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The Size of Rent-seeking Activity in Iran's Foreign Trade Sector: An Application of the DSGE Approach

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Abstract

Rent-seeking in the trade sector is an outcome of restrictions imposed on tariffs and import quotas by a government. In an effort to acquire more privilege in foreign trade, labor allocates a part of its time-effort to rent-seeking activity, while cutting down on production work. Given the importance of rent-seeking activity due to restrictions imposed by the government in the Iranian economy, this paper has attempted to calculate the size of rent-seeking activity in the foreign trade sector of the Iranian economy. Hence, a version of the DSGE model has been specified and the related parameters have been estimated in order to calculate the rent-seeking rate. We have applied quarterly data from 1998:1 to 2015:4 for Iran's trade sector, to obtain the empirical results through calibrating the specified DSGE model. The results have indicated that rent-seeking of Iran's trade sectors amounted to 0.45, which looks considerably high. Moreover, labor has shared 24 % of its effort time to rent-seeking activity and 76 % to ordinary work.

Keywords: Rent-seeking, Foreign trade, Production labor, DSGE approach**.**

JEL Classification: F10, B17, D11, E32.

1. Introduction

Rent-seeking is defined as the social cost of obtaining exclusive privileges. Due to limited supply, rents go to beneficiaries (Ricardo, 1809), which can be on the basis of natural monopoly and artificial monopoly (Muller, 2003) and access to natural resources (Baland and Fransoa, 2000). There is another type of rent due to regulation and government interference (Tirole and Laffont, 1991), including tariffs (Katz

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and Rosenberg, 1989), and changing tax rates (Acemoglou and Verdier, 2000).

Muller (2003) has defined rent as regulation by policy makers. He argued that policy makers enact legislates such that cause financial resources transfer from one group to another. For instance, policy makers can create barriers to impose them in specific industries and create monopolistic conditions, thus transferring income from consumers to producers. Such activities by policy-makers lead to fiscal privileges, whose scarcity strikes competition among various firms. Competition over gaining more fiscal privileges is known as rent-seeking. Krueger (1974) described how the government facilitated rent-seeking activities by intervening in a market-based economy. Kruger (1974) discussed rent as an outcome of restrictions imposed by the government on foreign trade. He noted that the government creates the motives in businessmen to gain larger shares by implementing import quotas.

In the foreign trade sector, the discussion of rents does not only revolve around setting import quotas (Krueger, 1974), moreover, rent can be found in import tariffs. Grossman and Helpman (1994) showed that higher tariffs are applied in industries where the elasticity of demand functions is greater. Also, there are pressure groups providing further protection of that particular industry through imposition of higher tariffs. Therefore, imposing any restrictions particularly on the free import of foreign goods, including tariffs and import quotas are kinds of rent-seeking. This will not only spread corruption on the economy, but will provide some agents to take benefit with government privilege (tariffs and import quotas) (Rogerson, 1982).

Thus, labor tends to gain more privilege and subsequently greater profits. Therefore, an individual uses a part of special resources to extract a proportion of revenue for own advantage. Then a part of production time is spent on earning privilege, thus curbing the supply of productive work. Acemoghlou (1995) believed that relative benefit of productive and rent-seeking activities lied in how ability of labors allocated to those activities (productive or rent-seeking). Labor chooses its work by comparing the reward function and the return on those activities. In case the return on rent-seeking is greater than that on production, the skill will be absorbed by the rent-seeking activity (Romer, 2006) and make misallocation of talent. Then, this redistributive hurts the macro-economy: first, by occupation of part of government revenues, government funding sources

are limited and second, by distorts individual' incentive, it push them away from productive work and extract rent-seeking activity.

This paper intends to compute the scale of rent-seeking in the foreign trade parts of the Iran's economy. The issue of rent-seeking, particularly in the foreign trade part, has rarely been explored in literature of the country. Therefore, this paper develops a version of a dynamic stochastic general equilibrium (DSGE) model by considering the trade rent-seeking to calculate the size of rent-seeking in the Iran's foreign trade sector. Thus, the quarterly data, including 1998:1 to 2015:4 are employed to estimate the effort time divided by labor to productive work and rent-seeking activities in addition to calculating the rent-seeking rate.

The distinction of our model is that if government receives tariff revenues to finance public sector, each individual uses certain resources to take out a portion of revenue for more benefit.

