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Research Article

Short-term and Long-term Impacts of Foreign Direct Investment on the Development of Iran's Health Sector

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Abstract

Background: The health sector (health care sector) is considered one of the key sectors in every country and is known as an infrastructure in economic development since the factor directly affects labor productivity and increases production and economic growth. Thus, the health system's quality may be considered a crucial and attractive factor of foreign direct investment (FDI) along with infrastructures like education, labor, and research and development costs.

Objectives: The present study evaluated the short-term and long-term impacts of foreign direct investment on the development of the health sector.

Methods: According to the time series data, the ARDL method tests the research hypotheses from 1981 to 2020. The present method can use data of nature I (0) and I (1) simultaneously.

Results: During the years 1982 to 2021 with the increase of foreign capital in the health sector of Iran, health indicators have changed significantly. The rates of some diseases have decreased and in the meantime, the financial resources needed for the health sector have been provided to some extent. According to the coefficients, the highest impact on health expenditures in the short term, foreign directs investment and the lowest impact on the percentage of people living with AIDS.

Conclusions: The research findings indicate that foreign direct investment has had positive and significant impacts on the development of the health sector in Iran in both the short and long terms.

Keywords: Foreign Direct Investment, Health Sector Development, Health Sector Costs

1. Background

Health is the axis of sustainable economic, social, political, and cultural development of human societies and has particular importance in the infrastructure of various sections of society. Maintaining health is so essential for the community. In addition to personal interests, the health of individuals in society has social benefits too. Health has a decisive role in human capital and economic growth and development. Without the growth and development of human capital, none of the systems, organizations, or societies can gain their desired financial goals (1). Thus, health, as an essential issue in all communities and their culture, has specific concepts. The most common perception of health is that it is considered a blessing, and its value is not recognized unless it is lost (2).

There is a long argument about the importance of macroeconomics for population health. While the overall perspective (3), the critical article "The richer is healthier" seems that economic development is good for health in the long term or some countries. However, such an issue may not be the case for short-term macroeconomic fluctuations.

The financing of the health system is one of the most fundamental matters in health and wellness, addressed in various studies. Types of financing health costs sources consist of direct consumer payments, social security contributions, payments from public government revenues, taxes, and private insurance, classified according to their reliability and completeness. Increasing the health costs in most countries is the main challenge for governments and households to fund these costs. As a result, many studies conducted in the last decade have surveyed the determinants of the expenses in the health sector (3).

Foreign direct investment is widely known for increasing economic growth, wages and generally improving working conditions in low- and middle-income countries. As these factors can affect access to healthcare, particularly in low- and middle-income countries where access to healthcare is highly dependent on the ability to pay, foreign direct investment may be associated with population health beneficially.

Though, foreign direct investment may have adverse health impacts. For instance, a significant body of studies indicates an association among foreign direct investment and consumption of tobacco or unhealthy food, increment of levels of harmful contaminants, and overeating, all of which directly affect population health. Such matter indicates a complex and vaguely predicted general relationship among foreign direct investment and health in low- and middle-income countries (4).

A few studies have quantitatively surveyed the health impacts of foreign direct investment in low- and middle-income countries. Two similar studies (4, 5) focus on foreign direct investment in second-tier industries and water pollution levels via annual data panel analysis from 30 countries. Their results indicate that foreign direct investment in the secondary sector is associated with high pollution, increasing infant and child mortality. Another study surveyed the impact of foreign direct investment and international trade on life expectancy via Pakistan's annual time series data. The results of vector error correction models indicate that in Pakistan, increasing foreign direct investment is associated with short-term and long-term benefits for life expectancy (5).

In this case, several studies have indicated that health is part of human capital too. Thus, the health system's quality may be considered a crucial and attractive factor of foreign direct investment along with infrastructures like education, labor, research, and development costs (6). Effective investments can theoretically complement various aspects of the health ecosystem. We can mention physical infrastructure, financial solutions, emergency response, and the development of drugs, vaccines, and diagnostic services. Direct investment in specific medical and pharmaceutical companies makes it possible to gain targeted opportunities. In addition, investing in healthcare can help expand and strengthen hospitals and clinics' physical infrastructure that serve patients (6).

Nowadays, as healthcare and education are one of the most critical economic requirements for ensuring a healthy and efficient workforce, various countries have made the provision of health and education minimums among their most important development programs. The economic development programs implemented nationally and internationally in different countries indicate that health and human resource development focus on eradicating poverty and human development. Developing countries have suffered from poor living conditions for many years.

