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RESEARCH PAPER

Optimal Tax Rate of Housing Capital in Iran

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Abstract
The aim of this study is to investigate the optimal tax rate in the housing market. Further, an optimum portfolio of investment in housing and business sector is determined in steady-state and Ramsey equilibrium. In addition, optimal tax rate and optimal effective housing capital tax rate, business capital and labor income in steady-state are calculated. Results indicate when housing capital return increases, goods production and capital in productive sectors decreases, thus housing capital must be taxed. Based on the results, the optimal tax rate of housing capital would be equal to 4.12 % and the optimal effective tax rate of housing capital is equal to 1.8 %. Moreover, in this case, the optimal tax rate of business capital and labor income reduce to 10.6 %.
Keywords: Optimal Tax Rate, Housing Capital Tax, Effective Tax Rate, Ramsey Equilibrium, Iran.
JEL Classification: C6, H21, H31.

Introduction

In choosing between different assets, consideration is given to relative return and relative risk. In other words, higher risk assets should have higher returns to compete. The Dutch disease is one of the factors that can increase the relative return of a non-tradable, such as housing capital, towards tradable sectors such as industry and agriculture. In these conditions, housing capital with the lowest risk has the highest rate of return. Therefore, buying and building a house is a kind of secure investment, which leads to the disruption of economic balance in economically productive sectors in favor of less productive and speculative sectors. As a result, housing as an essential and durable good convert to a kind of wealth and capital asset with a high return for family, which affects invest in other economic sectors. Although transferring resources to create real added value in the housing sector is positive, increased speculative motive affects the optimal function of the housing sector. Then, the industrial sector share in GDP will get stagnant or declined.

Changing tax rates or new taxes affect the level of activities in each sector. Capital tax reduces the return rate and decreases the willingness to invest. Taxation is always regarded as a cost and with a housing capital tax, cost increases and the return of housing capital decreases. As a result, due to the reduction of expected return, the housing capital demand has decreased and its supply has increased and, consequently will lead to a reduction in the house price.

Cremer and Gahvari (1998), using a general equilibrium model, show that it is possible to advance efficient allocation through tax policy, without changing the prices. Bye and Avitslan (2003) analyze the mutual welfare effects of the tax system between housing capital and financial capitals on the Norwegian economy using the computable general equilibrium

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model. They explain that effective housing capital tax rate in Norway is significantly lower than that on other kinds of capital, which results in allocating more capital in the housing sector (more investment) and economic productivity is eliminated. Therefore, increased housing capital tax has a positive welfare effect. Eerola and Maattanen (2006), using a dynamic general equilibrium model, show that housing capital and consumption must be taxed at a relatively high tax rate; while business capital tax must be close to zero.

Evans (2012) assesses the role of asset tax, using analytical–explanatory study. He explains that the housing capital tax rate must be higher than that of other assets. Eerola and Maattanen (2013), using the general equilibrium model, examine the optimal housing capital tax rate and business capital tax rate in America. Results indicate that housing tax is effective on household preferences. If housing capital is not taxable, optimal business capital tax rate change significantly and a high tax rate of business capital leads to reallocation of business capital to the housing capital. Aronsson and Mannberg (2015), using an overlapping generations model, indicate that by using housing tax, side effects and estate price might change.

Studies Gahvari, 1984; Berkovec and Fullerton, 1992; Hendershott and Won, 1992; Skinner, 1996; Gervais, 2002; Fuest et al., 2004; Goodman, 2006; Saarimaa, 2009; Alpanda and Zubairy, 2013; Norregaard, 2013; Bobo and Nur, 2014; and Best and Kleven, 2018, generally are show, the existence of housing tax exemptions or incomplete tax due to tax avoidance and with the change of tax effective rate, investor's behavior can be affected with government policies and use it as a tool for housing capital or other capital guidance.

In previous studies related to optimal housing capital tax, optimal effective tax rates[1] in Iran are not considered. Therefore, the aim of this paper is to fill this gap, with computing the optimal tax rate and the optimal effective Iranian housing capital tax rate. The rest of this paper is organized as follows. In section 2, the model is presented and then optimum values in steady-state and Ramsey equilibrium are calculated. Section 3 provides the results and in section 4 the conclusion is presented.