The rest of the paper is adjusted as follows: Section 2 discusses the related literature on rent-seeking in foreign trade. Section 3 develops a DSGE model including the trade rent-seeking indicator. Section 4 analyzes the empirical results, and finally Section 4 concludes remarks.

2. Literature Review

Krueger (1974) calculated economic rents in India and Turkey, to identify five sources of rent in India including: public investment, imports, controlled goods, credit rating and railway lines. This study estimated that trade protection in Indian 1964 incurred loss as large as 3.7% of GDP, which was deemed economic rent due to import licenses. As for Turkey, this figure was estimated to be 15% of GDP. Krueger pointed out although such estimates are approximate, the economic rents due to import licenses were huge, while the losses incurred by imposing quotas were equivalent to the welfare loss under tariffs versus to the rent caused by restrictions. Posner (1975) carried out a study from the perspective of rent costs. He explored the issue of rent-seeking in terms of government pricing. Posner believed that setting prices higher than competitive ones leads to consumer losses. Part of such losses is imposed on the entire society known as social losses. Then, Posner calculated the costs of rent-seeking. He explored various industries in USA, while calculating the costs incurred by monopoly rent. Accordingly, he estimated that the social cost of regulations in certain American industries amounted to almost 1.7% of GNP.

Lopez and Pagoulatos (1994) noted that corruption groups expended to solicit government trade protection. The government protection would provide them with the chances for rent approximately 12.5% of consumption. Lane and Tornell (1999) analyzed the economy in terms of weaknesses in legal institutions where there are multiple power groups. Power groups affect the economy through access to financial mechanisms. Their results suggested that the involvement of power groups leads to slow economic growth. In their study through a DSGE model, Angelopoulos et al. (2009) examined the social cost of rent-seeking in Europe. Their results were based on competition between entities interested to earn concession offered by government, including transfer payments and subsidies on tax concessions. The model was calibrated through data from the Continental Europe during 1980-2003. They found that a significant share of GDP was currently being exchanged as rents between rent-seekers.

In the present article, we develop a standard dynamic stochastic general equilibrium (DSGE) model by including rent-seeking factor of Iran's foreign trade. The innovation of the model is thus the revenue from trade restrictions is spent on government financing, but an individual uses a part of them that means each he/she allocates fraction of effort time to rent-seeking (versus ordinary activity). Therefore, the government trade revenues from imposition of restrictions such as tariffs were inserted into the model to calculate the allocation of labor effort time to rent-seeking and earn more privilege under DSGE. Moreover, a percentage of government trade revenues acquired by labor were calculated as rent-seeking rate.

3. The model:

According to Angelopoulos, et al. (2009), we calibrate the DSGE model and calculate the size of rent-seeking activity in the Iran's external sector. In this model, there are a large number of homogenous households and an equal number of homogenous firms. Households own capital and labor, and rent them to firms. Furthermore, there are a large number of rent-seekers who impose costs to the society for obtaining fiscal rewards (concession refers to fiscal privileges such as tariff discounts, import quotas, etc.). For simplification, it is assumed that households engaged in rent-seeking while firms are not engaged in the competition. This assumption does not change the results because households owned the firms. It was also assumed that households allocate their effort time (i.e.

non-leisure time) between productive work and rent-seeking activity. Therefore, households choose consumption; saving and leisure time and also choose how to allocate its effort time between an original work and a rent-seeking activity.

Firms produce homogeneous goods using labor and capital. The government realizes its objectives through tax and tariff revenues and issuing bonds. Similar to Becher (1983), this paper only specifies of the rent-seeking demand, while excluding the supply part of rent-seeking such as government mechanism, pricing, etc.

This paper focuses on the rent created by regulations and restrictions of trade on import of goods, i.e. tariffs and import quotas. The followings provide a variety of components of the DSGE model.

