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Optimal Amount of Government Expenditure Components with the Goal of Reducing Income Inequality (The Case of Iran)

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Abstract

Government expense is an important financial tool for empowering the poor. In such a way that the government provides a suitable environment for the business of people by investing in the fields of defense, judiciary, legislation, order and security. In addition, by providing social services such as education, health, social security, and transportation, communication, energy and infrastructure, the government causes an increase in human capacity for earning more money leading to the reduction of poverty and inequality. The purpose of this study is to estimate the optimal amount of government expenses in economic, social and cultural, defense and security, public affairs. Related chapters aim at minimizing income inequality. In this regard, the threshold regression model and the simplex linear programming algorithm are used for estimating the time series data during the period 1971-2019. The results reveal that the optimal amount of government expenditure total should be equal to 19.2% of GDP to reduce the income inequality. Also, for reducing the income inequality, the optimal amount of public, defense, social and economic expenses in GDP should reach 1.1, 2.35, 10.2 and 5.5 percent, respectively. Moreover, among the chapters, the optimal amount of education, health and defense chapters with the highest priority should be 6.5, 2.25, 1.79% of GDP, respectively. Furthermore, other chapters have different effects on income inequality.

Highlights

- There is a nonlinear relationship between size of Government Expenditure and Income Inequality, according to Kuznets curves and the inverted U-shaped Armey curve.
- The optimal share of government expenses in economic, social and cultural, defense and security, public affairs and related chapters aim at minimizing the income inequality.
- Using threshold regression model with simplex programming algorithm is applicable.

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1. Introduction

From the perspective of all economic schools, government intervention in economy is essential. Nevertheless, there are conflicting theories among economists regarding the extent of government intervention and the impact of government expenses on economic various sectors. These different theories can be a reason for the nonlinear relationship between the government size and the income inequality. The nonlinear relationship between the two variables, according to Kuznets curves and the inverted U-shaped Armey curve demonstrate the nonlinear relationship between economic growth and income distribution, growth and government size, respectively. Richard Army first proposed the nonlinear relationship between government expenses and economic growth in 1995, who explained the relationship between the two variables in the form of an inverted U-shaped curve called the Army curve (Armey, 1995). The main reason for the inverted U-shaped curve is because initially, the increase in the share of government public expenses in the GDP of an economy leads to a simultaneous increase in the real growth rate of GDP. However, this positive correlation between the government expenses and the economic growth is not infinitely stable. This positive relationship is such that the final productivity of public expenses is equal to the final productivity of private expenses. This point is called the break-even point at which the share of government public expenses in GDP maximizes the real growth rate of GDP. After the break-even point, the final effect of public government spending becomes negative, which in turn has a negative impact on the level of economic growth (Schmidt & Wigerstedt, 2019).

In this regard, Armey (1995) pinpoints the increase in government expenses raises the production level to some extent, but then the increase in government expenses does not help the economy and causes recession. He states that in the absence of the government, no law prevails. Without protection of property rights, powerful people can steal the country's assets, and weak people will have little incentive to save and invest. In addition, there is no protection against bigger bullying from foreign nations, or pirates in the seas, without government action. If the government intervenes, transportation improves and the cost of transactions reduces. Therefore, the establishment and growth of the government are accompanied by an increase in income levels and positive economic growth rates. As the government grows exponentially, the law of diminishing returns begins to work. While road construction initially leads to an expansion of output, for every dollar spent, roads add less positive impact (Vedder & Gallaway, 1998).

The nonlinear relationship between income distribution and economic growth was first proposed by Simon Kuznets thereafter called the Kuznets curve. Inequality increases to a certain extent as income increases and then inequality decreases as production and income increase (Kuznets, 1995). The reason for this, as Kuznets explained, is that in the early stages of development, there is a large wage gap between the modern and traditional sectors. People in the traditional sector are low-skilled and low-income workers in the agricultural sector who need little training for livelihood and at least medium-level education to enter the

modern sector. Hence, fewer people from the traditional sector of the economy can enter the modern sector and increase their income (Angel et al, 2009). Thus, in the early stages of the development of the modern sector of the economy, income distribution becomes more unequal, but over time, with the expansion of the modern sector in the economy and the promotion of education and equal opportunities for all people, the number of people entering the modern sector increases. As a result, with increasing economic growth at this stage, income distribution also improves (Mehregan et al, 2008; Nademi & Hassanvand, 2015).

Also, Karimi et al. (2015) show that there is a possibility of the nonlinear relationship between the government size with unemployment. In other words, a large government leads to an increase in the unemployment rate, which means that fewer people contribute to GDP, so there is no opportunity to generate income for some parts of the labor force. This phenomenon leads to the intensification of the class gap by increasing the burden of support and the spread of poverty (Nademi and Hassanvand, 2015).

By summarizing these three parts, it can be argued that there may be a nonlinear relationship between the size of the government and the income inequality.

Surveys in connection with government size over the last three decades show a significant reduction in government activities in Iran's post-revolutionary years. During 1973-1978, the government size reached its highest level, approximately 45.1% comparing to other periods. During the revolution and war, 1979-1988, government size was about 27.3 in Iran's economy. During the First Development Plan, 1989-1993, the public government size reduced to 17.4%. The sharp decline in economic growth during the second Development Plan, 1994-1999, with a growth reduction of government expenses led to a greater ratio of expenses to GDP and an increased size of government at all levels during the period. During the economic growth in the third Development Plan, despite the high growth of government expenses, Iran's economy has witnessed a decrease in the size of government at central and general government levels during the period. The size of the government in the years of the second and third five-year development plans was 22.1% and 20.6%, respectively. The size of the government in 2005 increased by about 5% compared to 2004 (Central Bank, 2006). According to the recent reports and research, the size of the government in late years reduced to 17.4%.