Model

Household

It is assumed in this model the household was looking for maximization of its benefit in consumption of goods, housing capital and leisure time. Also, for simplicity, we assume that the relative price of goods, housing capital and business capital is equal. Consider utility is a function of goods (c_t) and leisure (l_t) and the direct utility of housing capital (H_t); so, the representative agent with the following well-behaved instantaneous utility function as follows:

$$u_t = \mathrm{u}(c_t, l_t, H_t) \tag{1}$$

$$\mathrm{u}(c_t, l_t, H_t) = log\left(c_t^{\eta} l_t^{1-\eta}\right) + \varphi_H log H_t$$

The parameter φ_H is the weight housing capital in the utility function.

Since labor supply occurs in the housing sector and business sector, in each period, time is divided between work ($h_{m,t} + h_{H,t}$) and leisure (l_t). So, we have:

$$h_{m,t} + h_{H,t} + l_t = 1 \tag{2}$$

where $h_{n,t}$ is hour labor worked in the housing sector and $h_{m,t}$ is hours worked in the business sector.

Suppose that tax on consumption, labor, housing capital and non-housing capital are τ^c,

1. The effective tax rate is the average rate at which an individual or firm is taxed on income or profit. The effective tax rate is also used as a measure to detect tax evasion.

τ_t^n, τ_t^H and τ_t^k respectively. Furthermore, between two continuous periods, housing capital depreciate at the rate of δ_H and business capital depreciates at the rate of δ. So, a representative household budget constraint will be as equation (3):

$$\sum_{t=0}^{\infty} q_t[c_t(1+\tau^c)+a_{t+1}+H_{t+1}] = \sum_{t=0}^{\infty} q_t\left[w_t(1-\tau_t^n)h_{m,t}+R_t a_t+(1-\tau_t^H)(1-\delta_H)H_t+\Psi_t\right] \quad (3)$$

$R_t = 1+(1-\tau_t^k)(r_t-\delta)$

In equation (3), w_t is wage rate, a_t denotes asset and Ψ_t is transfer payment of government to household. In left-hand side, budget constraint includes consumption expenditures of goods and capital and in the right-hand side, budget constraint indicates household income, which includes labor income, the income from the asset, housing capital return and government transfer payments.

Firms

In this model, the firms rent the production factors, capital and labor from the sample household and apply them for production (equation 4). Production function of the housing sector is a function of housing capital (H) and working hours (zh_H). Furthermore, Z denotes labor productivity. This function is considered as a Cobb-Douglas form with a constant return to scale[1]:

$$Y_{H,t} = f^h\left(H_t, zh_{H,t}\right) = H_t^{\alpha}(z_h h_{H,t})^{1-\alpha} \quad (4)$$

In addition, the production function is as equation (5):

$$\mathrm{F(k,h}_m) = k^{\alpha}h_m^{1-\alpha} \quad (5)$$

Government

In each period, the government finances its expenditure through oil revenues, consumption tax, labor wage tax, housing capital return tax and business sector return tax. Thus, government budget constraint must be written as equation (6):

$$g+\Psi_t+d_t R_t = \varpi O_t + d_{t+1} + \tau^c c_t + \tau_t^n w_t h_{m,t} + \tau_t^k r_t k_t + \tau_t^H(1-\delta_H)H_t \quad (6)$$

where g is government consumption expenditure, Ψ denotes transfer payments[2] and ϖO_t is oil revenue share, which is used by the government in each period to finance some expenses. If government expenditure is more than its revenue, the government will finance it by diffusion of bonds (debt). Therefore, d shows the amount of government debts.

