Government Health Expenditures and Economic Growth: A Feder–Ram Approach for the Case of Turkey

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ABSTRACT

This paper aims to test the direct and indirect (external) effects of health expenditures on economic growth using the Feder–Ram model. It uses aggregate and manufacturing industrial production as total output, total government health expenditures, general government cure and pharmaceutical products health expenditures, general government medicine and health expenditures series belonging to the economy of Turkey between the 2006:M01-2013:M10 period using seasonally adjusted and real monthly data. The results obtained from this study have shown that in general, the direct impact of government health expenditures on economic growth in Turkey is positive and significant and its indirect impact is negative and significant. Moreover, when the coefficient calculated for efficiency is considered, it can be argued that while there are not very significant differences between the government health sector and other sectors, the government health sector is slightly more efficient. In this case it can clearly be seen that there is a requirement to improve and further develop the health sector in Turkey.

Keywords: Direct and Indirect Effects, Government Expenditure, Health Expenditures, Economic Growth and Development, The Feder–Ram Model
JEL Classifications: H23, H51, I15, O11, O41

1. INTRODUCTION

There is a mutual interaction between a population's health level and its level of economic growth and development. Maintaining a sustainable level of growth and development provides people significantly better nutrition and disease treatment opportunities along with wider access to preventive medical technology. A sustainable growth and development enables better health conditions, increasing the share of population of healthy individuals. In this way, loss of labor or efforts does not emerge in the society and thus, the amount of labor supply increases. On the other, because healthy individuals are more fit both physically and mentally, they are expected to contribute to production more than a sick person and increase productivity and have a positive impact on economic growth. When a person is healthy, life expectancy increases and this promotes individual savings and private investments in education. Thus, contributions are made to investments and the development of human capital. There is also the opportunity for the healthy individual to find better means to benefit from these investments they have made.

Considering the expenditures aspect, health expenditures are an expenditure item. With its multiplier effect, increased health expenditures leads to an increase in total expenditures and aggregate demand. Apart from that, the health sector constitutes an area of employment in the economy and increased health expenditures leads to a rise in the number of those employed in the sector along with the total income of those employed, which contributes to total expenditures and increases aggregate demand. Such effects health expenditures on total expenditures, aggregate demand, and total production are termed direct effects. Direct effect is expected to be positive. Besides, sick people are more inefficient, and impose burdens on their families and countries due to reasons associated with their diseases. This leads to disruptions in production and prevents expenditures made in the health sector to be utilized in such more productive sectors as infrastructure, investments and the like. On the other hand, a viability in the healthcare market spreads to the other sectors associated with the health sector and can vitalize these other sectors as well; and increases the trade and production volumes in these segments. Such indirect effects are called

indirect or external effects. Indirect effects may be positive or negative in total.

Labor is a scarce and capital is an abundant factor of production developing countries. The increase in the rate of non-healthy individuals in the community increases workforce loss and reduces productivity in developing countries, whose economic growth and economies are based on labor, and creates more significant impacts and losses on the production power as compared to those in the developed countries. In this case, developing countries cannot fully take advantage of the cheap labor factor to the extent required. They fall behind even more disadvantaged than an already disadvantageous situation. Therefore, the healths of the society and the labor markets as well as health expenditures are more important for developing countries. As it applies to all countries, an adequate and effective way of making health expenditure is important for Turkey, which is a developing country.

The study empirically tests the relationship between government health expenditures and economic growth. First, a literature review of the subject matter was conducted and an attempt was made to summarize some important previous studies theoretically and empirically. Later on, the direct and indirect (external) effects of government health expenditures on economic growth were investigated by the Feder–Ram model using Turkey data. In this context, whether the variables used in the model are stable was studied by unit root tests. Finally, the empirical results derived from the Feder–Ram model analysis were evaluated.

2. HEALTH EXPENDITURES IN TURKEY

Although life expectancy at birth in Turkey was 74.86 and above the world average of 70.78, it was lower than the European Union (EU) average of 80.54 and the Organization for Economic Co-operation and Development (OECD) average of 79.96 in 2012. Moreover, according to OECD data, while the USA ranked the first in terms of health expenditures per capita, Turkey ranked the last among OECD countries. While per capita health expenditures in Turkey in accordance with the purchasing power parity (PPP) was just above the world average of $1121 with $1144, it was far below the EU average of $3351 and the OECD average of $4484.