The study of Gini coefficient as an index of income inequality in Iran during 2001-2003 and 2006-2007 with a value of 0.43 at its highest level and in the late years reduced so that in 2010-2011with the implementation of targeted subsidies program, its amount reached a minimum, i.e. 0.37. In 2015, this amount was 0.39 and in 2018-2019, the index increased again**.**

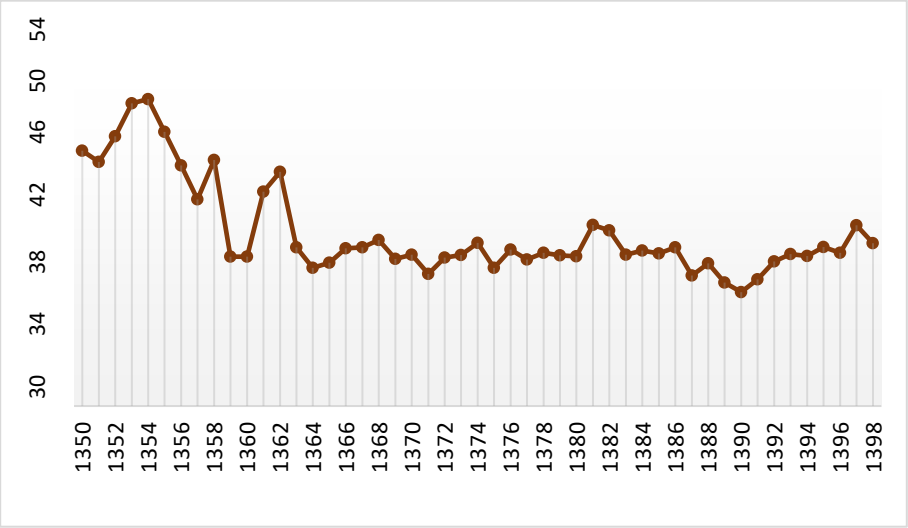

Figure 1. Gini coefficient trend chart in urban areas of the country[1]
***Source**: Central Bank of Iran*

Again, the increase of the Gini index in recent years, according to reports, doubles the importance of government intervention to prioritize its financial resources in economic, social, cultural, defense, and security affairs. In the meantime, what is important is the amount of allocation of these resources, the way it is allocated based on the priorities among the above-mentioned affairs and the structure by which poverty and inequality might reduce.

Due to the lack of necessary research in the field of obtaining the optimal amount of government expenditure components with the goal of reducing income inequality in economic, social and cultural, public and defense affairs and the chapters related to each affair with the aim of minimizing income inequality in Iran, this goal is the subject of present research. Threshold regression model with simplex programming algorithm is one of the contributions of the present study. Accordingly, the study is conducted under five sections. In the first section, after the introduction, some theoretical backgrounds related to the government size and income inequality are discussed. In the third section, the research background is discussed and in the fourth section, the econometric model and findings are presented. Finally, the last section is devoted to discussions and suggestions.

[1] Considering the Gini coefficient, information of the Central Bank in 2018 and 2019 has not been published yet, for these years the Gini coefficient has been estimated based on the ratio of the Gini coefficient of the Central Bank to the Gini coefficient of the Statistics Center.

2. Theoretical Foundations

Income inequality and the role of redistributive policies are key issues in economic, political, and academic discourses. Income inequality often indicates the existence of a class gap between different income deciles in a society that leads to different social and economic problems from a social, economic and political point of view (Wilkinson & Pickett, 2009; Chetty et al, 2016; Guzi & Kahanec, 2018). Since the 1970s, many economists have provided much evidence about the adverse economic and social effects of income inequality on investment, economic growth, poverty, health, welfare, crime, conflict, and social cohesion (Anderson et al, 2014).

In the context of reducing poverty and income inequality, government public expenses in different sectors of the economy have the potential to significantly affect the gap between different income deciles.

Increasing government expenses on health and education has been seen as a factor in reducing the health expenses of the poor, increasing human capital, and increasing per capita income. Thus, increasing government expenses in these sectors create more opportunities for the business of the poor and thus increase their income by increasing life expectancy and creating the ability of the poor as a healthy workforce to participate in productive activities [Omari & Muturi (2016), Oriavwote & Ukawe (2018), Asghar et al. (2012), Dankumo et al. (2018), Ambia & Sujarwoto (2018), O'Donnell et al. (2013), Ionu (2018), Omodro (2019), Fournier & johanson (2016)].

Bertussi and Junior (2012), Mussolini and Teles (2010) consider government expenses on infrastructure as one of the key components of economic growth and a factor in creating employment potential to reduce sustainable poverty and consider inequality (Marinho et al., 2017). Seetaneh et al. (2009) emphasize the access to transportation and communication infrastructure in developing countries and to promote opportunities (access to resources, services, and employment), to enhance security (reducing vulnerability to shock), and to facilitate empowerment (increasing the participation of the poor people in decision-making). Thurlow et al. (2007) and Christiaensen et al. (2012) believe that government expenses in the agricultural sector are a direct factor in increasing the nominal incomes of the poor through job creation and indirectly through lower food prices, which make up the bulk of the poor's budget. Janson et al. (2009) state that agricultural and livestock diversity and commercialization of agriculture have played an important role in helping some families escape poverty. Whereas, other families have fallen into poverty due to crop losses or livestock deaths caused by drought and disease. Thurlow et al. (2007) considered that it is necessary to increase agricultural expenses along with non-agricultural investments to support the poor. They see the overflow of expenses in the agricultural sector as a factor in earning more income and jobs for the poor. Dankumo et al. (2018) consider the chapters of agriculture, construction, transportation, and communication in the economic and urban development sectors as one of the budget allocation priorities in Nigeria. Oriavwote and Ukawe (2018) have emphasized government expenses on housing

and construction. They perceive government cooperation with the private sector to cover the cost of construction projects as a factor in reducing poverty and preventing future recessions. Asghar et al. (2012) consider increasing social services, including expenses on planning and urban development by local governments, including construction of houses, roads, public schools, hospitals, parks, and other recreational facilities, access to drinking water and sanitation facilities as effective factors in reducing poverty, inequality and increasing public welfare. They also value the role of government in ensuring peace and security. Therefore, government expenses in law and order are limited to criminal activities, security, peace and stability, protection of individuals, and the environment. In this area, financial regulatory laws are considered as a factor to increase investment and economic activities and help reduce poverty (Asghar et al., 2012). The United Nations Development Program (2006) also claims that energy is one of the most powerful tools in human development. However, the world lacks global strategies to address this basic need according to rapid population growth. In this regard, Douglas and Willem (1996), and Saghis (2005) noted that lack of energy services is directly related to the main elements of poverty such as low level of education, limited opportunities for a proper life, livelihood activities, and conflict. Edeme et al. (2017) state that there is a direct relationship between energy consumption and human development, and access to modern energy services being essential to social basic needs and fostering human development.