Competitive Equilibrium

In competitive equilibrium, the household problem must be solved by maximizing the utility function (equation1), subject to household budget constraint (equation3):

$$\text{Max} \sum_{t=1}^{\infty} \beta^{t-1}\,\mathrm{u}\left(c_t, l_t, k_{h,t}\right)$$

s.t:

$$\sum_{t=0}^{\infty} q_t\left[c_t(1+\tau^c)+a_{t+1}+k_{h,t+1}\right] = \sum_{t=0}^{\infty} q_t\left[w_t\left(1+\tau_t^h\right)h_{m,t}+R_t a_t+\left(1-\tau_t^{k_h}\right)(1-\delta_h)k_{h,t}+\Psi_t\right]$$

1. For doing sensitivity analysis, considered function with a constant return to scale.
2. In this model, the level of government expenditure and transfer payments over time is assumed constant.

Assets market alignment requires $k_t = a_t - d_t$. So, resources constraint is presented as equation (7):

$$c_t + H_{t+1} + k_{t+1} + g_t = F(k_t, h_{m,t}) + F(H_t, h_{H,t}) + (1-\delta)k_t + (1-\delta_H)H_t \quad (7)$$

Employing first order conditions obtained from maximizing the utility function, optimal tax rates in equilibrium conditions are as equation 8 to 10:

$$\tau_t^h = 1 + \frac{\partial u_{h_t}}{w_t u_{c_t}}(1+\tau_t^c) \quad (8)$$

$$\tau_{t+1}^k = 1 + \frac{1 - u_{c_t}/\beta u_{c_{t+1}}}{(r_{t+1} - \delta)} \quad (9)$$

$$\tau_t^H = 1 - \frac{u_{c_t} - \beta(\varphi_H H_{t+1}^{-1})(1+\tau^c)}{\beta u_{c_{t+1}}(1-\delta_H)} \quad (10)$$

Ramsey Equilibrium

In the Ramsey equilibrium, the objective is to find optimal tax rates that loss welfare will be minimized.[1] Using the primal approach, the optimal share of capital, consumption and working hours in the market are obtained according to the optimization of a household problem. Applying first-order condition, tax rates and substitution of them, we can represent Ramsey equilibrium. By substituting the abovementioned values in household budget constraint (equation 3), we have:

$$\sum_{t=0}^{\infty} \beta^t \left[u_{c_t}\left(c_t - \frac{\Psi}{1+\tau^c}\right) + u_{h_{m,t}} h_{m,t} + \beta u_{H_{t+1}} H_{t+1} \right] - V^0 = 0 \quad (11)$$

$$V^0 = u_{c_0}\left[\left(1 + \left(1-\tau_0^k\right)\left(F_{k_0} - \delta\right)\right) a_0 + (1-\tau_0^H)(1-\delta_H)H_0\right]$$

Considering the utility function and Φ as a Lagrange multiplier for budget constraint obtained in equation (11), we will have equation (12):

$$V = u(c_t, 1 - h_{m,t} - h_{H,t}, H_t) + \Phi\left[u_{c_t}\left(c_t - \frac{\Psi}{1+\tau^c}\right) + u_{h_{m,t}} h_{m,t} + \beta u_{H_{t+1}} H_{t+1}\right] \quad (12)$$

Applying resources constraint (equation 7), new household constraint (equation11) and first-order conditions, the Ramsey equilibrium issue is written as follows:

$$\max_{\{c_t, k_{t+1}, H_{n,t+1}, h_t, h_{H,t}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \{\beta^t V(c_t, 1 - h_{m,t} - h_{H,t}, H_t) - \lambda_t\left[c_t + k_{t+1} + H_{t+1} + g_t - F(k_t, h_{m,t}) - (1-\delta)(k_t) - (1-\delta_H)H_t\right] - x_t W_t - \Phi V^0\} \quad (13)$$

Optimal Tax

Using first-order conditions, optimal business capital tax and housing capital tax can be obtained for the $t > 1$ period. For simplicity, as in Chamley (1986) and Judd (1985), the optimal business capital tax rate is considered zero; but for numerical computation, its value will be estimated at equation (14) and (15):

$$\tau_t^k = 0 \quad (14)$$

$$\tau_t^H = \left(\frac{R_t}{1-\delta_H} - 1\right)\tau^c - \left[\Phi\left(\frac{\partial u_{c_t} c_t}{\partial H_t} + \frac{\partial u_{H_t} H_t}{\partial H_t}\right) - x_t\left(\frac{\partial u_{h_{H,t}}}{\partial H_t} - \frac{\partial u_{l,t}}{\partial H_t}\right)\right]\frac{1+\tau^c}{(1-\delta_H)u_{c_t}} \quad (15)$$