The low level of many indicators related to health development and associated costs in developing countries has led to the process of economic growth and development of these countries being affected. Thus, both dimensions of health sector indicators and health sector costs must be considered in surveying the growth of the health sector in countries (5).

The economic, social, and environmental factors are among the most influential factors in the development of the health sector; all these cases are consistent with the model proposed by Ogundari and Awokuse (6), which proposes health as a function of these factors; therefore, the modeling of the research is as the following way:

$$H = F(X)$$

H in the above-said function estimates the individual health outputs, which is indicated by the variable of health sector development in the form of improving health care costs.

X is personal health data that consists of economic, social, environmental conditions, and so on; accordingly, the above equation is indicated as follows:

$$H = F(Y, S, V)$$

Where Y = economic variables; S = social variables; V = environmental variables and H = health indicators.

Foreign direct investment can positively impact population health primarily by increasing demand for health-related goods and services and improving the supply. Based on the OECD (2002, p. 68), "beyond what domestic investment normally does, the foreign direct investment, in general, has a positive impact on both the productivity of the factors of production and the growth of income in the host countries. "In addition, foreign direct investment in the health sector of the host country can improve the performance of the health sector via making more medical goods and services available at lower prices (for instance, drugs and medical equipment). Foreign direct investment can increase the productivity of domestic suppliers in the health sector of the host country by expanding medical, technical knowledge, besides having impacts on direct supply (4, 6).

Practically, Bahrami et al. (7) have studied the impact of chosen health, environmental and economic indicators on health costs in developed and developing countries. They used data from 109 countries during 2000 - 2014. Their findings indicated that access to sanitary sewage systems at -3.72 and energy intensity at -2.43 affects per capita health costs in developed countries. Access to sanitary sewage systems affects per capita health costs by -9.17 in developing countries. Savojipour et al. (8) have studied the factors affecting the health costs of urban households in Iran for 2011. The results indicate that increasing income, education, the proportion of women, health development, and the number of elderly and non-elderly will increase household health costs. Also, benefiting from insurance coverage and smoking makes households spend higher costs on health.

On the one hand, the families run by married and never-married individuals have the highest and lowest health

costs, respectively. On the other hand, there is a problem of sample selection in surveying the factors affecting the health costs of urban households in Iran, and linear regression provides biased and inconsistent estimations. Khanzadi et al. (9) indicated a positive and significant relationship between public health expenditure and economic growth in provinces. In other words, health expenditure spent through the channel of improving the quality of human capital has caused economic growth. Kordbache and Ahmadi (10) indicated that according to the results gained from ARCH and ECM models, the variables of the exchange rate, liquidity, and domestic production in the short and long terms have a positive and significant impact on consumer and producer price indices. The effect of the exchange rate on the short-term consumer and producer price index is 0.23 and 0.14, respectively. Also, in the long term, the exchange rate affects the consumer and producer price indices by 0.327 and 0.256, respectively.

The exchange rate affects the health sector's consumer and producer price indices in the short and long terms, which significantly impacts exchange rate fluctuations on the consumer price index than the producer price index. Also, Giammanco and Gitto (11) surveyed "Health Expenditure and Foreign Direct Investment in Europe" in one study. The objective of the present study is to survey the role of various national institutions in attracting foreign direct investment in 28 E.U. member states. In particular, the present study focuses on the relationship between health costs and foreign direct investment. The percentage of public health costs can be considered an indicator of institutional quality in total health costs.

Accordingly, the GLS panel method is adopted, and a data set for 28 European Union member states are used from 2000 to 2013. The relationship between foreign direct investment and health indicators has been measured from three indexes of government health costs to total health care costs, the percentage of out-of-pocket payment costs (OOP) to total health costs, and the percentage of health coverage in the country in the present study. The control variables used in the current study consist of the quality of government oversight, market size, government efforts in R&D in higher education, and labor productivity. The findings indicate that the relationship between dependent variables and variables related to health costs is always significant in all models. Still, surprisingly, there was a positive relationship with the percentage of public health costs while a negative relationship with the OOP costs percentage. The variables that describe population health are always related to foreign direct investment positively.

In one study, Raeesi et al. (12) surveyed the impacts of private-sector health costs on health outcomes among countries with a variety of various health systems from 2000 to 2014. The econometric method has been used to estimate the impact of health costs on health status in the present study. Panel data were collected and grouped for 25 countries according to the health care system over 15 years (2000 - 2015). The research findings have indicated a significant relationship between health costs and health indicators.