Tanzi (2002) emphasizes that social security systems provide government financial support to citizens against the risks associated with aging, various forms of disability, unemployment and poverty to increase social welfare. Therefore, given the importance of protecting the vulnerable, a large portion of government expense is attributed to social insurance programs and arrears for people who have experienced adverse conditions or are elderly to reduce poverty (Bruce & Derek, 2018: 1). Gomanee et al. (2003), Chu et al. (2000), Lofgern and Rabinson (2008) have also pointed to this issue and considered it as a factor in reducing poverty and inequality. In addition to the above, increasing military expenses can also reduce welfare. This view has been expressed by the United Nations Development Planning Committee, which states, "the greatest obstacle to human development is the global cost of national defense activities" (Olabode, 2012). However, studies in this field are mixed. Some argue that defense expenses may impede economic growth and poverty reduction through the accumulation of investment or the transfer of resources from the civilian to the military sectors (Deger, 1986; Levy, 1998). Whereas during the period of economic recession when unemployment increases, more people join armed forces and this reduces poverty (Deger, 1986: 878). Also, the studies of Elveren (2012), Ali (2012), Meng et al. (2013), wolde- Rufael (2014) based on three hypotheses of weakening (reducing) inequality, expanding (increasing) inequality and neutralizing the effect of military and defense expenses on poverty and inequality are considered positive, negative or neutral, respectively. Elveren (2012), Lin and Ali (2009), Hirnissa et

al. (2009) state that if the defense industry is consumer and military products are produced domestically, it will create higher employment for the poor and reduce income inequality. Elveren (2012) states that if skilled manpower is used in the defense industry compared to non-defense industries, this will create a wage gap between the sectors by giving more wages to the skilled labor force in the defense sector. Consequently, inequality increases with increasing military expenses. Finally, he argues that if the budget allocated to the military sector is small, compared to the total government budget and the government spends most of its spending on improving welfare, such as education, health, and social welfare, the impact of defense expenses on income inequality can be negligible.

Some economists such as Aspe and Sigmund (1984), Aspe (1993), Birdsall and James (1993), Harberger (1998), Schwartz and Ter-minassian (2000) have considered the influence of government's public policies positive. For example, these economists have found it difficult to target the poor for regular education and health expenses. Dollar and Kraay (2013) found that government public expenses on education and health did not have a significant effect on the income of the poor. Dollar et al. (2013) also did not find a significant relationship between government expenses on health care and the share of 20% of the poorest households in national income (Anderson et al., 2014: 4). Flug et al. (1998), Mingat and Tan (1998), Wolf (2004) and Dreher et al. (2008) concluded that government expenses in education chapter did not have significant effect on poor access to education (Gebregziabher & Niño-Zarazúa, 2014). Margarita Benge et al. (2017) state that the sources of subsidies for liquefied natural gas, electricity, water and public transportation are mostly aimed at the upper classes of society and have little effect on reducing poverty, despite having a large budget. Moreover, Wilhelm and Fiest (2005) consider investment in infrastructure as a political concern for more unfair distribution of income due to its greater positive consequences for the rich than the poor do (Omari and Mutori, 2016: 9). Mosley et al. (2004) stated that higher levels of expenses for poor do not lead to reduction of poverty level (Haile and Nino- Zarazua, 2018: 370). The World Bank (2004) stated although about one-third of the government budget is allocated to the poor, the lack of institutional capacity to allocate these expenses largely leads to reducing human development (Edeme and Imide, 2014: 150). Filmer et al. (2000) argue that the weakness of governance, inefficiency of using institutional capacities and market failure are the basics of serious social expenses, including health expenses, and improving health status (Gebregziabher and Niño-Zarazúa, 2014). Tanzi (1974) has pointed that the government expenses redistribution may not lead to improving income inequality in some cases even can worsen it (Claus et al., 2012: 2).

3. Literature Review

Guzi and Kahance (2018) have studied the effect of the government size on the Gini coefficient using panel data, fixed effect (FE) and 2SLS methods during the period 2015-2004. The results demonstrate a non-linear relationship between

government expenses and income distribution. At first, with the positive effect of government expenses on the Gini coefficient, a decrease in income inequality is seen, but after exceeding the threshold, this effect becomes negative.

Fournier and Johansson (2016) examined the effects of government size on economic growth and income distribution first by using the least square estimator with year fixed effects, but without country fixed effects and then with adding country fixed effects during 2009-2013. The results reveal a non-linear relationship between government expenses, economic growth and income distribution. This way, public government expense reinforces potential growth. Evidence also shows that very large governments reduce potential growth, unless government performance is very effective. By increasing the size of government, family benefits or subsidies reduce inequality. In addition, government reforms in education may reduce income inequality, as the government grows larger with the goal of completing secondary education.

Martins and José Veiga (2014) studied the influence of the size of government's expenditures on defense, health, education, social protection on HDI for 156 countries for the period of 1980-2010 using a GMM methodology. They concluded that a quadratic effect exists contingent on defense, education and social protection expenditure on HDI growth.

Bandyopadhyay and Esteban (2009), using least square estimator and threshold regression methods over the period 1997-2008 ,examined the effect of the government size, public expenses, including education and health, and taxation on inequality. The results reveal that the size of the government is negatively related to inequality. Additionally, according to the threshold model, the optimal shares of public expenses, including health are 63% and 83%, respectively. Thus, the effect of public expenses on inequality is initially positive and then negative after crossing the threshold.

Davies (2009) studied the non-linear relationship between government size and human development index as an indicator of economic well-being by using panel data techniques and data from 154 samples each from different countries during the period 2000-1975. He concludes that for low-income countries, government expense has a positive effect on the human development index; in contrast, the investment spending has a negative effect on the human development index. In addition, based on the study, the effect continues until the investment spending reaches 40 percent of GDP. According to the table data, Davis states that government consumption share has violated GDP by 44% of cases and the investment share of government has violated 42% of GDP.

Zare and Zare (2017) studied a nonlinear relationship between poverty and government size in the Iranian economy using the threshold regression method during 1985-2013. The results indicate that the government size has a threshold effect on poverty and the threshold of the size of government is estimated at 21.5%. In other words, in a government regime smaller than the threshold, the size of the government has a negatively insignificant effect on absolute poverty. However, after exceeding the threshold and being in the regime of a large

government, the size of the government has a positively significant effect on absolute poverty, and the expansion of government size exacerbates poverty.

Nademi and Moftakhri (2017) examined the effect of government size on Amartyasen Welfare Index through the threshold model during 1975-2012. The results show that the government size threshold is 29%. In a small government regime, when the government size is less than 29%, increasing the size of the government has not had a significant effect on the social welfare index. Nevertheless, after increasing the size of the government and being in the regime of the big government, increasing the size of the government has had a negative impact on the social welfare index.

Nademi and Hassanvand (2015) examined the effects of the size of government thresholds on inequality of income distribution in Iran during the period 1963-2012. The results demonstrate that in the small government regime, i.e. as long as the government size is less than 0.367, increasing the size of government has no significant effect on income inequality. However, in the large government regime, the size of the government is greater than 0.367, the increase in government expenses leads to income inequality increase.

Zamani Shabkhane and Mehregan (2013) in their study found that there is an inverse relationship between income inequality and the rate of urbanization. Also, Shakibaei et al. (2015), in a study, concluded that increasing urbanization in different parts of the country has led to a reduction in income inequality.

