Investigating The Role of Households' Health Care Expenditures on The Iranian Households' Welfare Using DSGE Framework

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Hamid Reza Izadi conceived the study and were responsible for literature review, the design and data collection and data interpretation.

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Abstract
Nowadays, the study of the share of households' health expenditures in their total consumption expenditures and its impact on the well-being of households and society has become an important issue as it is applied in policy and planning by government officials. The objective of this paper is to examine the impact of changes in the share of health expenditures in the basket of total household consumption expenditures and to show that small changes in the variable have significant effects on consumption, desirability, and consequently the well-being of society. This paper examines the role of households' health care expenditures on the Iranian households' welfare Using dynamic stochastic general equilibrium framework. The results of this modeling suggest that a decrease in the share of household health expenditures leads to an increase in other household expenditures and, consequently, increases household welfare by increasing utility. The reason for this is that by increasing its health and medical expenditures, the household must reduce its consumption of other goods, which decreases its total utility. It should be noted that this decrease is due to the fact that households are less inclined to spend a larger share of their total consumption expenditure on health services. In general, then, it can be said that an increase in the share of households' health expenditures in their total expenditures leads to a decrease in welfare, and a decrease in this share increases household welfare. However, factors such as the inefficiency of the insurance system, poor monitoring of the health system, and problems in accessing and using health services can have a major impact on households' acceptance, desire, and use of health services and should be considered a serious problem.

JEL classification: E63, F42, H51, N3, p36

Keywords; Welfare, Households, Health Care Expenditures, DSGE Framework.

Introduction

Health is recognized as one of the most important requirements for the social system. In addition to a healthy lifestyle, people need to use health services to promote, maintain, and restore their health. The desire to use services and the demand for services are two concepts that are very close and sometimes even completely linked. From an economic point of view, a person's willingness to use health services depends on the cost of the beneficial the services. On the other hand, the purchase of health care services is the result of the interaction between the demand and the supply of health care services, in addition to the individual's desire.

Although the ultimate goal of health interventions and related programs is to improve living conditions, the most appropriate goal for health services is equal access to these services for all people in the country. Such a goal should never be measured by reductions in morbidity or mortality, but should be analyzed in terms of the access, desire, and motivation of people from different social classes or geographic areas to health services and facilities (Chou, 2007).

Adopting the wrong strategy in the health sector and household health, in addition to reducing the consumption of some goods and services, can also lead to discontinuing the consumption of some goods and services in the basket of goods of the whole household. It is important to know that reducing or increasing the consumption of health goods and services in society will lead to changes in the welfare of society. For this reason, economic and health policy makers and planners are interested in analyzing the consumption patterns of households in society and identifying what place each good and medical service occupies in the household budget. On the other hand, consumer behavior in different regions of the country regarding health services is very doubtful despite small differences, so by studying the economic behavior of Iranian households, we can provide a useful model and tool for policy makers in these sectors.

Considering this importance, this study examines the pattern of health care spending in the consumption basket of all households using a dynamic stochastic general equilibrium model for the Iranian economy. This paper attempts to model the issue of household, firm, and government policies according to the standard models in the economic literature and to empirically examine, estimate, and analyze these equations. The data required are quarterly data from 1997 to 2020 obtained from the Statistical Center of Iran, the Central Bank, and international financial statistics and the World Bank as needed.

Background and Related Literature

One of the most important challenges for political and economic leaders of countries is the adequate access to health goods and services for all people in society, because in this case the movement towards development can be accelerated. On the other hand, a key factor in ensuring proper access to health care is how the use of these goods is financed. That is, if people are unable to finance the purchase of health goods and services, they may use nonstandard goods that cost less, or they may reduce their use to lower than optimal levels or forgo the use of these services altogether Zare, et al., 2013)(

In general, the behavior and socioeconomic characteristics of individuals encompass a variety of factors that affect demand for health care services, with health status, income, and education among the most important factors. Health status and education inevitably affect the benefits of seeking medical services, such that individuals with higher education are more likely to seek health care services (Mehrara and Fazaeli, 2010).