Equation (15) indicates the optimal tax rate of housing capital, consisting of three parts. The second part shows the impact of housing capital on demand for goods, house, and final labor production in the housing sector and final leisure utility. Although the increase of

1. See Ramsey (1927)

housing capital leads to a reduction in demand for goods and services production, housing capital tax rate should increase. If the preferences are weakly separable between house capital and all other arguments, the optimal housing capital tax rate given by equation (16) is:

$$\tau_t^H = \left(\frac{R_t}{1-\delta_H} - 1\right)\tau^c \quad (16)$$

Based on equation (16), the prerequisite for the positive housing capital tax rate is that the rate of return is higher than$1-\delta_H$.

In the next section, using obtained equations for steady-state equilibrium and Ramsey equilibrium, the optimal value of variables in steady-state and Ramsey equilibrium and also the optimal housing capital tax rate, business capital tax rate and consumption tax calculate for the Iranian economy.

Results

Data Sources

Solving this model by the numerical method and using it for quantitative analysis involves setting parameters of preferences, productions, taxation and government sector, assuming that there is an initial steady-state, these parameters are initialized, so that the model indicates Iranian economic status as possible. For this purpose, conventional methods of parameters estimation, estimations related to conducted studies, or simulation of the designed model are used for the Iranian economy in initial equilibrium. Table 1 indicates the intended parameters values for a model numerical solution and its resources.

Table 1. Definitions and Values of Model Parameters

	Definition	Parameter	Value	Source
Preference	Discount rate	β	0.96	Kavand (2009)
	Share of utility from consumption	η	0.32	Zaraanejad and Anvari (2012)
	Weight parameter on housing capital	φk	0.33	Authors' calculation
Production function	output elasticities of capital	α	0.512	Jalali Naeini (2003)
	labor productivity	Z	1.025	Rafiei et al. (2012)
	Depreciation rate of housing capital	δ_H	0.025	Bahrami and Aslani (2011)
	Depreciation rate of business capital	δ_k	0.042	Amini and Neshat (2005)
Taxation system	Labor wage tax	τ^n	0.15	Tax laws of Iran
	Consumption tax	τ^c	0.09	
	Housing capital tax	τ^H	0.0	
	Business capital tax	τ^k	0.25	
Government	Government spending, percent of GDP	g	8.5	Central bank of Islamic Republic of Iran (2015)
	Transfer payments, percent of GDP	Ψ	8.3	Central bank of Islamic Republic of Iran (2012)
	Government Debt, percent of GDP	d	12.2	The Global Competitiveness Report 2015-2016

Source: Research findings.

Calibration

Steady-state

Values related to variables in steady-state are reported in table 2. As can be seen, in steady-state, considering real tax rates, capital in the business sector is more than the housing sector by 19 %. In addition, calculations done with an effective tax rate have a difference of 2 %.

Table 2. Housing Capital, Business Capital and Consumption in Steady-State

	Housing capital (k_n)	Business capital (k_m)	Consumption (C)
With real tax rate	0.6973	0.8917	0.1174
With effective tax rate	0.6857	0.9126	0.1212

Source: Research findings.

Optimal taxes for the Iranian economy, which are calculated from the proposed model maximization problem, are reported in table 3. Initializations and simulations indicate that Iranian tax systems are not optimal and they are different from optimal status, which leads to the improvement of social welfare.

Table 3. Optimal Tax and Effective Tax Rates

	Consumption tax (τ^c)	Housing capital tax (τ^{kn})	Business capital tax (τ^{km})	Labor wage tax (τ^h)
Actual tax rate	0.09	0.00	0.25	0.15
Optimal tax rate	0.09	0.0412	0.1060	0.1063
Optimal effective tax rate	0.04	0.0188	0.0482	0.1335

Source: Research findings.