Using simplex programming algorithm, considering all affairs and chapters of government budget and the Gini coefficient dependent variable are innovative aspects of the present study.

4. Methods

In this section, while analyzing the threshold model, the model is specified.

4.1 Econometrics Model

In estimating the threshold amount of government expenditure components with the goal of reducing income inequality, the threshold regression model will be used. This model is one of the most interesting forms of nonlinear regression model with varied applications in economics (Kourtellos et al., 2009: 434). The attractiveness of this model is because the sample is divided into several different regimes according to the threshold parameter and the coefficients of variables of some variables change depending on the regime in which they are located. Compared to other nonlinear time series models in the literature, one of the main reasons for the popularity of threshold models is that they can simply explain complex non-linear dynamics using partial linear functions. Perhaps the most important feature is that this model can provide a logical interpretation (Li et al, 2011).

A threshold regression model of the two regimes is shown as follows:

$$y_t = x_t'\beta + Z_t'\delta_1 + e_t \text{ if } \quad -\infty < q_t \leq h \tag{1}$$
$$y_t = x_t'\beta + Z_t'\delta_2 + e_t \text{ if } h \leq q_t < \infty$$

The symbol, q_t, is the threshold variable that includes all observations within the group, y_t is the dependent variable, x_t is the independent variable, e_t is the error component, and h is the threshold value.

The above model reveals that when the threshold amount is less than the threshold value, the regression equation is shown as the first expression of Equation (1), and when the threshold amount is greater than the threshold value, the regression equation is shown as the second Equation (1).

In most cases, the threshold value is unknown and must be estimated along with other model parameters.

Threshold value h can be obtained by estimating threshold regression equations through minimizing the sum of squares of threshold variable errors.

Moreover, the threshold variable can be determined by exogenous variables outside the theoretical model. Chan (1993) offers a method for obtaining a consistent estimate of the threshold value. In this method, a regression model is estimated for each possible threshold to obtain the threshold value. Then for each regression the sum of squares of error S(h) is calculated.

The threshold $\hat{h}$ is a variable that minimizes S(h).

$$minS(\hat{h}) = \hat{u}'/\hat{u} \text{ or } max\ R^2 = 1 - \hat{u}'\hat{u}/_{Tss} \quad \hat{h} = Arg\ min\ S(h) \tag{2}$$

$$minS(\hat{h}) = \hat{u}'/\hat{u} \text{ or } max\ R^2 = 1 - \hat{u}'\hat{u}/_{Tss} \quad \hat{h} = Arg\ min\ S(h)$$

Given that it is possible to have multiple threshold values for each variable, a criterion must be set to determine the number of thresholds. For this purpose, Bai and Perron test (1998) is used.

Assuming m thresholds, the regression model is calculated for each value of m, and the sum of the squares of the errors of each model is calculated. Each model with the lowest sum of squares of errors is selected, and the corresponding number of thresholds is used to estimate the threshold model. In general, if a regression model has m threshold, M + 1 different regime will have, $j = 1, \ldots, m + 1$.

This model allows regression parameters to have different values depending on the threshold values.

A regression model with several threshold values can be written as follows:

$$y_t = x_t'\beta + Z_t'\delta_1 I_1(\gamma_1,\omega_t) \ldots + Z_t'\delta_{m+1} I_{m+1}(\gamma_{m+1},\omega_t) + e_t \tag{3}$$

$$y_t = x_t'\beta + \sum_{j=1}^{m+1} Z_t\delta_1 I_1(\gamma_1,\omega_t) + e_t$$

Where $\gamma_1 < \gamma_1 < \cdots < \gamma_M$ are threshold values (arranged from descending to ascending) and $\boldsymbol{\gamma_0} = -\infty$ and $\gamma_{M+1} = +\infty$ and $I_j(\gamma_j,\omega_t) = I(\gamma_{j-1} < \omega_t \leq \gamma_j)$ are indicators that show the regime.

Subject to the threshold values, $\hat{\boldsymbol{\gamma}}_1, \ldots, \hat{\boldsymbol{\gamma}}_m$ will be a linear regression model and can be estimated by the least squares method.

$$S(\delta,\beta,\gamma) = \sum_{t=1}^{T}\left(y_t - x_t'\beta - \sum_{j=1}^{m+1} Z_t\delta_1 I_1(\gamma_1,\omega_t)\right)^2 \tag{4}$$

Threshold values are estimated by minimizing Equation (4) relative to the parameters $\delta.\beta,\gamma$.

In the next step, after calculating the threshold value, the important point is to infer its significance. In this regard, the linearity test is used.

- Linearity Test

Null hypothesis for testing the linearity of the threshold regression equation is:

$H_0: \beta_i = \alpha \quad i = 0.1.2 \ldots . n$ (5)

$H_1: \beta_i \neq \alpha \quad i = 0.1.2 \ldots . n$

The null hypothesis indicates that there is no threshold and it is a linear model. In the opposite hypothesis, there is the hypothesis of threshold and therefore a nonlinear model (Davidson and Mackinnon, 1999). Using selection matrices R=(0,I) in which I is a matrix with appropriate dimensions, $M(h) = \sum(y_t(h)\acute{y}_t(h))$ and V $V(h) = \sum(y_t(h)\acute{y}_t(h)\hat{e}_t^2)$ in which y_t is the matrix of explanatory variables.

Based on the above matrices, the Wald statistic with the point variance heterogeneity will be shown as follows:

$(h) = \big(R\theta(h)\big)'[R(M(h)^{-1}V(h)M(h)^{-1})R']^{-1}\big(R\theta(h)\big)$ (6)

In the above equation, θ is a coefficient vector. From the above statistic, the appropriate statistic to test the linearity of the threshold regression equation is obtained as follows (Spanos, 1999):

$W = SupW(h) \qquad h \in \Gamma$ (For any possible threshold) (7)

Given that the threshold parameter cannot be identified under the null hypothesis, the distribution of W in (5) will be non-standard. Therefore, Hansen (1996) proposes the Bootstrap test to approximate the asymptotic distribution of the test statistics, which is used in this study.