The extent to which education affects a person's desires varies depending on his or her socioeconomic conditions. Therefore, income is also important because it plays a critical role in an individual's ability to pay and in predicting the benefits of using health care services (Rous and Hotchkiss, 2003).

People of different ages and genders also have different predictions about the costs and benefits of services, which affects their demand for services and, consequently, their health and productivity. The cost of health care often increases with an individual's income. After income, insurance coverage, the age structure of the population, and access to health care services are also cited as factors that influence health care costs (Bolin et al., 2001).

Household health care costs refer to all household economic contributions to the health care system, which are divided into two categories: Out-of-pocket payments and prepayments (PP). Out-of-pocket payments are payments made by a sick person at the time of receiving services. Prepayments are contributions through general taxes, taxes on bills, and mandatory and voluntary insurance (Cantarero, 2005).

Most studies of health care costs generally use the individual (the person) as the unit of analysis. In many of these studies, the individual has been viewed as a producer of health care commodities. This commodity is part of society's human capital and affects the total time people spend producing wealth. Although these studies have provided the basis for large-scale economic studies in the field of health economics, they ignore the fact that each individual is a member of the same family and is strongly influenced by other family members. This means that people's use of health care services depends on the circumstances of the entire household, which includes communication among them and the characteristics of each individual. Therefore, it is better to consider the household as a health-promoting unit rather than as an individual (Parker and Wong, 1997).

Di Matteo (2003), Xu et al. (2007), Waters et al. (2004) and Meyerhoefer et al. (2007) have emphasized the importance of the role of education, income, and health status of the household on health costs in their studies on health costs, and have shown that the behavioral patterns of health costs differ among countries. This group of countries provides a wide range of goods and services to their citizens for free or at low cost, including health care, education, social security, and employment. They showed that examining the socioeconomic factors that affect health care costs in countries can provide useful information on the functioning of the insurance system, resource allocation, and the need for investment in different sectors for domestic policy and planning.

Sanwald and Theurl (2015) studied the modeling of household health care costs both theoretically and experimentally. Their results show that increasing the guardian's transfer payment to the child, lowering the minimum requirements for health care goods, and increasing the wage gap of workers lead people to be present in a wider range of prices in the health care market and to have a non-zero demand for the corresponding items.

Giammanco and Gitto (2019) have studied the impact of infrastructure aspects of health care costs on the development of European countries. Their findings are consistent with the idea that health is part of the human infrastructure and is influenced by public policies and governments. Health resource infrastructure and health facilities and systems are also key issues in countries.

Phua (2018) examines governance issues in financing health care costs. He concludes that external factors as well as poor performance of health care providers lead to additional costs for the recipients of these services, making the need for government intervention in health care expenditure financing undeniable.

It is worth noting that health is one of the categories managed by governments in most countries. This means that people's health cannot be left to market forces. In order for government managers to carefully plan health care spending and achieve a high return on investment by improving the health of individuals, it is necessary to identify the proportion of household health care spending that reflects, to some extent, the demand and need of individuals in the market for health care services. This study attempts to provide guidance to managers on how to support household health and make appropriate policies by focusing on

household health expenditures and using the existing literature in the field by modeling household health expenditures.

the Model and Methodology

This paper uses economic studies to build a model for studying household health expenditures and describes the variables and welfare status of households.

I consider an open economy with a representative household, a firm and a government using DSGE framework. It is considered this economy populated by a large number of identical households that receives income from providing labor and capital and chooses a path of consumption and capital investment to maximize their utility (the utility is in the logarithmic form) given by:

$$E_0 \sum_{t=0}^{\infty} \beta^t U(TC_t, H_t) \quad (1)$$

$$U_t = U(TC_t, H_t) = \ln(TC_t) + \chi\, ln(1 - H_t) \quad (2)$$

$$U_t^H = \ln(TC_t^H) + \chi\, ln(1 - H_t) \quad (3)$$

$$U_t^O = \ln(TC_t^O) + \chi\, ln(1 - H_t) \quad (4)$$

$$TC_t + K_{t+1} = (1 - \tau_H) W_t H_t + (1 + R_t(1 - \tau_k) - \delta) K_t \quad (5)$$

