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Araştırma Makalesi

The Role of The Frisch Elasticity on Households' Behavior Using the Endogenous Discount Factor Model

Hamid Reza IZADI
Corresponding Author, Chabahar Maritime University, Department of Economics
Izadi@cmu.ac.ir, ORCID ID: 0000-0003-2297-6429

Mehdi Shirafkan LAMSOO
Chabahar Maritime University, Department of Economics
Mehdi_shirafkan1982@yahoo.com, ORCID ID: 0000-0002-5834-7387

Abstract
Decisions made by households and society with regard to the economy are heavily influenced by the role and significance of the variables of discount factor and Frisch elasticity of labor supply, on capital formation and consumption, which are among the most significant sources of interest rate, consumption bundle, and household leisure. The existence of the endogenous discount factor and the Frisch elasticity of labor supply, which demonstrate the patience of society with regard to consumption and the choice of the household's work-and-leisure mix, respectively, point to significant changes in the household's decisions that may influence the portfolio of consumption and leisure. In order to develop a DSGE model utilizing data from the Iranian economy for the years 1998 to 2020, this article explores the effects of two variables, the endogenous discount factor, and Frisch's elasticity, on macroeconomic variables and household performance. The findings show that in a model with an endogenous discount component and a lower value of Frisch's elasticity, the effect of the technological shock on consumption, output, and household income variables is positive and more significant, but it is negative on the debt variable. Thus, it can be said that in general, given that the household is sensitive to the type of discount factor and the extent of the labor supply's Frisch elasticity and that these two factors are crucial in helping the household decide which purchases and activities to include in its bundle of leisure activities in order to change its expected utility, an increase in Frisch's elasticity coefficient along with the endogenous discount factor in the household will change its expected utility. Additionally, this road has evolved into the best one for household decisions, and in the best distribution of resources, households place a higher value on leisure and self-importance.
Keywords: Endogenous Discount Factor, DSGE Model, Frisch Elasticity, Households' Behavior
JEL: B22, C11, E24, J23

Frisch Esnekliğinin Hanehalkı Kullanım Davranışları Üzerindeki Rolü Endojen İndirgeme Faktörü Modeli
Öz
Hane halkı ve toplumun ekonomi ile ilgili kararlarında, faiz oranı, tüketim gibi en önemli kaynaklardan olan iskonto faktörü ve işgücü arzının Frisch esnekliği değişkenlerinin sermaye oluşumu ve tüketimi üzerindeki rolü ve önemi büyük ölçüde etkilenmektedir. sepet ve ev eğlencesi.
Sırasıyla tüketim ve hanehalkının iş ve boş zaman karışımı seçimi konusunda toplumun sabrını gösteren içsel iskonto faktörünün ve emek arzının Frisch esnekliğinin varlığı, hanehalkının kararlarında önemli değişikliklere işaret etmektedir. tüketim ve boş zaman portföyünü etkiler. 1998'den 2020'ye kadar İran ekonomisinden alınan verileri kullanarak bir DSGE modeli geliştirmek için, bu makale iki değişkenin, içsel iskonto faktörü ve Frisch'in esnekliğinin, makroekonomik değişkenler ve hanehalkı performansı üzerindeki etkilerini araştırıyor. Bulgular, içsel iskonto bileşenine sahip ve daha düşük Frisch esnekliği değerine sahip bir modelde, teknolojik şokun tüketim, çıktı ve hanehalkı geliri değişkenleri üzerindeki etkisinin pozitif ve daha anlamlı olduğunu, ancak borç değişkeni üzerinde negatif olduğunu göstermektedir. Dolayısıyla, genel olarak, hanehalkının iskonto faktörünün türüne ve işgücü arzının Frisch esnekliğinin boyutuna duyarlı olduğu ve bu iki faktörün hanehalkının hangi satın alma ve faaliyetleri dahil edeceğine karar vermesine yardımcı olduğu söylenebilir. Beklenen faydasını değiştirmek için boş zaman etkinlikleri sepetinin, hanedeki içsel iskonto faktörü ile birlikte Frisch'in esneklik katsayısındaki bir artış beklenen faydayı değiştirecektir. Ek olarak, bu yol hanehalkı kararları için en iyi yol haline geldi ve kaynakların en iyi dağılımında haneler boş zamana ve kişisel öneme daha yüksek bir değer veriyor.
Anahtar Kelimeler: Endojen İndirgeme Faktörü, DSGE Modeli, Frisch Esnekliği, Hanehalkı Davranışı
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1.Introduction

Making the best use of manufacturing resources is crucial for achieving sustainable economic growth and development. Human resource is one of the most vital and delicate sources of a nation's growth and development. It may be agreed that the issue of employment is the country's planners' top concern in the context of macro-plans, since issues relating to human resources include both economic and non-economic aspects, making them highly significant in the country's macro-planning. Therefore, the variables impacting the labor supply must be recognized so that they may be altered in the necessary amount and in the proper direction to prepare for the labor market and the supply of labor at their optimal level.

