} + u_t \qquad (2)$$

In small samples, to reduce the bias of the coefficients of the dynamic econometric model, such as Equation (3), the intervals of the variables must be large.

$$\varphi(L.P)X_{it} + c'w_t + u_t \qquad (3)$$

Equation (4) is an autoregressive econometric model with distributional lags.

$$\phi(L.P) = 1 - \phi_1 L - \phi_2 L^2 - \cdots - \phi_P$$

$$b_i(L.q_i) = b_{i0} + b_{i1}L + \cdots + b_{iq}L^q \qquad (4)$$

$$i = 1.2.\cdots.K$$

L= Lag operator

The vector w represents fixed parameters, including distance from origin, dummy variables, time trend, and exogenous variables with predetermined lag structures.

The econometric model (4) is estimated for all cases and for all possible arrangements of values, i.e.; $(m+1)^{k+1}$

M = maximum interval determined by the researcher.

k = number of explanatory variables.

Then, using one of the Akaik criteria (AIC), Schwartz Bayesian Criterion (SBC), Hannan Quine Criterion (HQC) or adjusted coefficient of determination, those equations are selected. The autoregressive model with distributed lags (ARDL) is not sensitive to sample size. In order to use other cointegration or cointegration methods, the condition of the same degree of integration of the variables is necessary, and in contrast, the ARDL is effective for variables with different degrees of cointegration. In this method, it is possible to use the optimal lags of each variable during the stages of model estimation. ARDL, in contrast to the systematic estimation of equations, has a single equation. In the estimation of ARDL, both short- and long-term dynamics between dependent and explanatory variables permit simultaneous estimation. In this study, Ewies[13] software was used for data analysis.

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Results

Stationarity test

In order to examine the stationarity (static) level of the variables of this study, the generalized Dickey-Fuller test was used.

As the results of Table 1 show, the variables of logarithm of GDP per capita (an indicator of economic growth), logarithm of household consumption expenditure, logarithm of trade openness and institutional quality index are at the stationary level (I(0)), but the variables of logarithm of health expenditure, logarithm of life expectancy at birth, and logarithm of labor force population are not at the stationary level; however, the first order difference of this variable is stationary, in other words, it is I(1).

Table 1. Stationarity test of research variables (Dickey-Fuller test)

Result	Stationary test		Variable
	Statistical probability	T-test	
At static level	0.080	-2.74	Ln(GDP)
Not at static level	0.110	-2.59	Ln(HE)
Static difference	0.009	-3.84	D(Ln(HE))
At static level	0.030	-3.23	Ln(HC)
Not at static level	0.350	-1.83	Ln(LE)
Static difference	0.050	-2.94	D(Ln(LE))
Not at static level	0.240	-2.09	Ln(LF)
Static difference	0.010	-3.80	D(Ln(LF))
At static level	0.010	-3.52	L(TR)
At static level	0.003	-5.14	INS

Source: Research calculations

As the results of Table 1 show, the variables of logarithm of GDP per capita (an indicator of economic growth), logarithm of household consumption expenditure, logarithm of trade openness, and institutional quality index are at the stationary level (I(0)), but the variables of logarithm of health expenditure, logarithm of life expectancy at birth, and logarithm of labor force population are not at the stationary level; however, the first order difference of this variable is stationary, in other words, it is I(1).

Model Estimation

Results of the stationary test showed that the research variables are of type I(0) and I(1). Since one of the advantages of the ARDL method is that it is effective when the variables are I(1) and I(0), the ARDL method is chosen to estimate the research model. In the following, the research models are estimated using this method.

Pesaran and Shin's bounds test to examine cointegration

First, in order to examine the existence of a long-run relationship between the model variables, a cointegration test is performed on the model variables. When the stationarity degree of the model variables is not the same, the Johansen-Josielius method cannot be used to examine cointegration (long-run relationship). Santos et al. (15) have presented a test called the bounds test to examine cointegration and long-run equilibrium test. The null and alternative hypotheses of this test are as follows:

$H_0: \rho = \theta^+ = \theta^- = 0$

$H_1: \rho \neq \theta^+ \neq \theta^- \neq 0$

The null hypothesis implies the absence of a cointegration relationship. Because F distribution is asymmetric, Santos et al. (15) estimated the critical values for F statistic in two stages; first, by assuming that all variables are I_0, and then, by assuming that all variables are I_1. Then, they defined the lower

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bound for the I_0 variables and the upper bound for the I_1 variables. If the calculated F statistic is greater than the upper bound, the null hypothesis is rejected, and if it is smaller than the lower bound, the null hypothesis is not rejected, and if the F statistic is between the two bounds, the test is inconclusive. The results of this test, which was performed using Eviews software, are presented in Table 2 and the appendices. As can be seen, the calculated F statistic is greater than the upper band value at the 1 percent significance level, and the existence of a cointegration relationship in this model is confirmed.