$$(1 - \tau_H) W_t = \chi\left(\frac{TC_t}{1 - H_t}\right) \quad (6)$$

$$\frac{1}{TC_t} = \beta E\left[(1 + (1 - \tau_K) R_t - \delta)\frac{1}{TC_{t+1}}\right] \quad (7)$$

$$TC_t = \theta TC_t^H + (1 - \theta) TC_t^O \quad (8)$$

Wherein TC_t is total consumption expenditures, TC_t^H is health care expenditures, TC_t^O is other consumption expenditures, θ is Share of health care expenditures in total consumption expenditures and H_t is labor of households.

$$K_{t+1} = I_t + (1 - \delta) K_t \quad (9)$$

$$Y_t = F(H_t, K_t) = (e^{a_t} H_t)^{\alpha} K_t^{1-\alpha} \quad (10)$$

$$R_t = (1 - \alpha)(e^{a_t})^{\alpha}\left(\frac{H_t}{K_t}\right)^{\alpha} \quad (11)$$

$$W_t = \alpha(e^{a_t})^{\alpha}\left(\frac{H_t}{K_t}\right)^{\alpha - 1} \quad (12)$$

Where R_t explains the interest rate, Y_t denotes domestic output, I_t denotes gross investment, and K_t denotes physical capital, δ denotes the depreciation rate of physical capital.

the labor augmented technical progress with a following an AR (1) process as the productivity shock and Government spending with a following an AR (1) process as Government expenditure shock are given by:

$$a_t = \rho_a a_{t-1} + \varepsilon_{a,t} \quad (13)$$

$$g_t = \rho_g g_{t-1} + \varepsilon_{g,t} \quad (15)$$

The government to finance

exogenously given consumption. It is assumed that

the government operates with a balanced budget and imposes taxes on labor and capital income. The budget constraint is given by:

$$e^{g_t} G_t = \tau_H W_t H_t + \tau_K R_t K_t \quad (14)$$

Finally, the gross domestic product(Market Clearing) and welfare function are defined as:

$$Y_t = TC_t + I_t + e^{g_t} G_t \quad (16)$$

$$WEL_t = U_t^O - U_t^H \quad (17)$$

Parametrization, Simulation and Discussion

Based on the literature of models for economies, to solve and simulate the pattern, the research model was used the parameter values listed in Table 1[1].

Table 1 calibration Parameters

Parameters	Description	Value	Source
δ	Depreciation rate	0.0139	Izadi (2021)
χ	risk aversion	2	Marzban et al. (2018)
α	Capital share	0.44	Izadi (2018)
β	Discount factor	0.9952	Izadi and Sayareh (2019)
τ^k	Tax on Capital	0.356	Marzban et al. (2016)
τ^h	Tax on Labor	0.047	Marzban et al. (2016)
ρ_a	Technology Shock Persistence	0.599	Izadi and Marzban (2019)
$\varepsilon_{a,t}$	Technology Shock Standard Deviation	0.016	Izadi and Marzban (2019)
ρ_g	Government Spending Shock Persistence	0.929	Izadi and Marzban (2016)
$\varepsilon_{g,t}$	Government Spending Shock Standard Deviation	0.075	Izadi and Marzban (2016)
G/y	Government Spending	0.125	Researcher's calculations

Table 2 defines the effects of changes in the proportion of household health expenditure with different values and then reports the magnitude of the mean and standard deviation of the variables. As can be seen from Table 2, the decrease in the share of household health expenditure in total consumption expenditure θ has increased the mean amount and standard deviation of the share of consumption expenditure on other goods, and at the same time, the household's utility has increased. For this reason, the welfare of society has increased because the consumption of other goods is associated with higher utility and satisfaction for the household. Similarly, as the share of household health expenditure in total consumption expenditure has increased, the average and standard deviation of the share of consumption expenditure on other goods has decreased and, at the same time, household utility has decreased. For this reason, the welfare of society has decreased, as the consumption of health goods and services is less desirable and satisfying for the household, and the household actually prefers other goods and services.