In the context of RBC models, households are the primary economic decision-makers, and choosing how to spend their time is crucial for maximizing their utility. Households earn money by allocating their time to work in the production process, and changes in consumption and working hours will instantly impact the household's utility. Families pick mixtures of consumption and leisure (work) to maximize their expected benefit. These decisions and their effects on the household's desirability are highly dependent on the role of labor supply elasticity and the rate of time preferences. The household determines its consumption bundle for each period by picking the amount of labor it uses, how much labor is available, and how much time it spends working and relaxing, all while taking labor supply elasticity into consideration. In reality, a change in the households' labor supply elasticity causes a change in the labor supply, which in turn causes a change in income, altering the period consumption level. If the household has an endogenous discount rate, then this shift in consumption will undoubtedly impact that rate and the household's behavior and best choices.

The Frisch elasticity of labor supply captures the elasticity of hours labored to the wage rate, given a constant marginal utility of wealth. Marginal utility is constant for risk-neutral individuals, according to microeconomics. In other words, the Frisch elasticity measures the substitution effect of a change in the wage rate on the labor supply. This concept was suggested by the economist Ragnar Frisch after whom the elasticity of labor supply is named. The matter of the Frisch elasticity is explicated as willingness to work when the wage is changed. The higher the Frisch elasticity, the more willing people are to work if the wage increases. The Frisch labor supply elasticity is essential for economic analysis and business cycle fluctuations. It also controls intertemporal substitution replies to fluctuations in wages. Moreover, it defines the effects of fiscal policy interventions, taxation or money transfers.

The term " elasticity of consumption to leisure " has been called different names in different studies. According to Ogaki & Atkeson (1997) and Mccallum (1989), this

ratio is the replacement rate. According to Altonji (1986), Whalen & Reichling (2017) and Hana & Kim (2014), this ratio is an intra-temporal preference. According to Moore et al. (2013) and Orsi & Turino (2014), this ratio is a preference parameter used to regulate the Frisch elasticity of labor, and Hu et al. (2015) and Accolley (2016) consider this ratio to represent the relative weight of welfare in the utility function. The phrase " elasticity of consumption to leisure " has been employed in this study by using this sum as the definition of elasticity in the model's introduction section.

The time preference rate is now widely used by economists and many nations as a discount rate when assessing economic projects. Because the purpose of investment is for any individual to consume more in the future, they should give up consumption today to consume more in the future by investing that given-up amount. The net flow of consumption resulting from an investment should be calculated for this purpose, and it should then be assessed using the temporal preference rate. The following elements of the time preference rate are considered to be its most crucial ones:

1. The final utility of consumption falls down as consumption rises;
2. Rate of net time reduction;
3. Risk.

Regarding the first situation, it should be noted that the quality of living is rising over time; hence, as a person's income rises consistently and uniformly, so does their desirability, but at a slowly accelerating rate. In other words, a consistent gain in income results in a lesser improvement in the person's financial well-being or attractiveness. A unit of individual currency is, therefore, currently worth more than it will be in the future. Regarding the second situation, it can be argued that economists hold the view that whatever is received in the future should have the same impact on the current life in order to ensure the maximum advantage in life. This implies that current quantities are more valuable than those in the future. The presence of risk, which may be broken down into two pieces, is the third explanation for the existence of the time preference rate.

1. The possibility of future extinction. When someone chooses to put off using the present for the sake of the future, he could not be there to enjoy the benefits of it;
2. The money that is saved or invested as a consequence of cutting back on current spending might be lost for several reasons.

Irving Fisher thought that because all people are mortal, they choose to live in the present rather than the future. Others contend that since the likelihood of living at any point in the future declines with age and an appropriate time discount rate should be

taken into account, the desirability of any future time should be multiplied by the likelihood of surviving at that time. It should be highlighted, of course, that the indigenization of the discount factor itself has the potential to alter households' choices and open up new avenues (Fisher, 1930).