Table 1 shows health indicators data from the US and Turkey. Based on PPP, while the USA ranks the first in the health

expenditures per capita listing with $8895, Turkey ranks the last with $1144. It is observed that PPP-based health expenditures in the USA was approximately 8 times of that in Turkey in 2012. While the share of health expenditures in gross domestic product (GDP) in the USA had a gradually increasing trend from 2006 to 2012, an increasing trend from 2006 to 2010 and then a declining trend that falls to a share of 6.30% is seen in Turkey. Accordingly, the share and importance of the health sector is lower in Turkey. In other words, while 5-6% of the GDP goes to health expenditures in Turkey, this ratio is about 15-18% in the USA and is following an increasing trend. What is more, life expectancy in the USA is approximately 4 years more than that in Turkey. While the share of public health expenditures in all public expenditure is approximately 19-20% in the USA, it is 11-12% in Turkey. The public sector share within total health expenditures is high and gradually increasing in Turkey, the share of the public remains lower in the USA as compared to Turkey and has been approximately 47% in the recent period. This shows that health expenditure in the USA is shared between the public and private sectors by approximately half of the total whereas in Turkey, with a share of 73.88, public health expenditures are 3 times of that of the private sector. The OECD average, on the other hand, is about 72%. In addition, the components of government health expenditure in Turkey as of 2012 comprised of overall treatment and medical supplies expenses with a rate of 83% overall drug costs with a rate of 13%, and other expenditures with a rate of 4%.

It is seen from the OECD Briefing Note United States (2014) and the OECD Briefing Note Turkey (2014) data that the rate of smokers in Turkey dropped from 32% in 2000 to 24% in 2012, but is still higher than the OECD average of 20.7% and the USA average of 14%. The obesity rate is increasing in time and diabetes and cardiovascular disease incidences are gradually increasing. While this rate was 22% in Turkey for the year 2011, it was around 35% in the US in 2012. The reason for increased incidences of cardiovascular diseases and cancer is considered to be these high rates. Alcohol consumption among adults (liters per capita) was 8.6 in the USA in 2011 while this rate was 1.6 in Turkey.

When considered as a whole, although some progresses are observed in the health sector in Turkey in recent years, these remain insufficient. Health expenditure and the sector is still well below the US, EU, and OECD averages. As a developing country with inadequate health expenditure, Turkey needs to increase

Table 1: Health indicators of the USA and Turkey

Countries	Indicators	2006	2007	2008	2009	2010	2011	2012
United States	THE as percentage of GDP	15.86	16.08	16.54	17.71	17.66	17.68	17.91
	GGHE as percentage of THE	45.00	45.16	46.00	47.21	47.57	47.79	46.39
	THE/capita at PPP (US Dollars, 2005=100)	7110.19	7486.34	7769.35	8008.67	8254.16	8467.04	8895.12
	HE as percentage of GGE	19.91	19.81	19.56	19.47	19.72	20.27	19.92
	Life expectancy at birth	77.59	77.84	77.94	78.09	78.54	78.64	78.74
Turkey	THE as percentage of GDP	5.81	6.04	6.07	6.75	6.75	6.13	6.30
	GGHE as percentage of THE	68.34	67.83	73.02	75.14	75.08	72.74	73.88
	THE/capita at PPP (US Dollars, 2005=100)	716.33	845.20	919.05	979.66	1071.53	1047.17	1143.91
	HE as percentage of GGE	11.95	12.13	12.79	12.79	12.79	12.79	12.79
	Life expectancy at birth	72.82	73.18	73.53	73.88	74.21	74.54	74.86

Source: HE: Health expenditures, THE: Total health expenditure, GGHE: General Government Expenditure on Health, GGE: General Government Expenditure, GDP: Gross domestic product. Life expectancy at birth data from the World Bank, world development indicators, Access Date: 10/28/2014

its health expenditure as well as healthcare-related studies and activities. The first step to be taken in order to develop and attach the necessary attention to the health sector in Turkey is increasing the number of studies highlighting the importance and essentiality of the health sector.