Table 2 Effect of changing Share of health care expenditures on Moments of Simulated Variables

Variable		TC_t	TC_t^H	TC_t^O	U_t	U_t^H	U_t^O	WEL_t
Mean	$\theta = 0.01$	17.8937	0.0636	1.0746	0.0010	0.0043	0.0296	0.0253
	$\theta = 0.5$	17.8807	0.5953	0.5689	0.0010	0.0269	0.0283	0.0013
	$\theta = 0.99$	17.8426	1.1270	0.0630	0.0010	0.0284	0.0043	-0.024
Std. Dev.	$\theta = 0.01$	0.0295	0.0002	0.0292	0.0049	0.0070	0.0292	0.0233
	$\theta = 0.5$	0.0295	0.0147	0.0147	0.0049	0.0267	0.0279	0.0012
	$\theta = 0.99$	0.0294	0.0291	0.0002	0.0049	0.0279	0.0070	0.0219

Source: **research findings**

[1] Please contact the author for data requests

Figure (1) shows the shock-impact function of government spending in the presence of changes in the parameter of the share of household health spending θ on the utility function of household consumption. The results of this function show that the lower the value of this parameter and the closer it is to zero, the weaker the impact of this shock on the UH function and the more severe the impact on the UO function. The higher the value of this parameter, the stronger the impact of this shock on the UH function and the weaker the impact of this shock on the UO function. Thus, from these graphs, we can conclude that the shock effect of government spending on the household utility function varies due to the change in the share of consumption goods spending and the resulting change in the composition of the basket of goods, which is a combination of health goods and other consumption goods. Depending on which consumption goods basket the household has chosen, the shock has a larger impact on the utility of consuming these goods.

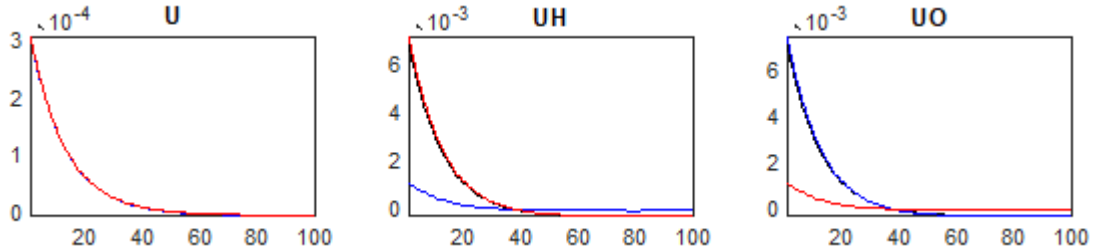

Figure 1 Impulse Response to A Unit Government Spending Shock in Model. Note. Blue Line: $\theta = 0.01$, Black Line: $\theta = 0.5$ And Red Line: $\theta = 0.99$.

Source: research findings

Figure (2) shows the shock response function of government spending to changes in the parameter of the household health expenditure share θ of the household consumption variable. The results of this function show that the lower the value of this parameter and the closer it is to zero, the weaker the impact of this shock on the consumption variable CH and the stronger the impact on the consumption variable CO. The higher the value of this parameter, the stronger the effect of this shock on the consumption variable CH and the weaker the effect of this shock on the consumption variable CO. Thus, from these graphs, we can conclude that the shock effect of government spending on the household consumption variable varies due to the change in the share of consumption goods spending and the resulting change in the composition of the basket of goods, which is a combination of health goods and other consumption goods, which is due to the choice of the composition of the household basket of goods.