The impact of private health costs on health outcomes in countries with mixed healthcare systems and traditional health insurance is higher than public costs. In addition, it was seen that the impact of health costs on health outcomes in countries with the National Health System (NHS) is more than other health systems after comparing the results between various healthcare systems.

2. Objectives

Foreign direct investment is related to the health sector's development. Accordingly, the short-term and long-term impacts of foreign direct investment on the development of the health sector were evaluated in the present study.

3. Methods

To survey the impact of foreign direct investment on Iran's health sector development, following Mottaqi et al. (2) and Talukdar (4), had been used from the estimation of below model by ARDL method:

$$HEt = c0 + c1\,GDPt + c2\,FDIt + c3\,LRt + c4\,HIVt + c5\,Urbent + c6\,EXRt + c7\,INFt + c8\,IRt + et$$

$$HEt = c0 + c1\,GDPt + c2\,FDIt + c3\,LRt + c4\,HIVt + c5\,Urbent + c6\,EXRt + c7\,INFt + c8\,IRt + et$$

Among them:

Dependent variable.

Health sector development (HE): health expenditure as a percentage of GDP.

Independent variable.

Economic growth (GDP): GDP growth.

Foreign direct investment (FDI): total health FDI as a share of GDP

Literacy rate (L.R.): literate people as a percentage of total population aged 6 years and above.

HIV prevalence: the increase in the number of people living with HIV

Urbanization rate (URBEN): the rate of growth of the urban population

Real exchange rate (EXR).

The real exchange rate is an adjustment of the nominal exchange rate to domestic and foreign price indicated as

follows (Talukdar (4))

EXR = NER (Pd / Pm).

EXR is the real exchange rate, NER is the nominal exchange rate, Pd is the domestic price index, and Pm is the import price index.

Inflation rate (INF): the annual inflation rate of a country.

Interest Rate (I.R.): the interest rate on one-year deposits in all government banks.

For data collection, data for 1982 - 2021 are collected from relevant sources like libraries and databases like the Central Bank, Statistical Center of Iran, World Health Organization, and the World Bank. The method of data collection is limited to libraries, which can be gained through archived materials and references and collecting data on well-known reference websites like the Central Bank, the Statistical Center of Iran, the World Health Organization, and the World Bank.

The autoregressive distribution interval (ARDL) method proposed by Kalemli-Ozcan (5) was used as a model testing method. The method can be summarized as follows: The ARDL model test consists of explanatory variables, dependent variable intervals, and simultaneous explanatory variable intervals for estimating short-term and long-term impacts. The present test allows convergence without requiring the investigated regression to be self-consistent at data level I (0) or interval I (1). The following equation is used for estimation.

$$\Delta HE = \beta 0 + \beta 1t \ \Sigma \ \Delta HE\ t\text{-}1 + \beta 2t \ \Sigma \ \Delta GDP + \beta\ 2t \ \Sigma \ \Delta FDI + \beta 3t \ \Sigma \ \Delta LR + \beta\ 4t \ \Sigma \ \Delta HIV + \beta\ 5t \ \Sigma \ \Delta Urben + \beta 6t \ \Sigma \ \Delta EXR + \beta\ 7t \ \Sigma \ \Delta INF + \beta\ 8t \ \Sigma \ \Delta IR + \beta 9\ GDPt\text{-}1 + \beta\ 10\ FDI\ t\text{-}1 + \beta\ 11\ LR\ t\text{-}1 + \beta\ 12\ HIV\ t\text{-}1 + \beta\ 13\ Urben\ t\text{-}1 + \beta 14\ EXR\ t\text{-}1 + \beta\ 15\ INF\ t\text{-}1 + \beta\ 16\ IR\ t\text{-}1 + ut$$

Where β1, β2, …, β8 are short-term dynamic coefficients, while β9, β10, ..., β16 are long-term coefficients, and ut is a random perturbation.

However, the asymptotic distribution of the F-statistic is non-standard whether the variable is correlated with zero or one. The proportional critical value was suggested by Ogundari et al. (6). One hypothesis variable is I (1), and the other hypothesis is I (0). The null hypothesis of non-convergence is rejected if the reported F-statistic is above the design level. It is necessary to test the significance of the required variables before estimating the model.

4. Results

The significance of the variables is discussed in the present section. The generalized Dicke-Fuller (ADF) test is used for this objective (Table 1).