3.1. Households

In each period (t), there are N_t number of similar households represented by h, where $h = 1,2,...,N_t$. Population size N_t grows at a fixed rate of $\upsilon_n \geq 0$, so that $N_{t+1} = \upsilon_n N_t$ and $N_t \geq 0$ has been included. Household expected utility function (h) is equal to:

$$E_t \sum_{t=0}^{\infty} \beta^t \left\{ \frac{C_t^{1-\sigma}}{1-\sigma} + \frac{\gamma}{1-b} \left(\frac{M_t}{P_t}\right)^{1-b} - \chi \frac{H_t^{1+\eta}}{1+\eta} \right\} \qquad (1)$$

where E_t denotes the rational expectations conditional in time (*t*), $0 < \beta < 1$ is the time discount factor, C_t is consumption in time (*t*), $\left(\frac{M_t}{P_t}\right)$ represent holding real money balance, and *H* is the time allocated to effort versus leisure. $(1/\sigma) \geq 0$, $(1/\eta) \geq 0$ and $(1/b) \geq 0$ represent substitution elasticity consumption, elasticity of labor and elasticity of real money balance.

Each household (*h*), invests I_t and purchases B_t government bonds. The rent income of capital is $r_t^k k_t$ and interest income is $r_t^b B_t$ from government bonds, where r_t^k and r_t^b are the rate of return on gross investment (k_t) and government bonds (B_t). Moreover, households have a unit of time that can be divide between leisure (L_t) and effort (H_t). Hence, $L_t + H_t = 1$ holds in each period. The effort time (H_t) is also divided between productive work $(\mu_t H_t)$ and rent-seeking activity $((1-\mu_t)H_t)$, where $0 < \mu_t \leq 1$ and $0 \leq (1-\mu_t) < 1$ represent the share of

effort times allocated to productive work and rent-seeking, respectively. Therefore, $H_t = \mu_t H_t + (1-\mu_t)H_t$ holds.

Finally, each household acquires a share of the firm profits (D_t) and pays income tax (TA_t). The household budget constraint is:

$$C_t + I_t + \frac{B_t}{P_t} + \frac{M_t}{P_t} + T_t = w_t \mu_t H_t + r_t^k K_{t-1} + \frac{(1-\mu_t)}{\sum_{t=0}^{T}(1-\mu_t)H_t}\theta_t R_t + (1+r^b_{t-1})\frac{B_{t-1}}{P_t} + \frac{M_{t-1}}{P_t} + D_t \qquad (2)$$

where w_t is labor wages. Moreover, R_t represents government import revenues (tariff revenue is used as a proxy), while $0 \le \theta < 1$ represents a share of government import revenues to be acquired by labor, which is called rent-seeking rate (Angelopolus, et al., 2009),

This paper differs in inserted trade income R_t into the model, where households obtain it by cutting down on their production time $(\mu_t H_t)$ and resort to rent-seeking activities $((1-\mu_t)H_t)$.Each household strives to gain a greater share of prizes $(\theta_t R_r)$.

The capital equation is as follows:

$$K_t = (1-\delta)K_{t-1} + I_t \qquad (3)$$

where $0 < \delta < 1$ is a depreciation rate.

Each household (*h*) chooses the variables $(B_t, k_t, \mu_t, H_t, c_t)$ in order to maximize the utility Equation (1) according to budget constraints (2) and (3) assigned by $(L_t + H_t = 1)$, $H_t = \mu_t H_t + (1-\mu_t)H_t$ and given k_0. The first order condition is obtained through the following equations:

$$\beta^t \left\{ -\chi H_t^{\eta} + c_t^{-\sigma}\left(w_t \mu_t + \frac{(1-\mu_t)}{\sum_{t=0}^{t}(1-\mu_t)H_t}\theta_t R_t\right)\right\} = 0 \qquad \text{(a-4)}$$

$$\beta^t \left\{ c_t^{-\sigma}\left(w_t \mu_t - \frac{H_t}{\sum_{t=0}^{t}(1-\mu_t)H_t}\theta_t R_t\right)\right\} = 0 \qquad \text{(b-4)}$$

$$\beta^t \left\{ \gamma\left(\frac{M_t}{P_t}\right)^{-b} - c_t^{-\sigma} + \beta^{t+1}\right\} E_t(c_{t+1}^{-\sigma} / \pi_{t+1}) = 0 \qquad \text{(c-4)}$$

$$\beta^t \left\{ -c_t^{-\sigma} + \beta^{t+1} E_t c_{t+1}^{-\sigma} (1 + r_{t-1}^b) \right\} = 0 \qquad \text{(d-4)}$$

$$\beta^t \left\{ -c_t^{-\sigma} + \beta^{t+1} E_t c_{t+1}^{-\sigma} (r_t^k + 1 - \delta) \right\} = 0 \qquad \text{(f-4)}$$

where Equation (a-4) is optimality a condition subject to effort time (H_t). Equation (b-4) is optimality a condition with respect to the portion of effort time allocated to productive activity versus rent-seeking activity (μ_t). In equilibrium, the return on productivity and return on rent-seeking should be equal. Equation (c-4) indicates real money balance holding. Equations (d-4) and (e-4) reflect Standard Euler equations for (k_t) and (B_t).