The valuable data that can reflect the economic circumstances of any nation can be found in macroeconomic functions, models, and parameters. In order to prescribe and establish activities and policies, as well as to assess household decisions, economists analyze these functions and characteristics. Choosing parameters and testing them in the model while taking into account the actual outcomes of the economy, such as the behavior of production, consumption, investment, and working hours throughout economic cycles, is a common technique employed in RBC models. For their model parameters, the majority of these research either pick arbitrary values or refer to other sources that support arbitrary values. The findings of this study may be utilized to examine and understand the most beneficial household behavior in Iran's economy within the framework of RBC models.

In the current study, an effort is made by taking into account the endogenous discount rate and the elasticity of the labor supply to investigate, interpret, and use human resources optimally, pick the best households' decisions, raise people's earnings, and, as a consequence, alleviate poverty in the community. In order for policymakers to see the effects and outcomes of these two crucial variables in economic models and base their policies on them, the adoption of the DSGE approach for the Iranian economy is intended and encouraged.

2. Literature Review

Recently, the focus has been more and more on the importance of endogenous time preference and its varying degrees of marginal impatience and The Frisch elasticity of labor supply. There are several various types of endogenous discount factor models. Still, it is thought that the qualitative outcomes of analyses based on these models do not depend virtually on the differences between these models, even though the analysis complexity varies with the model's choice. The validity of dynamic macroeconomic models for analyzing policy investigations depends on key behavioral parameters that specify the agents' responses to changes in policy variables. The intertemporal elasticity of labor supply, which defines the supply reaction, is among the most important parameters. There are different articles in the field of the endogenous discount factor and the Frisch elasticity of labor supply. Here, the articles are divided into two categories. The first category is the articles in which the endogenous discount factor is used. The second category is articles that are related to labor supply elasticity.

Uzawa (1968) brings up a time preference function that depends on the utility level. Based on this, several models with other endogenous discount factors or time preferences have been considered. Gootzeit et al. (2002) and Becker & Mulligan (1997) nominate endogenous time preferences distinguished by the number of resources spent and discuss a model in which the discount factor is a savings function. Hirose (2003) and Mohsin (2004) introduce endogenous time preferences that are a function of all the utility components and analyze wealth effects in a model where endogenous time preferences are asset-dependent.

Obstfeld (1982), Nairay (1984) and Bergman (1985) applied Uzawa preferences to study an open economy's response to a permanent, unanticipated terms of trade shock. The time preference rate is one of the variables that affects inflation expectations. It is derived from the degree of society's patience in using the available resources, whether now or in the future. However, in this context, there are ethical views about not considering the social discount rate in solving the optimization problem. The concavity of the utility function as one of the discounting factors can be considered an intermediate utility analyzer. Also, the assumption that all members of society have the same time preference rate seems unrealistic, but considering the significant share of inflation expectations and current consumption of the private and public sectors in inflation models, not including this variable in the model is considered a shortcoming. The Frisch elasticity of labor supply is a critical element in the design and measurement of public policies. From the optimal design of the tax system to the capability of the public sector to affect macroeconomic fluctuations, a wide range of relevant questions hinge on how much worker varies when wages change.

Friedman (1957) appraises Frisch's elasticity based on a life-cycle model, a line of analysis that stems from the permanent income hypothesis. Frisch elasticity is an intertemporal labor supply elasticity derived from standard dynamic models that solve a representative agent's intertemporal utility maximization problem. According to available studies, a representative agent changes her labor supply over the business cycle in response to the temporal wage changes persuaded by shocks, that is, to the deviation of actual wages from the permanent or expected wage. Frisch elasticity illustrates how people change their labor supply in response to these temporary wage changes. There is an excess of literature estimating Frisch elasticity using either aggregate. For example, we can refer to the studies of Lucas & Rapping (1969), Altonji (1982), Mankiw et al. (1985), Algoskoufis (1987), MaCurdy (1981), Heckman and MaCurdy (1982), Browning et al. (1985), and Altonji (1986).

In this paper, the research constructs an endogenous discount factor model. The discount factor is a function of the utility level as in Ozawa's model. In general, considering the different effects of the endogenousness discount factor and the Frisch

elasticity of labor supply in the behaviors of households on economic models, this study also aims to investigate the business cycles in the Iranian economy resulting from this issue and their effects on the behavior of macroeconomic variables with interest rates. For this aim, quarterly data from 1997 to 2020 are obtained from the statistical center of Iran, the central bank and, as needed, domestic, international and world bank financial statistics. This paper is divided into five sections. In the continuation of the introduction and the second part, literature review is presented, and in the third part, the model is presented. In the fourth part, the calibration and the discussion of the experimental results are presented, and in the final section, the results are presented.