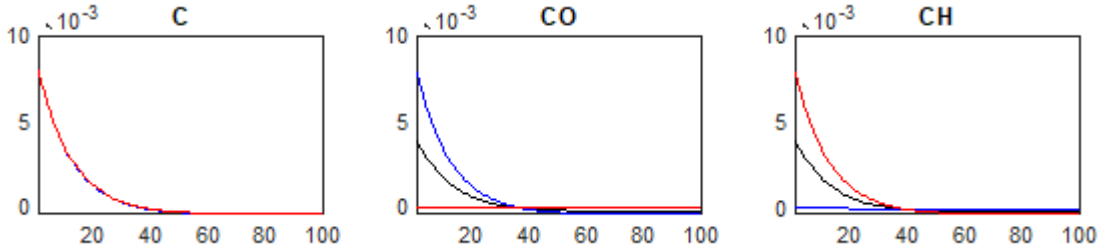

Figure 2 Impulse Response to A Unit Government Spending Shock in Model. Note. Blue Line: $\theta = 0.01$, Black Line: $\theta = 0.5$ And Red Line: $\theta = 0.99$.

Source: research findings

Figure (3) shows the shock-response function of government spending in the presence of changes in the parameter of the share of household health spending θ on the household welfare function. The results of this function show that the lower the value of this parameter and the closer it is to zero, the more positive the effect of this shock on the household WEL welfare

function and the higher the household welfare. This is because the share of consumption of other goods in the households' basket of goods has increased, so the government spending shock has increased the consumption of these goods and, consequently, the households' welfare increases due to the application of this shock. The higher the value of this parameter and the closer it is to one, the more negative the effect of this shock on the household WEL welfare function and the lower the household welfare. This is because the share of consumption of health goods in the households' basket of goods has increased, so the shock to government spending will increase the consumption of these goods again. However, since the consumption of these goods provides less satisfaction to the household and reduces the share of consumption of other goods, the household's welfare is reduced by this shock.

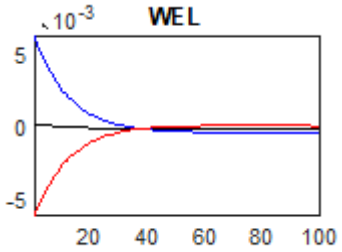

Figure 3 Impulse Response to A Unit Government Spending Shock in Model. Note. Blue Line: $\theta = 0.01$, Black Line: $\theta = 0.5$ And Red Line: $\theta = 0.99$.

Source: research findings

Figure (4) shows the shock function of the response to the technology shock in the presence of changes in the parameter of the share of the household's health expenditure θ in the utility function that results from the household's consumption. The results of this function show that the lower the value of this parameter and the closer it is to zero, the weaker the effect of this shock on the UH function and the more severe the effect of this shock on the UO function. The higher the value of this parameter, the stronger the effect of this shock on the UH function and the weaker the effect of this shock on the UO function. Thus, from these graphs, we can conclude that the impact of the technology shock on the household utility function will be different due to the change in the share of consumption goods expenditure and the resulting change in the composition of the basket of goods, which is a combination of health goods and other consumption goods.

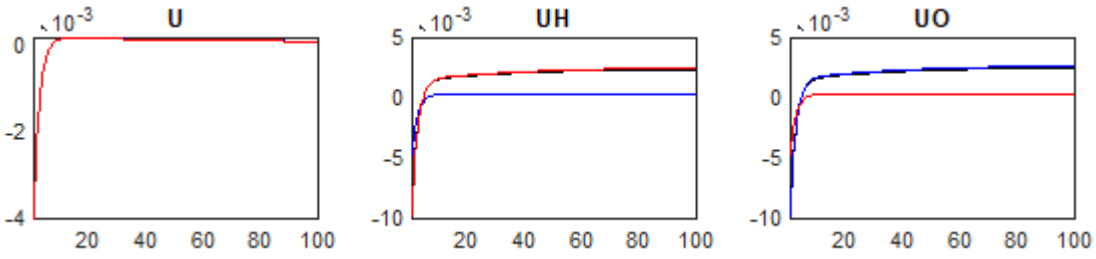

Figure 4 Impulse Response to A Unit Technology Shock in Model. Note. Blue Line: $\theta = 0.01$, Black Line: $\theta = 0.5$ And Red Line: $\theta = 0.99$.