4.2 Simplex Linear Programming Algorithm

Threshold regression estimation alone is not able to determine the optimal amounts of government expenses in affairs and chapters; rather, in threshold-only regression, threshold values are identified in which government expenses have the least incremental effect and the most decreasing effect on income inequality. In fact, threshold regression estimates a set of constraints (inequalities) whose simultaneous acquisition will reduce income inequality. These inequalities must be solved simultaneously to estimate the optimal quotas. There are several methods for solving linear inequalities; one of the common methods is the simplex algorithm of linear programming. The simplex algorithm begins at a starting vertex and moves along the edges of the polytope until it reaches the vertex of the optimal solution (Nocedal & Wright, 1999; Forsgren, 2002). The simplex algorithm operates on linear programs in the canonical form:

maximize $C^T X$

subject to $AX \leq b$ and ≥ 0 (8)

with $C = (C_1. \ldots . C_n)$the coefficients of the objective function,$(0)^T$ is the matrix transpose, and $X = (x_1. \ldots . x_n)$ are the variables of the problem, A is a $P \times n$ matrix, and $b = \left(b_1. \ldots . b_p\right)$ are nonnegative constants $(\forall_j . b_j \geq 0)$.

4.3 The Model Specification

Based on empirical studies, Anderson et.al. (2014), Zamani Shabkhane and Mehrgan (2013), the following model is used for choosing control variable to estimate the optimal amount of government expense components with the goal of reducing income inequality. This model estimates the effect of threshold variables (government expenditure in budget affairs and chapters and government total expenditure), and non-threshold variables (other explanatory variables) on income inequality based on the threshold regression model. The effect of threshold variables, depending on the values of these variables, has a different effect on the income inequality variable over time. Different effects over time of threshold variables lead to the making of different regimes in each of the affairs and chapters of the government budget. Finally, the selection of the optimal regime constitutes the constraints of the Simplex Linear Planning Model to obtain accurate and optimal amounts of government expenditure on economic, social and cultural, defense and security, public affairs and chapters related to each of the affairs with the aim of minimizing income inequality.

$$lnINI = f\left(lnI. ln\left(\frac{Gp}{GDP}\right). ln\left(\frac{Non\_Gp}{GDP}\right). lnIn_t. lnUrban_t. lnOpen_t. lnLiteracy_t. Subsidy_t\right) \quad (9)$$

where, $lnINI$ is the logarithm of Gini coefficient as index of income distribution, and the explanatory variables of the model are: lnI ; logarithm of per capita income, $ln\left(\frac{Gp}{GDP}\right)$, logarithms of the ratio of government expenses in different affairs and chapters of the general public budget to GDP, $ln\left(\frac{Non\_Gp}{GDP}\right)$; logarithm of government expenses in affairs and chapters other than the chapter or affairs under consideration, $lnIn$; logarithm of consumer price index based on constant price in 2016, $lnUrban_t$; logarithm of urbanization rate, $lnOpen$; logarithm of the economic openness index; $lnLiteracy_t$, logarithm of literacy rate. $Subsidy$ is a dummy variable used to consider the effects of subsidy targeting on inequality in the model. The value of this variable from 2010 onwards is equal to one and in other years, it is zero. Equation (9) will be estimated separately for 4 main affairs and 21 budget chapters separately (according to the classification of affairs and chapters in 2015). Accordingly, Eviews software has been utilized. Data during the period 1980-2019 are extracted from Iranian official resources such as CBI, the Ministry of Economic Sciences and SCI.

5. Results

- Diagnostic Tests for All Affairs and Chapters of the Government Budget

The normality of the regression error residuals was investigated using the Jarque-Bera statistic. The results of normality test indicate that regression

residuals are normal in regression models. In addition, the Breusch–Godfrey test is evidence for finding autocorrelation among the errors in a regression model. The results of autocorrelation test show that there is no strong statistical evidence that there is a problem of autocorrelation in regression models. Eventually, according to the White test, there is no heteroscedasticity in regression models.

- **Stationarity and Unit Root Test**

Dickey-Fuller test in level with Structural break is used to identify the stationarity of variable in model. The results of this test are presented in Table 1.

Table 1. Identify Stationarity of Variables by using Augmented Dickey-Fuller Test in level with Structural Break

Variable Name	Test Critical Values	t-Statistic	Status
Legislation	-4.44365	-4.48954	stationary
Public	-4.85981	-5.34562	stationary
Judicial	-4.85981	-5.04810	Stationary
Financial	-4.36351	-4.67221	Stationary
R&D	-4.85981	-82.31776	Stationary
Affairs Public	-4.44365	-5.55999	Stationary
defense	-4.85981	-5.28199	Stationary
Security	-4.44365	-4.52431	Stationary
Affairs Defense	-4.44365	-5.16244	Stationary
Education	-5.17571	-13.88345	Stationary
culture	-4.44365	-4.67765	Stationary
Health	-4.44365	-5.01889	Stationary
Wealth	-4.28173	-5.01570	Stationary
sport	-4.44365	-5.37888	Stationary
Affairs social	-4.44365	-5.35900	Stationary
Agriculture	-4.85981	-5.09155	Stationary
water	-3.60869	-3.78804	Stationary
industry	-3.62735	-4.16889	Stationary
Environment	-3.60869	-3.70393	Stationary
Trade	-4.52483	-4.60955	Stationary
Energy	-4.85981	-5.03571	Stationary
Transport	-5.17571	-6.17618	Stationary
IT	-4.85981	-4.96189	Stationary

Table 1 (Continued). Identify Stationarity of Variables by using Augmented Dickey-Fuller Test in level with Structural Break

House	-4.44365	-5.21072	Stationary
Affairs Economic	-4.44365	-6.16166	Stationary
CPI	-4.44365	-5.75116	Stationary
Gini	-4.44365	-4.85759	Stationary
Urbanization	-4.44365	-8.83756	Stationary
LITERACY	-4.44365	-6.42302	Stationary
OPEN	-4.44365	-4.53072	Stationary
Total expenditure	-3.76551	-3.96160	Stationary

The results show that all variables are stationary. Therefore, the threshold regression model can be implemented to estimate the optimal amount of government expenditure components. It should be noted that since this model uses the ratio of expenditure to GDP as an explanatory variable, the Dickey-Fuller test in level with Structural break for government expenditure is based on the ratio of expenditure to GDP.

- Bai and Peron Test

The number of thresholds is determined based on the Bai and Peron test. The results of this test are presented in Table 2.