Finally, the optimality condition was completed by applying the conditions for the two assets including capital (k_t) and government bonds (B_t).

$$\begin{aligned} &\lim_{t\to\infty} (\beta^t E_0 \frac{\partial u(.)}{\partial c_t} k_t) = 0 \\ &\lim_{t\to\infty} (\beta^t E_0 \frac{\partial u(.)}{\partial c_t} B_t) = 0 \end{aligned} \qquad (5)$$

3.2. Firms:

3.2.1. Final goods-producing firms

It is assumed that a goods-producing firm $y_t(j)$ purchases a unit of intermediate goods at a nominal price of $p_t(j)$ in the monopolistic competition market to produce Y_t units of finished goods as follows:

$$\left[\int_0^1 y_t(j)^{\frac{(\vartheta-1)}{\vartheta}} dj \right]^{\frac{\vartheta}{(\vartheta-1)}} \geq Y_t \qquad (6)$$

where $\vartheta \in (1,\infty)$ is a replacement term between goods and $j \in [0,1]$. The final good is produced through a technology with constant returns to scale. The purpose of final goods producers is profit maximization. Hence, it maximizes profits function given the production constraint with respect to the following:

$$\max . P_t Y_t - P_t(j) y_t(j) \qquad (7)$$

$$s.t. \left[\int_0^1 y_t(j)^{\frac{(\vartheta-1)}{\vartheta}} dj \right]^{\frac{\vartheta}{(\vartheta-1)}} \geq Y_t$$

According to the process of producer profit maximization, we obtain Dixit-Stiglitz Standard demand for *j*th intermediate good as follows:

$$y_t(j)=\left[\frac{p_t(j)}{p_t}\right]^{-\vartheta} Y_t \text{ For } \quad j\in[0,1] \tag{8}$$

Moreover, the price of final good as follows:

$$p_t=\left[\int_0^1 p_t(j)^{1-\vartheta}dj\right]^{\frac{1}{1-\vartheta}} \tag{9}$$

3.2.2. Intermediate goods-producing firm

Every economy comprises of intermediate producers in the monopolistic competition market, where $K_{t-1}(j)$ capital and $H_t(j)$ labor are employed to produce $y_t(j)$ units of intermediate goods based on the following production function:

$$y_t(j)\le a_t {K_{t-1}}^{\alpha}(j)H_t(j)^{1-\alpha} \tag{10}$$

where $\alpha\in(0,1)$ is the share of capital in production and a_t is the technology shock, while the production functions is Cobb-Douglas with constant returns to scale. Productivity shock follows the first order autoregressive process as follows:

$$a_t=\rho_a a_{t-1}+(1-\rho_a)\bar{a}+\varepsilon_{a,t} \tag{11}$$

where $\bar{a}$ is the steady state of productivity.

It is assumed that all firms in each period are not able to adjust their prices. Hence, there is price rigidity similar to that of Calvo (1983) in the economy. Based on a stochastic ratio, $(1-\omega)$ percent of firms adapt their prices. Therefore, the decision-making involves capital $K_{t-1}(j)$, labor $H_t(j)$ and price level p_t, so that cost (profit) is minimized (maximized) through real wage w_t, capital lease rate r_t^k, overall prices p_t and demand function for final producer of intermediate good (Equation 8). ω percent of firms are unable to adapt their prices can only make decisions regarding their own capital and labor. The cost minimization of intermediate goods producing firms will be formulated as follows:

$$\begin{aligned} &Min\, w_t H_t(j)+r_t^k K_{t-1}(j)\\ &S.t.[y_t(j)-a_t K_{t-1}^{\alpha}(j)H_{t-1}^{1-\alpha}] \end{aligned} \tag{12}$$

As explained previously, the price for $(1-\omega)$ percent of firms are able to adjust their prices is as follows:

$$E_t \sum_{j=0}^{\infty} (\omega\beta)^j \frac{\lambda_{t+j}}{\lambda_t} [p_t(j) - mc_t(j)] \left(\frac{p_t(j)}{p_{t+j}} \right)^{-\vartheta} Y_{t+j} \qquad (13)$$

where λ_t is marginal utility of consumption. The firm profit is paid as dividends distributed to households, i.e. shareholders. The maximization of the above problem and Equation (9) yields the Keynesian Phillips curve as follows:

$$\pi_t = \beta E_t \pi_{t+1} + \kappa Mc_t$$
$$\kappa = \frac{(1-\omega)(1-\beta\omega)}{\omega} \qquad (14)$$

where mc_t is marginal cost of intermediate good (*j*).