Source: research findings

Figure (5) shows the shock function of the response to the technology shock under changes in the parameter of the share of household health expenditure θ in the household consumption variable. The results of this function show that the lower the value of this parameter and the closer it is to zero, the weaker the impact of this shock on the consumption variable CH and the stronger the impact on the consumption variable CO. The higher the value of this parameter, the stronger the effect of this shock on the CH consumption variable and the weaker the effect of this shock on the CO consumption variable. Thus, from these graphs, we can conclude that

the impact of the technology shock on the household consumption variable will be different due to the change in the share of consumption goods expenditure and the resulting change in the composition of the shopping basket, which is a combination of health goods and other consumption goods, based on the choice of the composition of the household shopping basket.

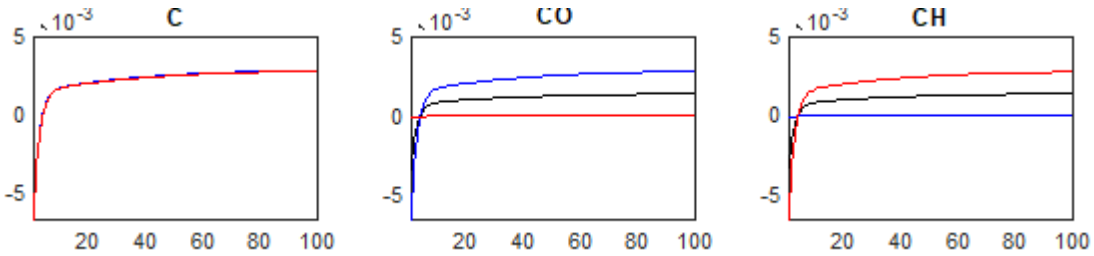

Figure 5 Impulse Response to A Unit Technology Shock in Model. Note. Blue Line: $\theta = 0.01$, Black Line: $\theta = 0.5$ And Red Line: $\theta = 0.99$.

Source: research findings

Figure (6) shows the shock function of the response to the technology shock in the presence of changes in the household health expenditure share parameter θ on the household welfare function. The results of this function show that the effect of this shock on the household WEL welfare function is negative and reduces household welfare the lower the value of this parameter and the closer it is to zero. This is because the technology first affects investment and then increases the production of other goods, reducing the welfare of the households' basket of goods, which has a larger share than other consumption goods. The higher the value of this parameter, the more positive the effect of this shock on the household WEL welfare function and the higher the household welfare. This is because the share of health goods consumption in the households' basket of goods has increased, so the direct technology shock has increased the production of health goods and services, and therefore the family welfare increases by applying this shock.

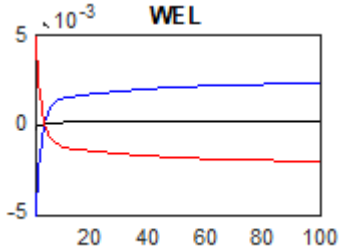

Figure 6 Impulse Response to A Unit Technology Shock in Model. Note. Blue Line: $\theta = 0.01$, Black Line: $\theta = 0.5$ And Red Line: $\theta = 0.99$.

Source: research findings

Conclusions

This article examines the effects of changes in the share of households' health expenditures. The reduction in the share of household health expenditure in total consumption expenditure has led to an increase in the share of consumption expenditure on other goods, increasing the utility of households and raising the welfare of society.

In general, the results of this modeling suggest that as the household is less willing and satisfied to spend a larger share of its total consumption expenditure on health care services, the increase in health care costs forces it to reduce its consumption of other goods, thus reducing its overall desirability. The smaller the household health expenditure share parameter, the weaker the impact of the shock on the health expenditure variable and the stronger the impact of this shock on the consumption of another goods variable. The higher the value of this parameter, the stronger the impact of this shock on the health spending variable and the weaker the impact of

this shock on the consumption of another goods variable. The application of a shock changes the consumption of goods and consequently, depending on the composition of the household's basket of goods, the household's wealth changes with the application of the shock. Since the health of individuals overshadows their other activities, any change in health expenditure should be taken into account and health policies should be adjusted to improve it. Since one of the principles of social justice is easy access to health services for all members of society, the following solutions are proposed to provide households with better and easier access to these services:

A. Extension of insurance coverage

B- Government support for the per capita insurance premium of the population

C- Timely financing of hospitals and health centers.

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