Table 2. Multiple Threshold Tests

Affairs/Chapters	Threshold Test	F-Statistic	Critical Values**	Number of Detected Thresholds
Public Affairs	**0 vs. 1 ***	**11.79**	**11.47**	**1**
Legislation	1 vs. 2 *	6.72	12.95	2
Public	2 vs. 3 *	84.61	14.03	3
judicial	0 vs. 1 *	4.87	11.47	0
Financial services	1 vs. 2 *	10.28	12.95	2
R&D	1 vs. 2 *	11.86	12.95	2
Defense Affairs	**2 vs. 3 ***	**23.63**	**14.03**	**3**
Defense	0 vs. 1 *	14.47	11.47	1
Discipline and security	2 vs. 3 *	9.75	14.03	3
Social Affairs	**2 vs. 3 ***	**136.29**	**14.03**	**3**
Education	2 vs. 3 *	80.83	14.03	3
Sport	0 vs. 1 *	11.76	11.47	1
Culture & Art	0 vs. 1 *	22.59	11.47	1
Social Welfare	0 vs. 1 *	515.5	11.47	1
Health	2 vs. 3 *	25.92	14.03	3
Economic Affairs	**1 vs. 2 ***	**7.71**	**11.47**	**1**
Agriculture	2 vs. 3 *	140.50	14.03	3

Table 2 (Continued). Multiple Threshold Tests

Water	0 vs. 1 *	75.09	11.47	1
Industry & Mining	1 vs. 2 *	6.77	12.95	2
Information Technology	2 vs. 3 *	399.07	14.03	3
Trade & Cooperation	2 vs. 3 *	38.90	14.03	3
Housing	1 vs. 2 *	75.44	12.95	2
Transportation	2 vs. 3 *	33.87	14.03	3
Environment	2 vs. 3 *	39.16	14.03	3
Energy	0 vs. 1 *	3.29	11.47	0
Total expenditure	**2 vs. 3 ***	**308.08**	**14.03**	**3**

**Significance level at 0.05. ** Bai-Perron critical values.*

Table 3 presents the results of the threshold effects of government expenditure in affairs and chapters on income inequality. Moreover, in order to achieve accurate results and maintain an adequate degree of freedom, a maximum of 3 thresholds has been applied. A threshold is chosen when it has the most negative effect and the least positive effect on inequality.

Table 3. Effects of Government Expenditure (Threshold Variables) by Affairs and Chapters on Income Inequality

	Approximate threshold (ratio of government expenditure in affairs and chapters to GDP)			**Correlation of expenditure of each chapter or affairs with income inequality**			
	Threshold 1	**Threshold 2**	**Threshold 3**	**Less than the threshold 1**	**Between 1 and 2**	**Between 2 and 3**	**More than threshold 3**
Public Affairs	1.1	-		Positive*			
legislation	0.05	-	-	Negative	Negative and significant *	-	-
Public	0.2	0.24	0.42	Negative and significant	Negative and significant *	Negative and significant	Negative and significant
Judiciary	According to Bai and Peron test, the existence of threshold effects at 95% confidence level is rejected (negative effect at 90% confidence level)						
Financial Services	0.3	-	-	Positive*	-	-	-

Table 3 (Continued). Effects of Government Expenditure (Threshold Variables) by Affairs and Chapters on Income Inequality

Science development	0.2	-	-	Negative and significant *	Negative	-	-
Defence Affairs	2.1	2.4	6.6	Positive and significant	Negative and significant *	Negative and significant	Positive and significant
Defence	5.3	-	-	Negative*	-	-	-
Order and security	0.6	0.9	1.1	Negative and significant *	Positive and significant	Positive and significant	Positive and significant
Social Affairs	6.4	7.6	8	Positive and significant	Positive and significant	Positive and significant	Negative and significant *
Training	3.1	3.9	4.3	Negative and significant	Positive and significant	Positive and significant	Negative and significant *
Physical education	0.1	-	-	Positive *	Positive	-	-
Culture and arts	0.3	-	-	Negative and significant *	Negative and significant	-	-
social welfare	1.1	1.5	-	Positive and significant *	Positive and significant	-	-
Health	1	1.3	1.4	Positive and significant	Positive and significant	Positive and significant	Negative and significant *
Economic Affairs	10.8	-	-	Negative and significant *	-	-	-
Agriculture	0.3	0.6	0.9	Negative and significant	Negative and significant *	Positive and significant	Positive and significant
Water resources	0.4	0.7	0.8	Positive and significant	Positive	Positive	Negative and significant *

Table 3 (Continued). Effects of Government Expenditure (Threshold Variables) by Affairs and Chapters on Income Inequality

Industry and Mine	0.6	1.5	-	Negative and significant *	Positive and significant	-	-
Information technology	0.08	0.13	0.3	Positive and significant	Negative and significant *	Positive and significant	Negative and significant
Commerce and Cooperation	0.05	0.1	0.86	Positive and significant	Negative and significant	Negative and significant *	Negative and significant
Housing and Civil Engineering	0.9	1.2	-	Negative*	Positive and significant	-	-
Transport	0.7	1	1.5	Negative and significant	Negative and significant *	Negative	Positive and significant
Environment	0.02	0.026	0.031	Negative and significant	Negative and significant *	-	-
Energy	Based on Bai and Peron test, the existence of threshold effects at 95% confidence level is ruled out (meaningless effects)						
Total expenditure	15.3	17.4	25.2	Positive and significant	Positive	Negative and significant *	Positive

***Source**: Research Findings*

The meaning of *: A threshold is chosen when it has the most negative effect and the least positive effect on inequality (chosen regime).

In public affairs with threshold 1.1, government expenses have positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in public must be between threshold 0 and 1.1($0 < A \leq 1.1$).

In legislation chapter with threshold 0.05, government expenses have negative and significant effects on income inequality in the second regime. This means that the amount of government expenses in legislation must be more than threshold 0.05(0.05<A1).

In public chapter with three thresholds of 0.2, 0.24 and 0.42, government expenses have negative and significant effects on income inequality in all regimes. Therefore, a regime will be choice so that it has the least positive effect

on inequality, i.e. the second regime with threshold ranging between 0.2 and 0.24 ($0.2<A2\leq0.24$).

According to the Bai and Peron test, there are not threshold effects in judicial chapters ($0<A3$).

In financial services chapter with threshold 0.3, government expenses have positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in financial services must be between threshold 0 and 0.3($0<A4\leq0.3$).

In science development chapter with threshold 0.2, government expenses have negative and significant effects on income inequality in the first regime. This means that the amount of government expenses in science development must be between threshold 0 and 0.2 ($0<A5\leq0.2$).

In defense affairs with three thresholds 2.1, 2.4 and 6.6, the government expenses have positive, negative, negative, positive and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Consequently, a regime will be of choice to have the most negative effect and the least positive effect on inequality i.e. the second regime with threshold, between 2.1 and 2.4 ($2.1\leq B\leq2.4$).

In defense chapter with threshold 5.3, government expenses have positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in defense must be between threshold 0 and 5.3 ($0<B1\leq5.3$).

In order and security chapter with three thresholds of 0.6, 0.9 and 1.1, the government expenses have negative, positive, positive, positive effects and are significant on income inequality in the first, second, third and fourth regimes, respectively. Therefore, a regime will be of choice so that it has the most negative effect and the least positive effect on inequality i.e. the first regime with threshold between 0 and 0.6 ($0<B2\leq0.6$).