Table 1. The Results of the Stationary test of Variables

Variables	t-Statistics	Possibility	The Result of Assuming the Non-stationarity and Significance Level
HE	-0.73	0.9914	The stationarity assumption is rejected at the 5% level
D(HE)	-7.19	0	The stationarity assumption in the first data difference is confirmed 1%
GDP	-6.55	0	The stationarity assumption is confirmed at the 1% level
FDI	-2.21	0.2052	The stationarity assumption is rejected at the 5% level
D(FDI)	-6.48	0	The stationarity assumption in the first data difference is confirmed 1%
LR	-2.96	0.0481	The stationarity assumption is confirmed at the 1% level
HIV	-6.14	0	The stationarity assumption is confirmed at the 1% level
URBEN	-3.32	0.0221	The stationarity assumption is confirmed at the 1% level
EXR	-2.58	0.1052	The stationarity assumption is rejected at the 5% level
D(EXR)	-4.65	0.0006	The stationarity assumption in the first data difference is confirmed 1%
INF	-3.36	0.0189	The stationarity assumption is confirmed at the 1% level
IR	-1.45	0.5441	The stationarity assumption is rejected at the 5% level
D(IR)	-4.38	0.0019	The stationarity assumption is confirmed at the 1% level

The results of Mann Whitnet test indicate that the significance level of the test is more significant than 0.10 due to the variables of health expenditure, foreign investment, exchange rate, and interest rate. Thus, it confirms the hypothesis of one element in the series, where the data are at the level of anonymity and maintain a one-time variation, while the other studied variables are at the level of Mann Whitnet test. Table 2 indicates the comparison of the calculated F-values with the critical values to test the coexistence or convergence of the model. I.T. can be seen that the calculated F-statistic is equal to 4.4830 From Table 2. The upper and lower critical values were determined based on the observation aids and unused in the Table 2.

Table 2. Comparison of the Value of Computational F-statistic with Critical Values of Narayan

F-statistic	Interval	Critical Value I (0)	Critical Value I (1)	Significant Level
4.4830	2 a	2.6367	4.0727	95%
		2.2203	3.4637	95%

[a] The optimal number of intervals were selected using the Schwartz-Bayesian (BS) criterion.

According to Table 2, the calculated F-statistic is higher than the critical value for data below 80 in Narayan's Table. Thus, the null hypothesis that there is not any long-term relationship between the variables is rejected. Therefore, there is a long-term equilibrium relationship at the 95% confidence interval probability level. The results of the ARDL test are provided in Table 3.

Table 3. Results of the Model with Distribution Intervals Related to Schwartz-Bayesian Standard Model ARDL (2,0,1,1,0,0,1,0,2)

Variables	Coefficient	t-statistic and Significance Level
HE (-1)	0.18288	10.2188 [0.236]
HE (-2)	0.41589	30.1384 [0.005]
GDP	0.058987	10.4474 [0.163]
FDI	0.19957	0.35800 [0.724]
FDI (-1)	1.3249	20.3948 [0.026]
LR	-0.62564	20.4558 [0.023]
LR (-1)	-0.49498	20.0867 [0.049]
HIV	0.64668	0.85812 [0.401]
POP	8.7343	30.5684 [0.002]
EXR	0.0062444	10.2594 [0.222]
EXR (-1)	0.012366	10.9237 [0.068]
INF	-0.047645	20.2026 [0.039]
IR	0.15521	10.2789 [0.215]
IR (-1)	0.48624	30.5467 [0.002]
IR (-2)	0.34576	20.7254 [0.013]
C	-112.2143	30.5073 [0.002]

As can be observed from Table 3, the variables of health costs and foreign direct investment have two intervals. The value of the detection coefficient of the model is equal to 0.99. Investigation of the probability of Watson camera statistics revealed that the model is not self-correlated. The F-statistic of the model is equivalent to 83.24, and its probability is higher than 99%. Thus, the health expenditure model is significant at the above probability level.

Table 4. Diagnostic Tests

Test Statistics L.M. Version	F Version
Serial Correlation*CHSQ (1)	0.003
Functional Form *CHSQ (1)	2.751
Normality *CHSQ (2)	1.685
Heteroscedasticity*CHSQ (1)	0.111

The results of diagnostic tests indicated in Table 4 confirm the classical assumptions of regression. It means that it confirms the non-correlation of error sentences, the shortage of variance inhomogeneity, the specification of the functional form, and the normality of error sentences. The results of estimating the long-term coefficients of the health expenditure model are provided in Table 5.