3. The Model and Methods

In the following, this research designs and implements a model using existing models in this field, such as Obstfeld (1982), Bergman (1985), Izadi (20021) and Izadi (2022) models and applies the DSGE method. This economy is considered populated by many identical households with preferences with the discount factor depending on their levels of effort and consumption described by the underneath utility functions. Table 1 shows two different models: the endogenous discount factor model and the endogenous discount factor model without internalization.

Table 1 Endogenous discount factor model

With internalization	Without internalization
$E_0 \sum_{t=0}^{\infty} \theta_t U_t(C_t, H_t)$ $\theta_0 = 1$ $\theta_{t+1} = \beta(C_t, H_t)\theta_t$ $t \geq 0$ $\beta_C < 0 \quad , \quad \beta_H > 0$	$E_0 \sum_{t=0}^{\infty} \theta_t U_t(C_t, H_t)$ $\theta_0 = 1$ $\theta_{t+1} = \beta\left(\widetilde{C_t}, \widetilde{H_t}\right)\theta_t$ $t \geq 0$
$\lambda_t = \beta(C_t, H_t)(1 + R_t)E_t\lambda_{t+1}$	$\lambda_t = \beta(\widetilde{C_t}, \widetilde{H_t})(1 + R_t)E_t\lambda_{t+1}$
$\lambda_t = U_c(C_t, H_t) - \mu_t\beta_c(C_t, H_t)$	$\lambda_t = U_c(C_t, H_t)$
$\mu_t = -E_t U(C_{t+1}, H_{t+1}) + E_t\mu_{t+1}\beta(C_{t+1}, H_{t+1})$	
$-U_H(C_t, H_t) + \mu_t\beta_H(C_t, H_t) = \lambda_t A_t F_H(K_t, H_t)$	$U_c(C_t, H_t) = \lambda_t A_t F_H(K_t, H_t)$
$\lambda_t\left[1 + \Phi(K_{t+1} - K_t)\right]$ $= \beta(C_t, H_t)E_t\lambda_{t+1}\left[A_{t+1}F_K(K_{t+1}, H_{t+1}) + 1 - \delta\right.$ $\left. + \acute{\Phi}(K_{t+2} - K_{t+1})\right]$	$\lambda_t\left[1 + \Phi(K_{t+1} - K_t)\right]$ $= \beta\left(\widetilde{C_t}, \widetilde{H_t}\right)E_t\lambda_{t+1}\left[A_{t+1}F_K(K_{t+1}, H_{t+1}) + 1\right.$ $\left. - \delta + \acute{\Phi}(K_{t+2} - K_{t+1})\right]$

$$D_t = (1 + R_{t-1})D_{t-1} - Y_t + C_t + I_t + \varphi(K_{t+1} - K_t) \quad (1)$$

$$Y_t = A_t F(K_t, H_t) \quad (2)$$

$$K_{t+1} = (1-\delta)K_t + I_t \quad , \quad \delta \in (0,1) \tag{3}$$

$$\text{Ln}\,(A_t) = \rho_A \,\text{Ln}\big(A_t(-1)\big) + \epsilon_{At} \tag{4}$$

$$(C,H) = \frac{(C - \frac{H^{\omega}}{\omega})^{1-\gamma} - 1}{1-\gamma} \tag{5}$$

$$\beta(C,H) = (1 + C - \omega^{-1}H^{\omega})^{\psi} \tag{6}$$

$$F(K_t, H_t) = K^{\alpha}H^{1-\alpha} \tag{7}$$

$$\Phi(x) = x^2 \qquad \Phi > 0 \tag{8}$$

$$TB_t = Y_t - C_t - I_t - \varphi(K_{t+1} - K_t) \tag{9}$$

$$CA_t = D_{t-1} - D_t \tag{10}$$

Households select processes $\{C_t, H_t, Y_t, I_t, K_{t+1}, D_t, \theta_{t+1}\}_{t=0}^{\infty}$ to maximize the utility function. The non-Ponzi game condition is established. putting θ_t, μ_t and λ_{t_t} define the lagrange multipliers, the household's maximization problem and the first-order conditions.where $\widetilde{C_t}$ and $\widetilde{H_t}$, which the individual households take as given, explain consumption and hours, respectively, TB_t explains the trade-balance and CA_t denotes the current account, R_t explains the interest rate that households can borrow in international markets, Y_t denotes domestic output, K_t denotes physical capital and I_t denotes gross investment. also, $\varphi(.)$ is the function of capital adjustment costs and is granted to satisfy $\varphi(0) = \acute{\varphi}(0) = 0$. The role of capital adjustment costs in an open economy model is typically to avoid excessive investment volatility in response to variations in the domestic foreign interest rate differential. a production function defines output that capital and labor are its inputs. in fact, a linearly function that catch capital and labor services as inputs.