In social affairs with three thresholds of 6.4, 7.6 and 8, the government expenses have positive, positive, positive, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. As a result, a regime will be of choice to have the most negative effect and the least positive effect on inequality i.e. the fourth regime with threshold more than 8 ($8\leq C$).

In training chapter with three thresholds of 3.1, 3.9 and 4.3, the government expenses have negative, positive, positive, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Consequently, a regime will be chosen so that it has the most negative effect and the least positive effect on inequality i.e. the fourth regime with threshold more than 4.3 ($4.3\leq C1$).

In physical education chapter with threshold 0.1, government expenses have positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in physical education must be less than threshold 0.1 ($0.1\leq C2$)

In culture and arts chapter with threshold 0.3, government expenses have negative and significant effects on income inequality in the first regime. This means that the amount of government expenses in culture and arts must be between thresholds of 0 and 0.3 ($0<C3\leq0.3$).

In social welfare chapter with two thresholds of 1.1, 1.5, the government expenses have positive and significant effects on income inequality in all regimes. Therefore, a regime will be chosen to have the least positive effect on inequality i.e. the first regime with threshold between 0 and 1.1 ($0<C4\leq1.1$).

In health chapter, three thresholds 1, 1.3 and 1.4, the government expenses have positive, positive, positive, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. As a result, a regime will be of choice that has the most negative effect and the least positive effect on inequality i.e. the fourth regime with threshold more than 1.4 ($1.4\leq C5$).

In economic affairs with threshold 10.8, government expenses have positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in economic affairs must be between threshold 0 and 10.8 ($0<D\leq10.8$).

In agriculture chapter with three thresholds of 0.3, 0.6 and 0.9, the government expenses have negative, negative, positive, positive and significant effects on income inequality in the first, second, third and fourth regimes, respectively. So, a regime will be chosen so that it has the most negative effect and the least positive effect on inequality i.e. the second regime with threshold between 0.3 and 0.6 ($0.3\leq D1\leq0.6$).

In water resources chapter with three thresholds of 0.4, 0.7 and 0.8, the government expenses have positive, positive, positive, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Therefore, a regime will be of choice to have the most negative effect and the least positive effect on inequality i.e. the fourth regime with threshold more than 0.8 ($0.8\leq D2$).

In industry and mine chapter two thresholds of 0.6 and 1.5, government expenses have negative, positive and significant effects on income inequality in the first and second regimes, respectively. Accordingly, a regime will be of choice that has the most negative effect and the least positive effect on inequality i.e. the first regime with threshold between 0 and 0.6 ($0<D3\leq0.6$).

In information technology chapter with three thresholds of 0.08, 0.13 and 0.3, the government expenses have positive, negative, positive, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. As a result, a regime will be of choice, which has the most negative effect and the least positive effect on inequality i.e. the second regime with threshold between 0.08 and 0.13 ($0.08\leq D4\leq0.13$).

In commerce and cooperation with three thresholds of 0.05, 0.1 and 0.86, the government expenses have positive, negative, negative, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Consequently, a regime will be chosen so that it has the most

negative effect and the least positive effect on inequality i.e. the third regime with a threshold between 0.1 and 0.86 (0.1≤D5≤0.86).

In housing and civil engineering chapter with two thresholds of 0.9 and 1.2, the government expenses have negative, positive and significant effects on income inequality in the first and second regimes, respectively. Therefore, a regime will be chosen so that it has the most negative effect and the least positive effect on inequality i.e. the first regime with threshold between 0 and 0.9 (0<D6≤0.9)

In transport chapter with three thresholds of 0.7, 1 and 1.5, the government expenses have negative, negative, negative, positive and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Accordingly, a regime will be of choice that has the most negative effect and the least positive effect on inequality i.e. the second regime with a threshold between, 0.7 and 1(0.7≤D7≤1).

In environment chapter with three thresholds 0.02, 0.026 and 0.031, the government expenses have negative, negative and significant effects on income inequality in the first and second regimes, respectively. So, a regime will be of choice that has the most negative effect on inequality i.e. the second regime with threshold between 0.02 and 0.026 (0.02≤D8≤0.026).

According to the Bai and Peron test, there are not threshold effects in energy chapters (0<D9).

In total expenses with three thresholds of 15.3, 17.4 and 25.2, the government expenses have positive, positive, negative, positive and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Therefore, a regime will be chosen so that it has the most negative effect and the least positive effect on inequality i.e. the third regime with threshold between 17.4 and 25.2 (17.4≤E≤25.2).

As a result, with a set of constraints obtained from Table 3, inequality is expected to minimize the income.

Table 4. Expenditure optimization constraints aimed at minimizing income inequality

	Symbol	Optimization constraint
Public Affairs	A	$0 < A \leq 1.1$
legislation	A1	$0.05 < A1$
Management Public	A2	$0.2 < A2 \leq 0.24$
Judiciary	A3	$0 < A3$
Financial Services	A4	$0 < A4 \leq 0.3$
Science development	A5	$0 < A5 \leq 0.2$
Defense Affairs	B	$2.1 \leq B \leq 2.4$
Defense	B1	$0 < B1 \leq 5.3$
Order and security	B2	$0 < B2 \leq 0.6$
Social Affairs	C	$8 \leq C$
Training	C1	$4.3 \leq C1$

Table 4(Continued). Expenditure optimization constraints aimed at minimizing income inequality

Physical education	C2	$0.1 \leq C2$
Culture and arts	C3	$0 < C3 \leq 0.3$
social welfare	C4	$0 < C4 \leq 1.1$
Health	C5	$1.4 \leq C5$
Economic Affairs	D	$0 < D \leq 10.8$
Agriculture	D1	$0.3 \leq D1 \leq 0.6$
Water resources	D2	$0.8 \leq D2$
Industry and Mine	D3	$0 < D3 \leq 0.6$
Information technology	D4	$0.08 \leq D4 \leq 0.13$
Commerce and Cooperation	D5	$0.1 \leq \mathrm{D5} \leq 0.86$
Housing and Civil Engineering	D6	$0 < \mathrm{D6} \leq 0.9$
Transport	D7	$0.7 \leq \mathrm{D7} \leq 1$
Environment	D8	$0.02 \leq \mathrm{D8} \leq 0.026$
Energy	D9	$0 < \mathrm{D9}$
Total expenses	E	$17.4 \leq \mathrm{E} \leq 25.2$
Constraints on the equality of the sum of chapters with affairs	Public	A1+A2+A3+A4+A5=A
	Defense	B1+B2=B
	Social	C1+C2+C3+C4+C5=C
	Economic	D1+D2+D3+D4+D5+D6+D7+D8+D9=D
	Total expenses	A+B+C+D=E

***Source**: Research Findings*

The optimal government expenses in all budget affairs and chapters should be determined in such a way that all the constraints of Table 4 are met at the same time. For this purpose, the simplex linear programming method has been used. The optimization results[2] are presented in Table 5.