3. LITERATURE FRAMEWORK

The theoretical structure of the subject can be based on Lucas (1988), Romer (1990), and Solow (1956)'s traditional neoclassical growth model, Mankiw et al. (1992). There are two growth theories as exogenous and endogenous growth. The Solow model stipulates that the level of savings-capital accumulation affects growth in the transition period; however, neglects human capital, which is an important input. It acknowledges the impact of technological developments on growth; however, technological progress is exogenous in the Solow model. In this respect, the Solow model fails to explain how economic growth occurs. Even when the Solow model was expanded with the inclusion of an exogenous variable of human capital to the production function, this addition did not prove sufficient to explain how growth occurs. Lucas (1988) and Romer (1990) played an important role in the development of an endogenous growth model as an alternative approach in the 1980s. In the endogenous growth model capital is not limited to the physical capital, but also includes knowledge, skills, and experience owned by the labor input as well. Thus, growth is considered a function of human capital, too, and not of physical capital only. The components of the human capital, knowledge, skills, abilities and experience are developing through health and education.

Sustainable growth depends on increased human capital shocks due to a better education, a higher level of health and the new learning-application processes (López-Casasnovas et al., 2005).

Accordingly, education and health have an important place in terms of the quality of human capital. All kinds of expenditures on education and health raises the level of human capital and makes a positive contribution to economic growth. As is the case with education, the relationship between health and economic growth has been examined in literature. The study by Sorkin (1977) can be given as one of the first studies to examine the impact of health on economic growth. According to Sorkin (1977), decrease in birth rates positively affects economic growth. Freeland and Schendler (1983) examined health expenditures and economic growth between 1971 and 1981. During this period, health expenditures rose threefold from $83 million to $287 million. Expenditure growth in the health sector has increased faster than and outpaced that in the gross national product. Strauss and Thomas (1998) stated that health and income mutually affect each other. They concluded that problems affecting health cause negative shocks in growth. Arora (2001) investigated the effects of health on economic growth for ten industrialized countries. By increasing the growth rate, changes in health have led to continuous growth leaps. Bhargava et al. (2001) studied the impact of health indicators for the period 1965-90 for developed and developing countries. Economic performance in developing countries increases with the improvement of public health. Bloom et al. (2001) stated

that health makes a significant positive impact on economic growth. They concluded that an annual improvement of 1 year in life expectancy increases growth by 4%. Mayer et al. (2001) emphasized that the existence of a healthy population, rather than education, may be more important for human capital in the long-term. Examining 21 Africa countries for the 1961-1995 period and 23 OECD countries for the 1975-1994 period, Gyimah-Brempong and Wilson (2004) found that 23 OECD health shocks affect growth in secondary level per capita income, applying the extended Solow growth model. With the importance given to health in human capital, it is possible to reduce health shocks on average. Van Zon and Muysken (2003) investigated whether health is one of the determinants of economic growth. They concluded that high growth leads to investments in human capital and thus, health advances. Howitt (2005) analyzed channels associated with the influence of the health of the country on growth performance with the Schumpeterian growth theory. The Schumpeterian theory emphasizes the importance of maternal and child health on the critical dimensions of human capital.

Taban (2006) examined the relationship between economic growth and life expectancy at birth, bed numbers of medical institutions, the number of medical institutions, the number of persons per medical staff in Turkey. The test results did not yield any evidence of causality between the number of health institutions and real GDP and indicated bidirectional causality with others. Ashraf et al. (2008) have focused on the economic impact of external changes in public health. Beneficial effects in the improvement of public health arise in per capita GDP in the long-term. Matteo and Sunde (2009) studied the causal effects of life expectancy on economic growth. High life expectancy is the cause of sustainable revenue growth. Aghion et al. (2011) studied the relationship between health and growth in the light of the modern endogenous growth theory. A better life expectancy increases growth. Life expectancy at various ages in OECD countries have been examined and declines in mortality rates under 40 years of age have been observed to increase growth.