4.Calibration and Discussion

In the following, to solve the research pattern, the research model was used, including the equations extracted from the optimization and the identities in the model. A part of the steady-state described by the model is specified by table 1, where the parameter values have been replaced by the calibration method.

Table 2 Parameter of calibration

Parameter	Description	Value	Source
Δ	Depreciation rate	0.0139	Izadi (2021)
Γ	Risk aversion	2	Izadi (2018)
Φ	Capital adjustment cost	7.6	Izadi (2022)
A	Capital share	0.44	Izadi (2018)
B	Discount factor	0.9745	Izadi (2021)
Ω	Frisch elasticity	2.5	Izadi and Sayareh (2019)
P_A	Autocorrelation TFP	0.59	Izadi (2021)
ϵ_T	Standard deviation TFP	0.0164	Izadi and Sayareh (2019)
Ψ	Elasticity of the discount factor	0.16	Izadi and Marzban (2016)
$\bar{D}$	The steady-state level of foreign debt	0.47	Izadi (2022)

Figure (1) shows the shock function of the response to the positive technology shock in the endogenous discount factor model and endogenous discount factor model without internalization. The results of these figures show that the two models are approximately similar. The variables curve of the endogenous discount factor model and the endogenous discount factor model without internalization have coincided in the presence of positive technology shock. Also, this shock has a different effect on the variable utility of the endogenous discount factor model, and the economy will experience a decrease in the utility of households. The change in the discount factor causes an important part of these big fluctuations in the economy and then the change in the consumption bundle of the households. In general, the only significant difference is related to the households' discount factor variable, which is due to the behavior of households due to the change in utility, as can be seen in the endogenous discount factor model.

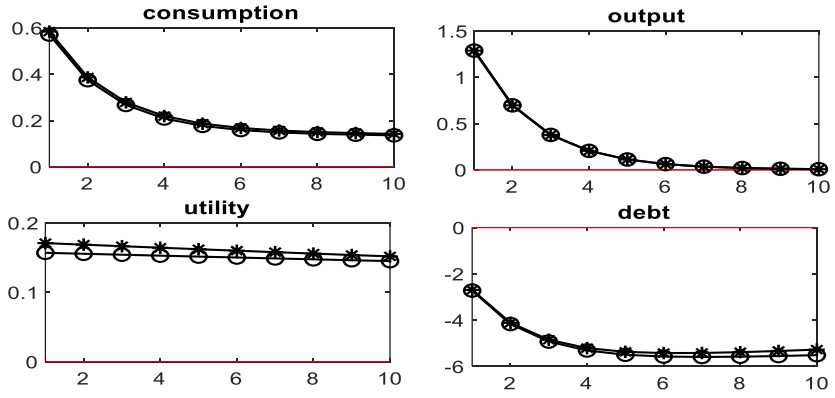

Figure 1. Impulse response to a unit technology shock in endogenous discount factor model(circles) and endogenous discount factor model without internalization(stars).

Figure (2) shows the shock function of the response to the positive technology shock in the endogenous discount factor model and endogenous discount factor model without internalization. The effect of positive technology shock on the variables trade balance and current account are similar due to the existing shock. Also, this shock has a different impact on the variable endogenous discount factor due to changes in intermediate households' consumption in the economy.in general, in response to the positive technology shock, the trade balance and current account variables have the same trend in both models, and their impulse response functions are similar. The only significant difference is related to the households' discount factor variable, which is due to the behavior of households due to the change in consumption, as can be seen in the endogenous discount factor model.

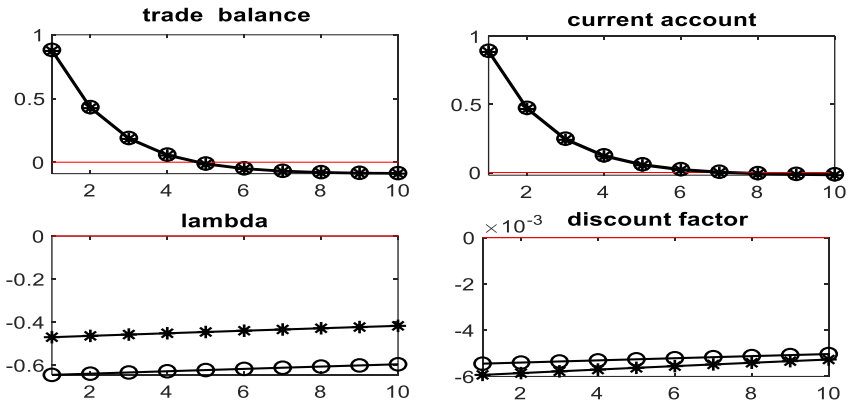

Figure 3. Impulse response to a unit technology shock in endogenous discount factor model(circles) and endogenous discount factor model without internalization(stars).