3.3. Government and Central Bank

Since the Iran's Central Bank is supervised by the government, we assume that government and Central Bank are considered as a single institution in the model. The government is responsible for monetary and fiscal policies, while government spending is specified through money creation, taxation (tax lump-sum), sale of securities and funds obtained from the sale of import licenses and imposition of financing tariffs. This study is also distinct in terms of government budget, since the government earns trade income through the sale of import licenses and import tariffs. Since labor is restricted in gaining tariff discounts or imposition of tariffs/licenses, it can be regarded as a type of economic rent in the trade sector, where rent seekers can grab $\theta_t R_t$, while $(1-\theta_t)$ percent is injected as trade revenues into government budget (Angelopoulos et al., 2009). Also considered for the monetary base in foreign exchange earnings, the oil revenues are not independently included into the model. Hence, the government budget constraint was as follows:

$$g_t + (1+r_t^b)\frac{B_{t-1}}{p_t} = \frac{B_t}{p_t} + t_t + \frac{M_t}{P_t} - \frac{M_{t-1}}{p_t} + (1-\theta_t)R_t \qquad (15)$$

where government spending, government bonds and import revenues follow the first order autoregressive process;

$$g_t = \rho_g g_{t-1} + (1-\rho_g)\bar{g} + \varepsilon_{g,t} \qquad (16)$$

$$R_t = \rho_R R_{t-1} + (1-\rho_R)\bar{R} + \varepsilon_{R,t} \qquad (17)$$

$$B_t = \rho_B B_{t-1} + (1-\rho_B)\bar{B} + \varepsilon_{B,t} \qquad (18)$$

where $\bar{R}$, $\bar{B}$ and $\bar{g}$ represent the average stochastic processes. Moreover, ρ_R , ρ_B and ρ_g represent the first order autoregressive coefficients, while ε_R , ε_B and ε_g are *i.i.d* shocks. The gross monetary growth rates in period (*t*) are formulated as follows:

$$\varphi = \frac{M_t}{M_{t-1}} \tag{19}$$

The gross monetary growth rate also follows the first order autoregressive process.

$$\varphi_t = \rho_\varphi \varphi_{t-1} + (1-\rho_\varphi)\bar{\varphi} + \varepsilon_{\varphi,t} \tag{20}$$

where $\rho_\varphi \in (-1,1)$ and ε_φ represent money supply shock entailing a normal distribution with mean zero and standard deviation of σ_φ.

The combination of government budget constraint and consumer budget constraint delivered the condition of goods and services market clearing as follows:

$$Y_t + R_t = C_t + I_t + G_t \tag{21}$$

Finally, , we specify the economy-wide degree of extraction $(0 \le \theta < 1)$ following by Zak and Knack (2001), Mauro (2004) and Park et al. (2005) to close the model. We assume θ_0 increases with per capita rent seeking activities, i.e. $\frac{\sum_{t=1}^{T}(1-\mu_t)H_t}{N_t}$. Using a linear specification followed by Angelopoulos, et al. (2009), we have:

$$\theta_t = \theta_0 \frac{\sum_{t=1}^{T}(1-\mu_t)H_t}{N_t} \tag{22}$$

where $\theta_0 \ge 0$ is a technology parameter that implies rent-seeking activity into rent extraction. Higher values of this parameter display a more rent-seeking technology, through permissive legal systems and permissible corruption. Thus, $\theta_0 \ge 0$ is a measure of institutional equality, in which the higher value of $\theta_0 \ge 0$ indicates a worse situation of institutions.