4.3. Estimation of Long-term Coefficients of the Model by ARDL Method

The long-term coefficients were estimated according to the estimated ARDL model after doing the above levels. The results of such estimation are indicated in Table 5.

Table 5. The Results of Long-term Effects of the Research Model

Variables	Coefficient	T-statistic and Significance Level
GDP	0.14701	20.0529 [0.053]
FDI	3.7994	20.3717 [0.027]
LR	-2.7929	-30.2657 [0.004]
HIV	1.6117	10.0093 [0.324]
URBEN	21.7686	40.4560 [0.000]
EXR	0.015257	10.7600 [0.093]

INF	-0.11875	-10.6485 [0.114]
IR	0.73697	20.0111 [0.057]
C	-279.6735	-30.5737 [0.002]

The long-term function of Iran's health costs from 1982 to 2021 is as follows:

HE = -279.67 + 0.14 GDP + 3.79FDI – 2.79LR + 1.61HIV + 21.76URBEN +0.01EXR – 0.11INF + 0.73IR

According to the function, all variables have the expected symptoms theoretically. The results indicated that foreign direct investment (FDI), gross domestic product (GDP), HIV infection rate (HIV), urbanization rate (URBEN), the exchange rate (EXR), and interest rate (I.R.) The annual Inflation Rate (INF) and literacy rate (L.R.) have negatively impacted health costs. Also, it is seen that the impact of the variables of AIDS incidence rate and inflation rate are insignificant statistically while other research variables are significant statistically.

According to the results, the increment of the investment types (domestic and foreign direct investments) and separation from the suffering conditions while moving towards economic growth lead to increasing resource investment in health and other human investment; therefore, costs in the health sector will increase. Also, the share of health costs in GDP increases with GDP increment, interpreted as economic growth. More income means more spending on both the public and private health sectors since the consumption of goods and capacity building for automatic financing is invested in health by increasing current income and demand for health.

Such impact will decrease the final cost of investing in health and increase the equilibrium level of investing in health. Regarding the negative effect of literacy rates on health costs, it is expressed that the increment of the level of literacy and education causes better awareness of individuals about using existing health facilities and improving health status. In addition, the increment of an educated population improves personal care and decreases health costs. Also, the incidence of AIDS leads to an increment of the expenses for medical and psychological treatments and maintenance of such patients, which can positively impact health care costs. The urbanization rate has had a positive impact on increasing health sector costs as well. Urban people spend more of their income on health than rural ones. The parallel increment of industrialization and urbanization leads to environmental pollution and increased healthcare and health costs following the poor quality of the environment.

Also, the exchange rate has indicated a positive impact on health sector costs. The exchange rate can be one of the most critical factors in increasing healthcare expenditures for the dependence of the pharmaceutical industry on imports, particularly during the peak years of economic sanctions. Since the household expenditure basket consists of various expenses like food, clothing, housing, education, health and so on, the available financial resources for healthcare become less than other basic needs like food, and out-of-pocket payments and private health expenses will decrease by the increment of inflation and declining incomes. In addition, increasing the inflation rate via the channel of creating instability and class gap and reducing some factors like purchasing power and economic and social security, etc., have a negative impact on the health costs of society and economic growth and development.

Regarding the positive impact of interest rates, lowering interest rates cause higher confidence in the return on all types of investments and investments in health, leading to an increment in investments. As a result, it will increase the costs. The dynamics (short-term) of the model can be stated using the error correction model (ECM) just after gaining the long-term function; the results of the present model are reported in Table 6.

Table 6. The results of Dynamic Error Correction Model (Short Term) Depending on Bayesian Schwartz Standard Model

Variables	Coefficient	T-statistic and Significance Level
ecm (-1)	-.37963	-3.1291 [0.004]

Source: research findings

Given the results reported in Table 6, all coefficients had their expected symptoms. Based on the coefficients, foreign direct investment had the maximum impact on health costs in the short term, and the percentage of individuals with AIDS had the minimum impact.

The ECM coefficient in the model is significant and indicates statistically and indicates the model adjustment speed. The present speed is relatively high and adjusts to equilibrium at short intervals. The error correction rate for each period is about 46% and indicates that the deviation from the long-term equilibrium relationship is adjusted over the third period. The cumulative sum of the recursive waste test (CUSUM) was used for evaluating the stability of the parameters and the variance of the model. The CUSUM test is according to the following statistics:

$$W_t = \sum \frac{W_i}{S}$$
$$t = k + 1, \ldots, n$$

Where S indicates the error or residual regression criterion fitted to n members. W indicates a cumulative sum and is plotted against t. If the vector B remains constant

from one period to another, then E (Wt) is -0; and if it changes, then Wt deviates from the mean line of zero.