Figure (3) shows the shock function of the response to the positive technology shock following an increase in the Frisch elasticity of labor supply in the endogenous discount factor model and endogenous discount factor model without internalization. The results of these figures show that the two models are approximately similar. The variables curve of the endogenous discount factor model and the endogenous discount factor model without internalization have coincided in the presence of positive technology shock. Also, this shock has a different effect on the variable utility of the endogenous discount factor model, and the economy will experience a decrease in the utility of households. The change in the discount factor causes an important part of these big fluctuations in the economy and then the change in the consumption bundle of the households. In general, the only significant difference is related to the households' discount factor variable, which is due to the behavior of households due to the change

in utility, as can be seen in the endogenous discount factor model. In the following, a comparison of figures (1) and (3) shows that a change in the value of the Frisch elasticity of labor supply will change the existing shock's effect on the variables of consumption, output, utility and debt. It can be said that the figures present that the higher the value of the Frisch elasticity, the lower the effect of the shock on the above variables. In fact, by changing the value of the Frisch elasticity parameter, the households will change its choice between work and leisure. As a result, the household's consumption, production, and debt will change.

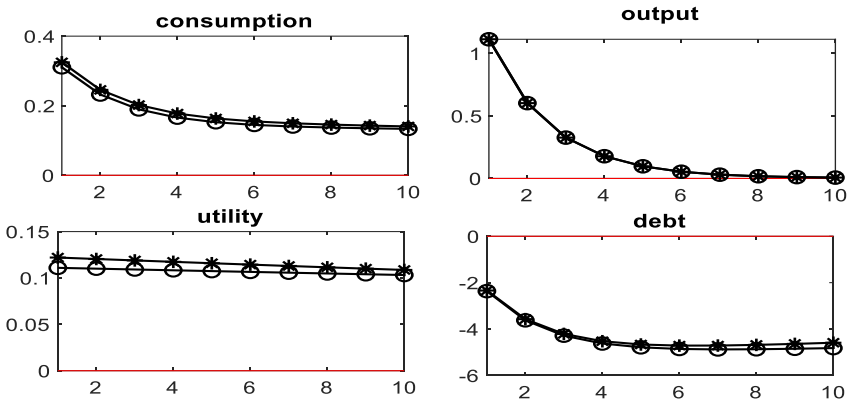

Figure 3. Impulse response to a unit technology shock following an increase in Frisch elasticity (ω) in endogenous discount factor model(circles) and endogenous discount factor model without internalization(stars).

Figure (4) shows the shock function of the response to the technology shock in the endogenous discount factor model and endogenous discount factor model without internalization. The effect of positive technology shock on the variables trade balance and current account are similar due to the existing shock. Also, this shock has a different impact on the variable endogenous discount factor due to changes in intermediate households' consumption in the economy.in general, in response to the positive technology shock, the trade balance and current account variables have the same trend in both models, and their impulse response functions are similar. The only significant difference is related to the households' discount factor variable, which is due to the behavior of households due to the change in consumption, as can be seen in the endogenous discount factor model. In the following, a comparison of figures (2) and (4) shows that a change in the value of the Frisch elasticity of labor supply will change the existing shock's effect on the variables of trade balance, current account and discount factor. It can be said that the figures present that the higher the value of the Frisch elasticity, the lower the effect of the shock on the discount factor variable. In fact, by changing the value of the Frisch elasticity parameter, the households will

change its choice between work and leisure. As a result, the household's discount factor will change.