Table 2 presents some studies investigating the relationship between certain health expenditures and economic growth.

4. THE FEDER–RAM MODEL

The theoretical structure of the subject is analyzed in an empirical modeling approach in accordance with the Feder–Ram model. Feder's (1983, 1986) paper describes a model of the exports-growth nexus in developing countries for a cross-country study about the relationship between exports and economic growth. Feder deals with two sectors in economy. The first sector is exports and the other one is non-exports. There are positive externalities from exports to non-exports. And then, following the lead of Ram (1986) and Biswas and Rati (1986), most of studies have examined variants of the same approach. In this paper, we assumed there was basic two-sector of model, first sector is health output (H) and the rest of output (non-health sector [NH]). Labor (L) and capital (K) are homogeneous in both of the sectors.

$$H = F\left(L_h, K_h\right),\ NH = F\left(L_{nh}, K_{nh}, H\right) \qquad (1)$$

Table 2: Selected studies examining the relationship between health expenditures and macroeconomic growth

Study	Countries and time period	Method	Empirical results
Heshmati (2001)	OECD countries 1970-1992	Solow growth model	Positive
Kar and Taban (2003)	Turkey 1971-2000	Co-integration	Negative
Chakroun (2009)	17 OECD countries 1975-2003	Multivariate nonlinear	Positive
Yumuşak and Yıldırım (2009)	Turkey (1980-2005)	Co-integration	Negative
Arısoy et al. (2010)	Turkey 1960-2005	Co-integration	Positive
Çetin and Ecevit (2010)	15 OECD countries 1990-2006	Pooled OLS	No relationships
Elmi and Sadeghi (2012)	Developing countries 1990-2009	Panel co-integration causality in VECM	From GDP to health causality in short run Bi-directional causality in the long run
Eryiğit et al. (2012)	Turkey 1950-2005	Co-integration	Positive
Lago-Penas et al. (2013)	31 OECD countries 1970-2009	Fixed effect model	Private health expenditures more productive than government expenditures
Odubunmi et al. (2012)	Nigeria 1970-2009	Co-integration	Positive
Temitope and Bola (2013)	Nigeria 1977-2010	Co-integration	Positive
Oni (2014)	Nigeria 1970-2010	Multiple OLS	Positive

GDP: Gross domestic product, VECM: Vector error correction model

$$L = L_h + L_{nh}, \quad K = K_h + K_{nh} \tag{2}$$

Y is total output,

$$Y = NH + H \tag{3}$$

After proportional differentiation of (3) with (1) and (2), Ram (1986) and Biswas and Rati (1986) yield the growth model equation as,

$$\ddot{Y} = NH_K \frac{\Delta K}{Y} + \frac{NH_L L}{Y} \ddot{L} + \left(\frac{\gamma}{1+\gamma} + NH_h \right) \frac{H}{Y} \ddot{H} \tag{4}$$

$$\ddot{Y} = NH_K \frac{I}{Y} + \frac{NH_L L}{Y} \ddot{L} + \left(\frac{\gamma}{1+\gamma} - \theta \right) \frac{H}{Y} \ddot{H} + \theta \ddot{H} \tag{5}$$

Here, the double dot notation on top of the variables refers to the growth rate of the related variable. The $\lambda = \left(\frac{\gamma}{1+\gamma} - \theta \right)$ is the coefficient expressing the impact of health expenditures on economic growth. θ is the coefficient showing the indirect effect or exogeneity effect γ. It shows the productivity differences between the health sector and non-health sectors γ. It demonstrates that the health sector is more efficient than non-health sectors when the productivity index is positive. When the productivity index is negative, just the opposite is true γ. A zero value indicates that there is no productivity gap between the two sectors.

5. DATA AND EMPIRICAL FINDINGS

In this study, the industrial production index (2010=100) for total industry as total output Y_T, industrial production index (2010=100) for manufacturing industry as manufacturing output (Y_M), manufacture of capital goods (2010=100) as investment (I), population ages 15-64 as labor (L), total government health expenditures (H), general government cure and pharmaceutical products health expenditures (CP), general government medicine health expenditures (M) series belonging to the economy of Turkey between the 2006:M01-2013:M10 period were used through monthly observations. H, CPHE and MHE are realized by the consumer price index (2003=100). All the data were taken from the Electronic Data Delivery System of

The Central Bank of The Republic of Turkey website and seasonally adjusted by Tramo-Seat by using Eviews 7.1.