According to table 3, labor wage tax and business capital tax must reduce. Now, in Iran, business capital tax is 25 %, which must decrease to 10.6 %. In addition, the actual rate of labor wage tax is now 15 %, which must decrease to 10.6 %. In optimal status, housing capital tax should be 4.12 % and the optimal effective tax rate should be 1.8 %. Reduction of other tax levels leads to a significant increase in social welfare, which will be referred to in the next section.

Ramsey Equilibrium

Here, we investigate how to move toward Ramsey equilibrium and a new level of variables. In table 4, variables in Ramsey equilibrium is compared with their status in steady-state.

Table 4. Housing Capital, Business Capital and Consumption in Ramsey Equilibrium Compared Steady-State

		k_n	k_m	C	Welfare changes
with real tax rate	Steady-state	0.6973	0.8917	0.1174	0.0000
	Ramsey equilibrium	0.6511	0.9616	0.1222	0.8649
with effective tax rate	Steady-state	0.6857	0.9126	0.1212	0.0000
	Ramsey equilibrium	0.6554	0.9672	0.1221	0.5823

Source: Research findings.

As it can be seen in table 4, consumption increased in Ramsey equilibrium to 4% rather than steady-state. The business capital value in the Ramsey equilibrium of 8% increases rather than steady-state. Housing capital with increased applied tax reduced in Ramsey equilibrium as 7%. Moving based on Ramsey equilibrium is followed by substitution effect and income effect. Due to the reduction of tax on consumption, income and business capital, disposable income increases and leads to increased consumption of all goods. On the other hand, increased housing capital tax has a substitution effect. In other words, it reduces investment in the housing sector and leads to increased investment or consumption in other sectors. When the substitution effect dominates the income effect, housing capital decreases.

Table 4 shows variables value in steady-state and Ramsey equilibrium; also, in its last column, welfare changes obtained from applying tax levels of Ramsey equilibrium are shown. Applying new tax levels leads to increased goods consumption and increase production, which generally leads to a raised level of welfare. According to calculations, moving from initial equilibrium toward Ramsey equilibrium increases the welfare of society to 0.86%.

Optimal Path of Variables in Ramsey Equilibrium

Figure 1 indicates the optimal path of capital variables (housing capital and business capital) in the Ramsey equilibrium. As shown in table 4, the business capital value of Ramsey equilibrium is more than initial steady-state, while housing capital value by applying the tax, is less than that. According to the fact that production functions have a positive relationship with the capital variable, it is expected that production in Ramsey equilibrium is better than the initial status. Generally, housing capital in initial periods has a decreasing trend, while business capital has an increasing trend.

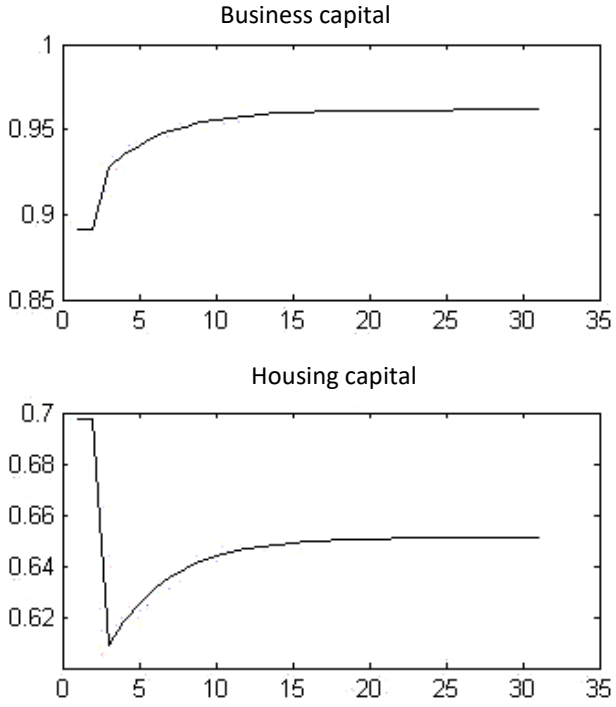

Figure 1. Optimal Path of Business Capital and Housing Capital in Ramsey Equilibrium
Source: Research findings.