Any deviation from the zero line is significant concerning a pair of straight lines whose distance increases with increasing t. The test draws a graph of Wt against t and indicates the critical lines of 5%. The movement of Wt outside the essential lines suggests the instability of the parameters. The CUSUM test results are indicated in Figure 1.

Since the recursive waste path or St is not out of the range of two lines; therefore, the hypothesis of instability of the parameters is rejected at the 95% probability level. Thus, long-term permanent stability for model parameters is acceptable during the period under study. In better words, any structural failure is not seen in the model.

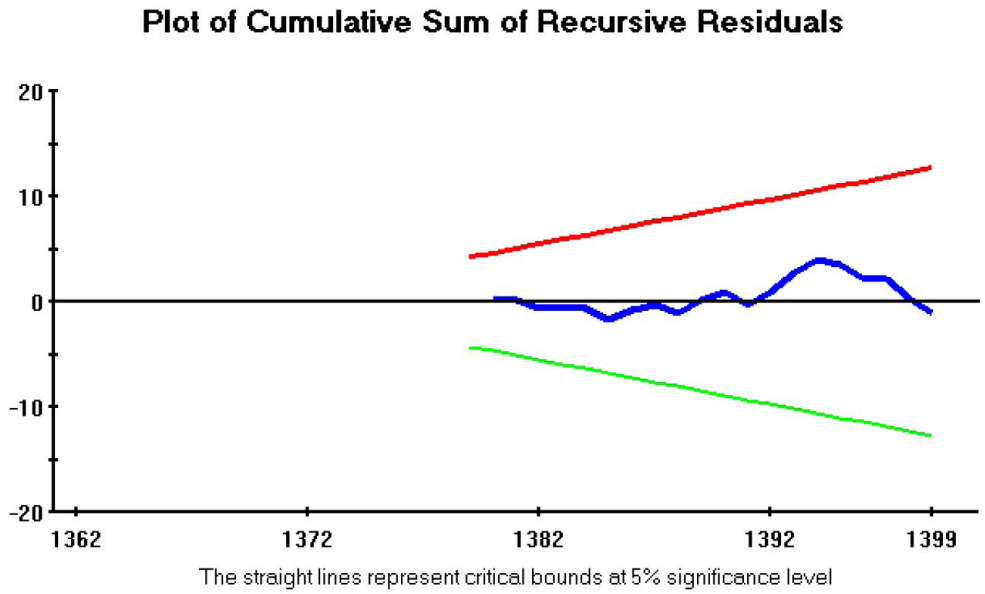

Figure 1. The cumulative sum of recursive waste test.

5. Discussion

Healthcare is a crucial matter in health, one of the primary and vital needs in human societies, and financing is considered an essential issue in this field. Recognition and investigation of the trend of health indicators are important since improving these indicators has a significant impact on economic growth and development by increasing the health of human resources (1). The low level of many health indicators related to its supply costs can seriously affect the economic development process. The cost of healthcare has a significant impact on social and economic life in all human societies, including a substantial share of the household basket or the costs of enterprises (4). Using foreign direct investment in this sector is considered one way to finance health care costs. In this case, the results indicated that foreign direct investment had positive and significant impacts on the variable of health costs in Iran in both the short and long terms. Thus, it can be expected that investing in the health sector can affect the economic growth of communities according to such a perspective (6). So, one of the crucial macroeconomic factors in health can be a foreign direct investment (FDI), an additional investment source (5, 7, 8). The right policies can be a vital tool for developing countries and the development of the health sector especially. In addition, foreign direct investment is widely recognized for economic growth, wage growth, and improving working conditions in low- and middle-income countries generally (7-9). Since these factors can affect access to healthcare, particularly in low- and middle-income countries where access to care depends on the ability to pay very much, then the foreign direct investment can positively affect population health. Such a conclusion is consistent with the findings of Giammanco (11) and Talukdar (4). According to the findings, the macroeconomic policymakers bases for broader foreign direct investment in the health sector. Increasing domestic investment to provide the basis for improving and promoting economic growth and development in various economic, cultural and social sectors results in improving health indicators in the country, including life expectancy, by creating a spirit of vitality and more effort in individuals (10-12).

5.1. Conclusions

The research findings indicate that foreign direct investment has had positive and significant impacts on the development of the health sector in Iran in both the short and long terms.

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