4. The Empirical Model

According to the theory of the model discussed in the previous section, the maximization of consumer utility function under budget constraint yields several equations, including real money balance demand, labor supply, Standard Euler, capital rent rate equation and nominal return on bonds for a period of household portfolio decisions. These equations are formulated through a log-linear version, assuming a set of $\hat{x}_t$ implies log deviation of the vector x_t (w, c, …) from its steady state, as follows:

$$\hat{w}_t = \sigma\hat{c}_t + (2+\eta)\hat{H}_t - \hat{\mu}_t - \hat{N}_t + \hat{\theta}_t + \hat{R}_t \tag{23}$$

$$(1-\frac{\beta}{\bar{\pi}})b\hat{m}_t = \sigma\hat{c}_t - \frac{\beta}{\bar{\pi}}(E\bar{c}_{t+1} - E\,\hat{\pi}_{t+1}) \tag{24}$$

$$\sigma\hat{c}_t = E_t\hat{c}_{t+1} - (1-\sigma)\beta E_t\hat{r}^b_{t+1} \tag{25}$$

$$r^b_{t+1} = \frac{1-\kappa}{\delta+\kappa}, \kappa = \frac{1-\beta}{\beta} \tag{26}$$

The profit maximization of final goods producer and intermediate goods producer as well as Keynesian Phillips curve delivers the labor demand and marginal cost of production for an intermediate goods, which together with production function, technology shock, capital rule and production equations.

The log-linear equations are as follows:

$$\hat{\pi}_t = \beta E_t\hat{\pi}_{t+1} + \frac{(1-\omega)(1-\omega\beta)}{\omega}\hat{mc}_t \tag{27}$$

$$\hat{mc}_t = \alpha\hat{r}^k_t + (1-\alpha)\hat{w}_t - \hat{a}_t \tag{28}$$

$$\hat{H}_t = \hat{r}^k_t - \hat{w}_t + \hat{k}_{t-1} \tag{29}$$

$$\hat{y}_t = \alpha\hat{k}_{t-1} + (1-\alpha)\hat{H}_t + \hat{a}_t \tag{30}$$

$$\hat{a}_t = \rho^a\hat{a}_{t-1} + \varepsilon^a_t \tag{31}$$

$$\hat{k}_t = (1-\delta)\hat{k}_{t-1} + \delta\hat{i}_t \tag{32}$$

Moreover, the log-linear of government budget constraint, money growth and market clearing are as follows:

$$\hat{g}_t = \frac{\bar{B}}{\bar{g}}(\hat{B}_t - \hat{B}_{t-1}) - \frac{\bar{r}\bar{B}}{\bar{g}}(\hat{r}_t + \hat{B}_{t-1}) + \frac{\bar{t}}{\bar{g}}\hat{t}_t + \frac{\bar{m}}{\bar{g}}(\hat{m}_t - \hat{m}_{t-1} + \hat{\pi}_t) + \frac{\bar{\theta}\bar{R}}{\bar{g}}(\hat{\theta}_t - \hat{R}_t) + \frac{\bar{R}}{\bar{g}}\hat{R}_t \tag{33}$$

$$\hat{\varphi}_t = \hat{m}_t - \hat{m}_{t-1} + \hat{\pi}_t \tag{34}$$

$$\hat{\theta}_t = \theta_0\left(\frac{\bar{H}}{\bar{\theta}}\hat{H}_t - \frac{\bar{\mu}\bar{H}}{\bar{\theta}}(\hat{\mu}_t + \hat{H}_t)\right) \quad (35)$$

$$\hat{y}_t + \frac{\bar{R}}{\bar{y}}\hat{R}_t = \frac{\bar{c}}{\bar{y}}\hat{c}_t + \frac{\bar{i}}{\bar{y}}\hat{i}_t + \frac{\bar{g}}{\bar{y}}\hat{g}_t \quad (36)$$

$$\hat{R}_t = \rho^R \hat{R}_{t-1} + \varepsilon_t^R \quad (37)$$

$$\hat{\varphi}_t = \rho^{\varphi}\hat{\varphi}_{t-1} + \varepsilon^{\varphi}{}_t \quad (38)$$

$$\hat{N}_t = \nu \hat{N}_{t-1} \quad (39)$$

$$\hat{B}_t = \rho_B \hat{B}_{t-1} + \varepsilon_t^B \quad (40)$$

Equations (23) to (40) are employed to estimate the model parameters focusing on the rent-seeking rate (θ_t) available in the Iranian economy.