The variables to be used in time series models should be stationary. The series are required to be stationarized to accurately calculate the t, F, and R^2 values of the models and to achieve reliable and robust analysis results. The stationarity level of the series was determined by applying the augmented Dickey–Fuller (ADF) test developed by Dickey and Fuller (1979, 1981) and the Phillips and Perron (1988) (PP) test, which are two of the most widely used stationarity or unit root tests.

The ADF and PP tests can be explained with three different models as follows.

$$\Delta Y_t = \rho Y_{t-1} + \sum_{(i=1)}^{p} \alpha_i \Delta Y_{t-i} + e_t \text{ (None)} \tag{6}$$

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + e_t \text{ (Intercept)} \tag{7}$$

$$\Delta Y_t = \alpha_0 + T + \rho Y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + e_t \text{ (Intercept and Trend)} \tag{8}$$

If t statistics of ρ is greater than the MacKinnon (1996) table value, the null hypothesis, the series is non-stationary, is rejected, so the series is stationary. Based on the results of the performed ADF and PP tests, it has been concluded that all the variables used in the Feder–Ram model are stationary and can be used in the model.

For health expenditures, the Feder–Ram model can be expressed as follows.

$$\ddot{Y} = \delta + \alpha \frac{I}{Y_{-1}} + \beta \ddot{L} + \left(\frac{\gamma}{1+\gamma} - \theta \right) \frac{\dot{H}}{Y_{-1}} + \theta \ddot{H} \tag{9}$$

or

$$\ddot{Y} = \delta + \alpha \frac{I}{Y_{-1}} + \beta \ddot{L} + \lambda \frac{\dot{H}}{Y_{-1}} + \theta \ddot{H} \tag{10}$$

Here, δ represents the constant term, α, β, λ, and θ, show the variable coefficients. A single dot on top of the variable shows that their differences are taken whereas double dots mean that growth rates are used. The H in the equation represents the related health expenditures to be used in the equation. The Feder–Ram model

Table 3: The Feder-Ram model (dependent variable: Total industry output)

Variable	Coefficient (*t*-statistic)		
	Total government health expenditures	General government cure and pharmaceutical products health expenditures	General government medicine health expenditures
δ	−0.003 (−0.833)	−0.001 (−0.45)	−0.003 (−0.65)
α	0.257[a] (5.02)	0.260[a] (5.30)	0.255[a] (5.23)
β	0.040[c] (1.74)	0.032 (1.27)	0.043 (1.31)
λ_H	0.0006[c] (1.71)	-	-
θ_H	−0.0004 (−0.32)	-	-
λ_{CP}	-	0.001[c] (1.95)	-
θ_{CP}	-	−0.0001[a] (−2.97)	-
λ_M	-	-	0.002[b] (2.02)
θ_M	-	-	−0.0003[a] (−3.25)
γ	-	0.0009	0.0017
R^2	0.32	0.33	0.31
F	10.53[a]	10.89[a]	9.77[a]
n	93	93	93

[a,b,c]Denote significant at 1%, 5% and 10%, respectively. The Newey-West HAC standard errors and covariance are used

Table 4: The Feder-Ram model (dependent variable: Manufacturing industry output)

Variable	Coefficient (*t*-statistic)		
	Total government health expenditures	General government cure and pharmaceutical products health expenditures	General government medicine health expenditures
δ	−0.003 (−0.57)	−0.001 (−0.22)	−0.003 (−0.48)
α	0.28[a] (4.88)	0.29[a] (5.13)	0.28[a] (5.04)
β	0.035 (1.33)	0.027 (0.90)	0.039 (1.04)
γ_H	0.0007 (1.61)	-	-
θ_H	−0.0006 (−0.40)	-	-
λ_{CP}	-	0.001[c] (1.84)	-
θ_{CP}	-	−0.0001[a] (−2.75)	-
λ_M	-	-	0.002[c] (1.80)
θ_M	-	-	−0.0003[a] (−2.89)
γ	-	0.00010	0.0017
R^2	0.32	0.33	0.30
F	10.54[a]	10.91[a]	9.73[a]
n	93	93	93

[a,b,c]Denote significant at 1%, 5% and 10%, respectively. The Newey–West HAC standard errors and covariance are used

was estimated and the results are summarized in the following Tables 3 and 4.