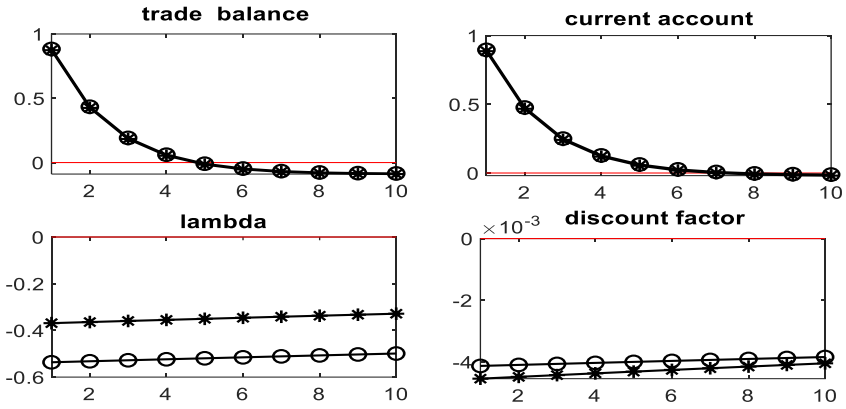

Figure 4. Impulse response to a unit technology shock following an increase in Frisch elasticity (ω) in endogenous discount factor model(circles) and endogenous discount factor model without internalization(stars).

Table 2, shows the volatilities and serial correlations of the variables and correlations with output variables with other variables of endogenous discount factor model and endogenous discount factor model without internalization. From the results of table 2, it is clear that the results of both models indicate a range of volatilities in consumption and trade balance. From the second part of the table, it can be said that the endogenous discount factor model shows more changes in the correlation of the consumption variable and the trade balance than the rest of the variables, which is due to the internalization of the discount rate and the change in households' decisions. The third part of the table shows that the consumption, trade balance and current account variables have a higher correlation with output than the rest.

On the other hand, the table results show that the dynamic paths in both models during business cycles are almost the same and similar. Only when the discount factor becomes endogenous does consumption volatility increase because the tendency to postpone between periods of households' consumption decreases; thus, consumption volatility increases. A decrease in the delay between consumption periods has led to an increase in households' consumption. This increase in households' consumption will cause a decrease in capital and economic output. Therefore, the numerical value of the correlation between consumption and output will be higher in the endogenous discount factor model without internalization.

Also, with the increase in the current consumption of households and the decrease in output, the trade balance of the endogenous discount factor model without internalization has increased, and the current account of the endogenous discount factor model has decreased. This change results from changes in the discount factor and its consumption effect.

Table 3 Implied unconditional second moments

	Endogenous discount factor model	**Endogenous discount factor model without internalization**
Volatilities		
$\mathbf{std}(Y_t)$	2.5	2.5
$\mathbf{std}(C_t)$	2.2	2.0
$\mathbf{std}(I_t)$	0.1	0.1
$\mathbf{std}(H_t)$	1.0	1.0
$\mathbf{std}(\frac{TB_t}{Y_t})$	2.0	1.9
$\mathbf{std}(\frac{CA_t}{Y_t})$	1.7	1.7
Serial correlations		
$\mathbf{corr}(Y_t, Y_{t-1})$	0.54	0.54
$\mathbf{corr}(C_t, C_{t-1})$	0.89	0.87
$\mathbf{corr}(I_t, I_{t-1})$	0.787	0.787
$\mathbf{corr}(H_t, H_{t-1})$	0.54	0.54
$\mathbf{corr}(\frac{TB_t}{Y_t}, \frac{TB_{t-1}}{Y_{t-1}})$	0.64	0.61
$\mathbf{corr}(\frac{CA_t}{y_t}, \frac{CA_{t-1}}{Y_{t-1}})$	0.53	0.53
Correlations with output		
$\mathbf{corr}(C_t, Y_t)$	0.59	0.65
$\mathbf{corr}(I_t, Y_t)$	0.79	0.79
$\mathbf{corr}(H_t, Y_t)$	1.0	1.0
$\mathbf{corr}(\frac{TB_t}{Y_t}, Y_t)$	0.805	0.835
$\mathbf{corr}(\frac{CA_t}{Y_t}, Y_t)$	0.991	0.987

Table 3 shows the volatilities and serial correlations of the variables and correlations with output variables with other variables following an increase in the Frisch elasticity of the two models. From the results of table 3, it is clear that the results of both models indicate a range of volatilities in consumption and trade. From the second part of the table, it can be said that the endogenous discount factor model shows more changes in the correlation of the consumption variable and the trade balance than the rest of the

variables, which is due to the change in the Frisch elasticity of labor supply. The third part of the table shows that the consumption, trade balance and current account variables have a higher correlation with output than the rest. On the other hand, when the Frisch elasticity increases, consumption fluctuations remain constant in both models, and the numerical value of the correlation between consumption and output in the endogenous discount factor model without internalization will be higher.