[2] Optimization means the exact amount of government expenditure to minimize income inequality.

Table 5. Optimal amounts of government expenses in budget affairs and chapters with the aim of minimizing income inequality - percentage of GDP

	The optimal amount		**The optimal Amount**
Public affairs	**1.1**	social welfare	1.08
Legislation	0.092	Health	2.25
Public	0.24	**Economic Affairs**	**5.52**
Judiciary	0.268	Agriculture	0.6
Financial services	0.3	Water resources	1
Science development	0.2	Industry and Mine	0.6
Defense affairs	**2.35**	Information technology	0.13
Defense	1.79	Commerce and Cooperation	0.86
Order and security	0.56	Housing and Civil Engineering	0.9
Social affairs	**10.2%**	Transport	1
Training	6.5	Environment	0.026
Physical education	0.16	Energy	0.4
Culture and arts	0.22	**Total expenses**	**19.2**

***Source**: Research Findings*

The results exhibit government expenses should be equal to 19.2% of GDP to reduce income inequality; the total level of government expenses is more important than the combination of government expenses. The optimal share of public affairs expenses was estimated at 1.1, defense at 2.35, social affairs at 10.2 and economic affairs at 5.5% of GDP. To reduce income inequality, the largest share should be given to the training chapter, followed by the health chapter. The largest share of these chapters is due to their significance and role in the development process, reducing poverty and reducing income inequality in societies. As such, according to the studies of Kartasasmita (1996), , Asghar et al. (2012), O'Donnell et al (2013), Seetanah et al. (2009), Fournier and Johansson

(2016), Ilker (2018), Oriavwote and Ukawe (2018), Ambia and Sujarwoto (2018), Ionu (2018), Dankumo et al (2018), increasing government expenses on health and education is a factor in reducing the health expenses of the poor, increasing human capital and increasing per capita income. Thus, increasing government expenses in these sectors, by increasing life expectancy and creating the ability of the poor as a healthy workforce group to participate in productive activities, creates more opportunities for work and income, creating skills and confidence for people to absorb technologies.

After the chapters on education and health in social affairs, the defense chapter in defense affairs has a high priority in allocating the government budget. Elveren (2012), Ali (2012), Meng et al. (2013), Wolde-Rufael (2014) suggested three hypotheses; weakening Inequality-Narrowing, expansion (Inequality-Widening) and the Neutrality Hypothesis for the impact of military and defense expenses on poverty and inequality. Elveren (2012), Lin and Ali (2009), Hirinissa et al. (2009) state if the defense industry is the user and military products are produced in the country, there would be higher employment for the poor and unequal income would decrease. Elveren (2012) states that if skilled manpower is used in the defense industry compared to non-defense industries, this will lead to a wage gap between the sector by giving more wages to the skilled labor force in the defense sector. As a result, inequality increases with increasing military spending. Finally, he argues that if the budget allocated to the military sector is small compared to the total government budget and the government spends most of its spending on improving welfare, such as education, health and social welfare, the impact of defense spending on income inequality could be small. Iran's strategic position in the region and the imposition of sanctions over the years have led to a large share of the government budget to the military and defense sector. Due to the production of defense products in Iran and the demand for a large part of the workforce in this area, the chapter is based on the hypothesis of reducing inequality in the high priorities of government budget allocation to reducing income inequality.

6. Concluding Remarks

Although one of the objectives of the Islamic Revolution of Iran has been to reduce the gap between social classes and increase justice, income inequality in the country has increased sharply in recent years. One of the tools that can be used to reduce income inequality is allocating public funds to affairs in different chapters.

Therefore, given this necessity in this study, by combining the threshold regression method and the simplex linear programming algorithm, the optimal amount of government expenses in different affairs and chapters during 198-2019 was estimated. The results demonstrated total expenses with three thresholds of 15.3, 17.4 and 25.2 had positive, positive, negative, positive and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Therefore, a regime will be chosen to have the most negative effect

and the least positive effect on inequality i.e. the third regime with threshold between 17.4 and 25.2 (17.4≤E≤25.2). Optimal amount of total government expenditure in GDP is obtained 19.2% by using simplex linear programming algorithm. In public affairs with a 1.1 threshold, the government expenses had positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in public must be obtained between threshold 0 and 1.1($0 < A \leq 1.1$). Optimal amount of government expenditure in public affair to GDP is obtained 1.1 % by using simplex linear programming algorithm. In defense affairs with three thresholds of 2.1, 2.4 and 6.6, the government expenses had positive, negative, negative, positive and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Accordingly, a regime will be chosen so that it has the most negative effect and the least positive effect on inequality i.e. the second regime with threshold between 2.1 and 2.4 (2.1≤B≤2.4). Optimal amount of government expenditure in defense affairs to GDP is obtained 2.35 % by using simplex linear programming algorithm. In economic affairs with 10.8 threshold, government expenses had positive and significant effects on income inequality in the first regime. This means that the amount of government expenses in economic affairs must be obtained between threshold 0 and 10.8 (0<D≤10.8). Optimal amount of government expenditure in economic affairs to GDP is obtained 2.52 % by using simplex linear programming algorithm. In social affairs with three thresholds of 6.4, 7.6 and 8, the government expenses had positive, positive, positive, negative and significant effects on income inequality in the first, second, third and fourth regimes, respectively. Consequently, a regime will be chosen to have the most negative effect and the least positive effect on inequality i.e. the fourth regime with threshold more than 8 (8≤C). Optimal amount of government expenditure in social affair to GDP is obtained 10.2 % by using simplex linear programming algorithm.

Accordingly, among all affairs, social and economic affairs have the highest priority for the allocation of government budget. Among all chapters, the training, health, defense and social welfare, with a share of 6.5, 2.25, 1.79 and 1.08, respectively, are the most important ones in minimizing income inequality.

Therefore, given the results, government resources should first focus on social and economic affairs and then prioritize the chapters to training chapters in order to promote human capital, the health chapter for building capacity for the poor as a healthy workforce group, the defense chapter should be dedicated to maintaining internal and external security according due to Iran's strategic position in the region. Finally, the social welfare chapter should be designated to provide the livelihood of the injured and the unemployed. As a result, government resources should be directed to affairs and chapters that have a greater and more positive impact on minimizing income inequality.

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