Table 2. Cointegration test

K	The amount of statistic test	Test
7	14.05	F test
Critical amounts		
Lower band	**Upper band**	**1 percent**
2.73	3.90	

Estimation of the model and the ECM model

After proving the existence of a long-run relationship, the long-run relationships between the model variables are extracted using the ARDL method. The general form of the ARDL(p,q) model is as follows:

$$Y_t = \mu + \sum_{j=1}^{p} \gamma_j Y_{t-j} + \sum_{j=0}^{q} \beta_j X_{t-j} + u_t$$

Where p is the number of dependent variable intervals and q is the number of independent variable intervals.

The first step in the ARDL method is to determine the optimal intervals. One of the advantages of the ARDL method is that it allows for the determination of different intervals for each variable. Accordingly, considering the order of the variables entered in model 4-1, the optimal model is ARDL (1,0,0,0,1,1,1,1).

The results of the ARDL model estimation are presented in Table 3. As can be seen, most of the estimated coefficients are significant. Also, the high value of the F statistic indicates that the model is significant in general cases. The results of Table 3 show that the coefficient of the life expectancy at birth variable is positive and statistically significant. The coefficient related to this variable is estimated to be 11.3, which indicates that with a 1 percent increase in the life expectancy at birth index, economic growth increases by 11.3 percent.

The coefficient of the labor force population variable has also become positive and significant, indicating that labor force has a positive effect on economic growth. The coefficient of this variable is estimated to be 1.5, indicating that with a 1 percent increase in the country's labor force population, economic growth increases by 1.5 percent. The coefficient of the degree of trade openness variable has also become positive and significant, demonstrating that the openness of the Iranian economy leads to an increase in economic growth. The estimated coefficient for this variable is 0.19, indicating that a 1 percent increase in the openness index of the Iranian economy leads to an increase in the country's economic growth by 0.19 percent.

The coefficient of the institutional quality variable has become positive and significant; indicating that in the period under review, improving institutional quality has increased economic growth in Iran. The estimated coefficient for this variable is 0.09, showing that a one-unit increase in the institutional quality index has led to an increase in economic growth by 0.09 percent.

The coefficient of health expenditure variable is not statistically significant, indicating that health expenditure has no effect on economic growth in Iran. The coefficient of the household consumption expenditure variable is estimated to be 0.68 and is statistically significant. Considering that the

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variables are in logarithmic form, the calculated coefficient is the elasticity of household consumption expenditure, which indicates that a 1percent increase in household consumption expenditure leads to a 0.68 percent increase in Iran's economic growth. However, the coefficient of the contrasting variable of health expenditure and institutional quality (HE*INS) is positive and significant, indicating that an increase in health expenditure only leads to economic growth in the presence of quality institutions.

Table 3. Results of model estimation using the ARDL method

Variable	Coefficient	T statistic	Prob
C	-6.13	-2.25	0.05
LnGDP(-1)	0.24	2.21	0.05
Ln(HE)	-0.04	-1.39	0.20
Ln(HC)	0.51	8.12	0.00
Ln(LE)	-2.35	-6.28	0.00
Ln(LF)	0.40	3.99	0.00
Ln(LF(-1))	0.73	7.54	0.00
Ln(TR)	-0.07	-2.01	0.07
Ln(TR(-1))	-0.07	-2.54	0.03
INS	0.08	4.70	0.00
INS(-1)	-0.15	-5.53	0.00
Ln(HE)*INS	0.00	-2.49	0.03
Ln(HE)*INS(-1)	0.00	3.47	0.00
R^2	0.98		
F statistic	58.81		

Table 4. Results of estimating long-term coefficients

Prob	T statistic	Coefficient	Variable
0.10	-1.81	-8.130	C
0.24	-1.26	-0.060	Ln(HE)
0.00	12.59	0.680	Ln(HC)
0.00	3.72	3.110	Ln(LE)
0.00	3.58	1.500	Ln(LF)
0.01	3.11	0.190	Ln(TR)
0.06	2.11	0.090	INS
0.03	1.27	0.0001	Ln(HE)*INS

Table 5 Error correction model results

Prob	T statistic	Coefficient	Variable C
0.001	5.07	0.04	D(Ln(LF))
0.016	-3.02	-0.07	D(Ln(TR))
0.004	3.85	0.08	D(INS)
0.002	-4.44	-0.0002	D(HE*INS)
0.000	-15.9	-0.75	CointEq(-1)
	0.94		R^2