In optimal path related to housing capital, at first, housing capital decreases and then increases, which is because of significant increase of housing capital tax in initial periods in

Ramsey equilibrium that leads to a reduction in capital in Ramsey equilibrium rather than the steady-state.

In Figure 2, the optimal tax on business capital, housing capital and labor wage is specified. In the initial period of the optimal path, applied taxes fluctuated greatly and it cannot be seen in the real world. Although obtained results may not be realistic for initial periods, it does not affect the results of steady-state in Ramsey equilibrium and variables in Ramsey equilibrium have realistic values. The results show that the housing capital tax should be higher than the initial amount and the business capital tax and labor tax should be less than the initial amount.

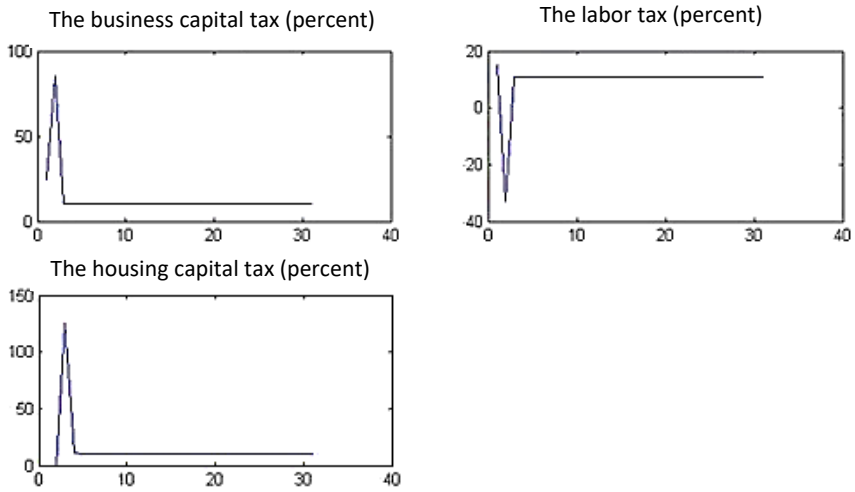

Figure 2. Optimal Path of Taxes in Ramsey Equilibrium
Source: Research findings.

Optimal path of goods production toward Ramsey equilibrium are shown in figure 3. As can be seen in this figure, in the Ramsey equilibrium, goods production is more than the initial production of goods. The total of these results show that tax reform contains housing capital tax, reducing the labor tax and business capital tax, due to the change in the incentive for investment from housing capital to business capital and the increase in the incentive for the work and as a result, production increases.

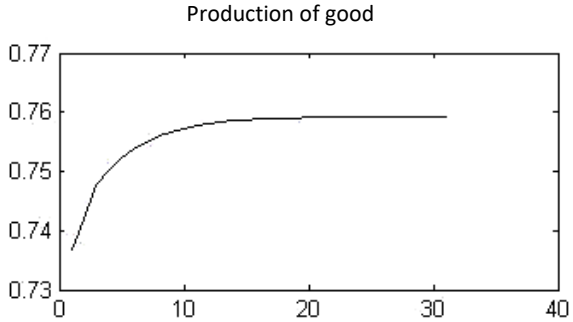

Figure 3. Optimal Path of Goods Production in Ramsey Equilibrium
Source: Research findings.

Optimal path of consumption variable movement toward Ramsey equilibrium is shown in figure 4. Results show that consumption in Ramsey equilibrium is higher than the initial value.

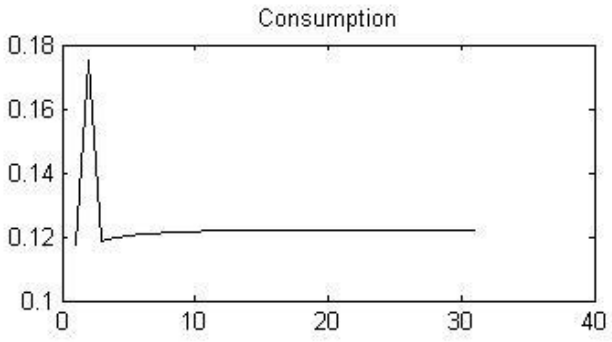

Figure 4. Optimal Path of Consumption in Ramsey Equilibrium
Source: Research findings.