The results from the implementation of the Feder–Ram model are summarized in Table 3. The dependent variable in Table 3 is total industry output.

In the model, where the dependent variable is taken as the total industry output, the impact of the share of the capital within the output has been found to be positive and significant for all the three equations. Increase in labor has positive and significant effect in the equation estimated for total government health expenditures.

Moreover, it has been found that the direct impact of health expenditures on outcome is positive in all the three equations. In other words, government health expenditures as an expenditure item has a positive effect on output and makes an impact of increasing aggregate demand and expenditures. The indirect or external effect of government health expenditures, on the other hand, is negative. That is to say that it has been concluded that the external or indirect impact on other sectors of making public expenditures in the form of health sector expenditures is negative. This has been interpreted as the negative impact of diseases, accidents, and business disruption on the output of other sectors and as the exclusion (crowding out) effect of government health expenditures.

Apart from that, δ is positive, which indicates that the health sector is a bit more productive than the other sectors. Calculations are based on the Newey and West (1987) corrected standard errors and covariance coefficients, which take autocorrelation and heteroskedasticity into account as well. Similar results were obtained with regards to general government cure and pharmaceutical products health expenditures and general government medicine health expenditures.

Table 4 summarizes the Feder–Ram model results for the equation where the dependent variable is manufacturing industry output. Athough total government health expenditures data do not have a direct or indirect effect when the impact of health expenditures on the manufacturing sector is taken into consideration, it is seen that results consistent with those obtained for total industry are achieved when the situation is examined with regards to the General Government Cure and Pharmaceutical Products Health Expenditures and General Government Medicine Health Expenditures equations. The Newey–West correction was used for this model, too.

6. CONCLUDING REMARKS

Although some progresses in the health sector are observed in Turkey in recent years, these remain insufficient. Health expenditures and the sector are still well below the US, EU and OECD averages. As a developing country with inadequate health expenditures, Turkey needs to increase its health expenditures as well as healthcare-related studies and activities. The first step to be taken in order to develop and attach the necessary attention to the health sector in Turkey is increasing the number of studies highlighting the importance and essentiality of the health sector.

When the fact that the ratio of government health expenditures to total health expenditures in Turkey is approximately 74% is taken into consideration, the importance of government health expenditure is obviously understood. For this purpose, the direct and indirect effects of government health expenditures and its sub-items in Turkey have been examined under the scope of the Feder–Ram model and with seasonally adjusted real data for the 2006:M01-2013:M10 period in this study.

The variables used in the Feder–Ram model were found to be stable as they are used in the model according to both the ADF and

PP tests. Under the scope of the Feder–Ram model, it is possible to analyze the direct and indirect or external effects of government health expenditures on the output level. According to the obtained results, the direct effect of government health expenditures on total expenditures, aggregate demand, and total production was found to be positive. On the other hand, the indirect or external impact interpreted as the negative impact of diseases, accidents, and business disruptions on the output of other sectors and as the exclusion (crowding out) effect of government health expenditures were found to be negative. Moreover, when the coefficient calculated to measure the efficiency of the government health sector is taken into consideration, it can be asserted that while there are not very significant differences between the government health sector and other sectors, the government health sector is slightly more efficient.

As an overall evaluation, it can clearly be seen that there is a requirement to improve and further develop the health sector in Turkey. When indirect effect and crowding out are considered, it can further be argued that the private sector needs to get more involved in the health sector and that the private sector should be supported and encouraged for health expenditures and health investments. Thus, positive effects on aggregate demand will possibly emerge as both expenditures and investment items and crowding out effect may not occur, while it will also be possible to assert that the health sector will further develop in terms of productivity as a result of more competition in the private sector.

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