5. Calibration and Long-run Results:

The calibration concentrated first on the Iran's economy. For this purpose, the quarterly data on Iran were used from 1998:1 to 2015:4. Table (1) displays the values of model parameters and exogenous variables, as estimated or set up by the previous information from the literature.

Table (1): Calibration of the model parameters

Parameter or exogenous Variable	Description	Value	Source
η	Consumption weight in utility function	2.17	Set
β	Time discount factor	0.93	Calibrate from $(r = \frac{1-\beta}{\beta})$
α	Labor share in production	0.417	Set
σ	Depreciation rate of capital	0.181	Set
θ_0	Extraction rent-seeking parameter	8.4	Set
γ	Growth rate of population	0.015	Estimation
ρ_A	Persistence parameter of A_t	0.83	Estimation
ρ_{φ}	Persistence parameter of φ_t	0.98	Estimation
ρ_g	Persistence parameter of g_t	0.88	Estimation
ρ_R	Persistence parameter of R_t	0.95	Estimation
ρ_B	Persistence parameter of B_t	0.90	Estimation

Source: Authors
Notes: (1) Quarterly data 1998:1-2015:4. (2) Set on the basis of a prior information.

As the objective of this study has been to measure the extent of rent-seeking activity (θ_t) in Iran's external economic sector, the DSGE model has been specified to include trade income (tariff revenue was used as a proxy[1]), where the trade rent-seeking rate (θ_t), a share of labor productive work $(\mu_t H_t)$ and a share of rent-seeking activity $((1-\mu_t)H_t)$ have been calculated. Table (2) summarizes the long-run results of the model in which the empirical data have been obtained through calculating all the equations (23 to 40), using Dynare.

Table (2): Long-run results of the DSGE model

Endogenous variable	Description	Long-run solution
c/y	Consumption to output ratio	0.563
i/y	Investment to output ratio	0.302
g/y	Government expenditure to output ratio	0.0751
ta/g	Tax revenue to government expenditure	0.3199
B/g	Government bond to government expenditure	0.564
r^b	Return to bonds (%)	7.5
m/g	Monetary demand to government expenditure	0.705
R/g	Trade revenue to government expenditure	0.3601
θ	Share of trade revenue extracted by rent seekers	0.45
R/y	Trade revenue to output ratio	0.06
H/θ	Hours at work to share of trade revenue extracted by rent seekers	0.5001
μ	Fraction of hours at work allocated to productive work	0.76

Source: Authors

[1]As mentioned in the theoretical discussion, interest group forces influence the policy-maker to earn concession of tariff discounts or tariff imposition (depending on the labor conditions; if labor is producer, it prefers to impose tariffs on specific goods; if labor is importer, it prefers to impose tariff discounts). The rent-seeking rate refers to gaining tariff discounts.

Table (2) shows long-term results of the model which, being based on the parameters values reported in Table (1). The long-term result gives $(R_t / g_t = 0.36)$ and $(\frac{\theta_t R_t}{g_t} = 0.1662)$, then we calculate $\theta = 0.46$ that means the rent-seekers grab 46 percent of trade revenue of government and rest of them goes to government. In addition, according to Equation (34), the long-run solution gives $\eta = 0.24$ that means agents allocate 76 percent of their effort time (non-leisure time) to productive work, while the rest 24 percent goes to rent-seeking activities. In other words, agents put pressure on policy makers (lobbying or bribery) to take 45 percent of trade revenue. Finally, the latter translates to 27% of GDP, denoted as $(\theta R / Y)$, and that seems high for Iran's foreign economic sector.

6. Conclusion

This paper investigated rent-seeking of foreign trade in Iran through specifying an innovative version of the DSGE model. In the model rent-seeking was defined as the portion of trade revenue of government that is captured by individual by influence government's trade policy. Since the trade revenue of government is limited, inefficient behavior of the labor (e.g. rent seeking) can result in obtaining more trade privileges. It means that rent seeking activity is arising from an unproductive activity.

By calibrating the model, the labor rent-seeking rate in the foreign trade sector was obtained. The results revealed that 45 percent of government trade income arising from imposing restrictions is allocated to rent-seekers. In other words, Labor acquires a share of 45 percent from trade income (rent) by allocating 24 percent of its effort time to rent-seeking and 76 percent to productive activity, which is considered a high portion for Iran' economy. The implication is that a policy of liberalization in Iran's trade sector should remove the incentive of rent-seeking due to a higher proportion of the efficient trade sector Iran.

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