Table 4 Implied unconditional second moments following an increase in Frisch elasticity (ω)

	Endogenous discount factor model	**Endogenous discount factor model without internalization**
Volatilities		
$\mathbf{std}(\mathbf{Y_t})$	2.2	2.2
$\mathbf{std}(\mathbf{C_t})$	2.0	2.0
$\mathbf{std}(\mathbf{I_t})$	0.1	0.1
$\mathbf{std}(\mathbf{H_t})$	0.4	0.4
$\mathbf{std}(\frac{\mathbf{TB_t}}{\mathbf{Y_t}})$	2.0	1.9
$\mathbf{std}(\frac{\mathbf{CA_t}}{\boldsymbol{Y_t}})$	1.7	1.7
Serial correlations		
$\mathbf{corr}(\mathbf{Y_t}, \mathbf{Y_{t-1}})$	0.54	0.54
$\mathbf{corr}(\mathbf{C_t}, \mathbf{C_{t-1}})$	0.96	0.95
$\mathbf{corr}(\mathbf{I_t}, \mathbf{I_{t-1}})$	0.757	0.757
$\mathbf{corr}(\mathbf{H_t}, \mathbf{H_{t-1}})$	0.54	0.54
$\mathbf{corr}(\frac{\mathbf{TB_t}}{\mathbf{Y_t}}, \frac{\mathbf{TB_{t-1}}}{\mathbf{Y_{t-1}}})$	0.65	0.61
$\mathbf{corr}(\frac{\mathbf{CA_t}}{\mathbf{y_t}}, \frac{\mathbf{CA_{t-1}}}{\mathbf{Y_{t-1}}})$	0.53	0.53
Correlations with output		
$\mathbf{corr}(\mathbf{C_t}, \mathbf{Y_t})$	0.39	0.46
$\mathbf{corr}(\mathbf{I_t}, \mathbf{Y_t})$	0.83	0.83
$\mathbf{corr}(\mathbf{H_t}, \mathbf{Y_t})$	1.0	1.0
$\mathbf{corr}(\frac{\mathbf{TB_t}}{\boldsymbol{Y_t}}, \mathbf{Y_t})$	0.797	0.834
$\mathbf{corr}(\frac{\mathbf{CA_t}}{\boldsymbol{Y_t}}, \boldsymbol{Y_t})$	0.992	0.988

By comparing the elements in Tables 2 and 3, it can be concluded that there are fewer variations in household working hours when there is an increase in Frisch elasticity. The workforce's desire to work fewer hours or lower their overall working hours will

lessen the amount of production and consumption fluctuations. As a result of the smaller consumption cut in this model, the level of utility is lower than it was in the first model's initial state. However, because this model uses an endogenous discount factor, the impact of the reduced utility consumption is more pronounced.

4.Conclusion

This paper surveys the shock function of the response to the positive technology shock in the endogenous discount factor model, the endogenous discount factor model without internalization, the endogenous discount factor model in the presence of increased Frisch elasticity of labor supply and the endogenous discount factor model without internalization in the presence of increased the Frisch elasticity of labor supply. The research finding shows that the variables curve of the endogenous discount factor model and the endogenous discount factor model without internalization have coincided in the presence of positive technology shock. This shock has a different effect on the variable utility of the endogenous discount factor model. in response to the positive technology shock, the trade balance and current account variables have the same trend in both models, and their impulse response functions are similar. The only significant difference is related to the households' discount factor variable, which is due to the behavior of households due to the change in consumption, as seen in the endogenous discount factor model. The variables curve of the endogenous discount factor model and the endogenous discount factor model without internalization following an increase in the Frisch elasticity of labor supply have coincided in the presence of positive technology shock. This shock has a different effect on the variable utility of the endogenous discount factor model, and the economy will experience a decrease in the utility of households.

By using tax exemptions, customs tariff exemptions, granting banking facilities and other facilities to the user's production units, and paying a portion of the employer's share insurance for the production units, the government should use appropriate policies to encourage the labor force to increase production and maintain the level of utility of the labor force. The household's labor supply will rise as a result of this reduction. The most significant factors that lead to impatience and irrationality in the effective consumption of households include fluctuations in oil prices, revolutions, the start and end of wars, the issuance of various resolutions and sanctions, the changing and burdensome political and economic laws of domestic governments, and droughts. Therefore, in addition to effective management to limit such oscillations, the government should provide circumstances to lessen the susceptibility of households to these fluctuations in order to reduce impatience and improve intergenerational fairness. In addition, it is recommended that governments reduce barriers to investment and

production, enhance worker welfare through commodities credits, and maintain relatively steady salaries.

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