Source: Research calculations

Goodness of Fit Tests

In order to ensure the results obtained, goodness of fit tests are performed. These tests are performed to ensure the absence of self-correlation (LM test), homogeneity of variance (ARCH test) and the correct form of the dependent variable of the model

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(Ramsey-Rist test). In all these tests, the null hypothesis is the desired hypothesis. The results of the goodness of fit tests are presented in Table 4. As can be seen, in all these tests, the null hypothesis cannot be rejected, and therefore, the model is well-fitted

Table 6. Results of the goodness-of-fit test

Prob	F statistic	Test
0.15	2.63	test LM
0.20	1.70	test ARCH
0.82	0.05	test Ramsey Reset

Source: Research calculations

Discussion

Achieving desirable economic growth is known as one of the main concerns of governments and economic policymakers, so that many governments can achieve desirable economic growth rates by adopting different economic policies and growth patterns. Therefore, economic growth is known as one of the most important macroeconomic factors for governments, and identifying the factors affecting economic growth has attracted the attention of economists. Initial studies related to economic growth indicate that the difference in the economic growth rate of countries is due to differences in the basic factors of production and the level of technology. In contrast, theoretical and empirical studies indicate that in addition to physical capital and the level of technology, the health of the state as an indicator of human capital has had a significant impact on the economic growth of countries. In Iran, health expenditure is of great importance because the Iranian population is young, and maintaining the health and well-being of this workforce, along with the expansion of public and higher education, can better contribute to economic growth and development. Accordingly, this study aims to investigate the relationship between economic growth and health spending in the Iranian economy for the period 2000-2021 using the ARDL method.

This study's findings demonstrate that household consumption expenditure exerted a statistically significant positive effect on economic growth during the observation period. As a core component of aggregate demand, consumption expenditure directly stimulates expansionary macroeconomic outcomes by driving cyclical growth patterns. Household consumption expenditure indicates the standard of living, welfare, and desires of the people. An increase in household consumption expenditure can increase GDP, employment, and national income. However, if household consumption expenditure exceeds the country's production capacity, it may lead to inflation, public debt, and income inequality. Therefore, household consumption expenditure should be adjusted according to economic conditions, government policies, and other factors.

Trade openness demonstrates a statistically significant positive correlation with economic growth, serving as a quantitative indicator reflecting a nation's global economic integration. This metric stimulates growth through multiple channels; increased foreign trade can lead to increased production, employment, investment, and innovation and act as a driving force for economic growth. Increased trade openness can also lead to reduced inflation, as it increases competition, lowers prices, and improves efficiency. This is consistent with the results of Hosseinizadeh (2018) and Rahmani Fazli et al. (14).

Labor force population has a positive and significant effect on economic growth. The employment and utilization of a highly skilled and educated labor force leads to a more proportionate use of physical capital, thereby increasing economic growth. An increase in the labor force population, on the one hand, leads to an increase in the labor force, and on the other hand, leads to an increase in potential human capital, which increases labor productivity, both of which have a positive effect on economic growth. This result is consistent with the results of Bazdar Ardebili and Pejmanzad (19), Mataher et al. (10), and Rahmani Fazli et al. (14).

Institutional quality has a positive and significant effect on economic growth; it strengthens the incentives of economic agents for physical, human, and production technology investment, and as a

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result, affects economic growth. This is consistent with the results of Ahmadpour and Dehmardeh (18).

However, the coefficient of the interaction variable between health expenditure and institutional quality (HE*INS) has become positive and significant, indicating that increasing health expenditure only leads to economic growth in the presence of quality institutions.

Conclusion

Considering the results of this study, which indicate a positive interactive effect of institutional quality on the relationship between health expenditure and economic growth, it is recommended to Iranian economic policymakers to plan to improve institutional quality indicators. In order for government health expenditure to contribute to economic growth, it is essential that resources be allocated effectively and efficiently. Educational and health policies should be designed in a way that not only they do not have negative effects in the short term, but also help to improve the quality of the workforce and promote public health in the long- term.

Ethical Consideration

This article is extracted from the master's thesis of Tavakoli Kamkowii (2023), which was approved in the meeting dated 09.23.2023, No. D/327926, in the Specialized Council of the Management Department of Payam Noor University, Yazd Province. In this research, a number of ethical considerations were meticulously addressed to uphold the integrity and ethical standards of the study. These considerations included: - Participants were thoroughly informed about the study's objectives, methodologies, and potential impacts. - Informed consent was secured from each participant prior to their involvement in the research. - Participants were clearly informed of their right to withdraw from the study at any time without facing any repercussions.

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Authors' Contributions

SV.R designed and conducted research; S.AN analyzed data or performed statistical analysis, and wrote the manuscript; S.AN. All the authors read and approved the final manuscript.

Conflict of Interests

The authors of the article declare that there are no conflicts of interest.

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