Consumption variable increases significantly at first but then decreases. In initial periods, capital tax variables increase significantly and when taxes are too high, the individual's optimal decision is to increase the consumption and decrease investment. By adjustment of taxes, consumption increases to the Ramsey equilibrium. This increase in consumption, in the long run, is due to an increase in long-run production (Figure 3).

Sensitivity Analysis

In order to assess the research results, some important parameters change and obtained results are compared with primary calibration. There are important parameters whose change may affect our results potentially. Results of the sensitivity analysis are shown in table 5.

Table 5. Sensitivity Analysis

	τ^{kn}	τ^{km}	τ^{h}	Welfare changes (percent)
Optimal tax with main parameters	0.0412	0.1060	0.1063	0.8649
Optimal tax with $z_n = 0.5$	0.0412	0.1060	0.1062	0.8647
Optimal tax with $\varphi_k = 0.7$	0.0388	0.0998	0.0845	0.7052

Source: Research findings.

As it can be seen in table 5, fundamental changes in main parameters of the model do not affect tax rate in Ramsey equilibrium and also do not change welfare level; hence, we can ensure that the results obtained in previous sections are reliable. Sensitivity analysis also shows that if the weight parameter on housing capital rises from 0.33 to 0.7, the welfare will be reduced by about 20 percent, which is due to a reduction in business capital, followed by a decline in production and consumption.

Conclusions

The aim of this study was to investigate the effect of taxation on housing capital in the determination of optimal taxes in the equilibrium model. Based on the experimental results for Iranian economics, the optimal housing capital tax rate is about 4.12%. Besides, the business capital tax must decrease to 11% and also wage tax must be lower than the current values. Taxation improves the welfare in society to 0.86% and increases the production and investment in the business sector. In addition, in the housing sector, applying housing capital tax leads to an increase in empty houses cost. Thus, capital will be transferred to the business sector.

Consumption increased in Ramsey equilibrium to 4% rather than steady-state and the business capital value in the Ramsey equilibrium of 8% increases rather than steady-state. Housing capital with increased applied tax reduced in Ramsey equilibrium as 7%. Moving based on Ramsey equilibrium is followed by substitution effect and income effect. Due to the reduction of tax on consumption, income and business capital, disposable income increases and leads to increased consumption of all goods. On the other hand, increased housing capital tax has a substitution effect. That is to say, it reduces investment in the housing sector and leads to increased investment or consumption in other sectors. When the substitution effect dominates the income effect, housing capital decreases.

The important point is that taxation on housing capital and reducing other tax items, along with observing government budget, leads to a rise of welfare and production level. It can be claimed that with increasing the housing capital tax and reducing the tax levels related to business and wage sector, the government will face budget shortage; but it should be considered that optimal taxes are tax levels that keep government budget in balance and optimization problem is solved by government budget balance constraint.

In this paper, the optimal effective tax rates are also calculated. In many studies, effective tax rates have been investigated such as Chen, Chen, Cheng, and Shevlin, 2010; Kim, Li, and Zhang, 2011; Dyreng et al., 2017. But in Iran's macroeconomic studies have not attended to effective tax rates. The results show that the ratio of effective tax rates to the consumption tax rate is 44% and in business capital effective tax rate is 45.5%, which represents about 55% tax avoidance according to the conditions of the Iranian economy. Only in the labor wage, the effective tax rate is more than the optimal tax rate, which shows that in Iran the labor wage tax, which is mainly the labor of public sector, is more than the optimal taxes.

Given the fact that currently there is no housing capital tax in Iran, the policy of taxation on housing capital and reducing other taxes could be applied. Applying this policy results in increasing the business capital and also enhances the production.

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