

Investigating the Structural Changes of Tax in Iran

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Abstract

Structural change is defined as a change in the relative weight of the important constituents of the macro-economic indicator such as production, taxes, imports and exports, workforce etc. Since the structure change is one of the main reasons for the growth and economic development of countries, the investigation of the trend of changes in economic important constituents is important. Tax as an important source of state revenue is one of the most significant macro-economic indicators; furthermore it is the most important instrument of the state's fiscal policy. So due to the important position of tax in the countries' economy, evaluating the trend of changes in the tax structure is of paramount importance. Therefore, the purpose of this study is to investigate the structural changes of taxes in Iran, by Bai and Perron method, for the period 1971-2012. The results based on the UDmax and WDmax tests show that there is at least one breakpoint in the movement process of all taxes in Iran; also based on the sequential procedure all breaks have not lead to the structural changes and Iran have not had the structure changes in income tax.

Keywords: Structural Breaks, Tax Structure Changes, Bai and Perron Method, Iran.

JEL Classification: H20, H11, C22.

1. Introduction

Structural evolutions in the near past have created the significant changes in economic growth of countries, international trade and the expansion of urban centers. Structural change is defined as a change in the relative weight of the important constituents of the macro-economic indicator, such as production and government expenses, taxes, imports

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and exports, population and workforce. One example of this structural change that is done quickly is the transition from the agricultural sector to the production and services one. Another example is the transfer of population from young to older in which the increase of life expectancy has been considerable and also the other example is mutation in technology capacities in the some developing countries.

With a change in the macro structures the tax structure also has exposed to change proportionately. In the non-oil new economy the taxes has an important place, because the states' need to financial credit for performing the duties and responsibilities of providing safety and protection of borders, providing public goods and services, consolidation and so on in the society cause them to act in various ways for providing financial credit and the taxes as one of the most important ways of providing financial credit since the beginning of formation of societies and states have always been considered and investigated; in fact the tax is among the important sources of the state's revenues that is also the most important instrument of implementing the state's fiscal policy and plays an important role in achieving the economic goals such as the social justice, improving income distribution, resource allocation and economic stability.

So due to the very important position of tax in the countries' economy, investigating the trend of changes in the tax structure is of paramount importance; hence in this study we investigate the changes in the tax structure in the Nordic countries and its comparison with Iran for the period 1971-2012. In this regard the second part has dealt with the literature by examining the conducted researches that have been provided on the structural changes and tax. In the third and fourth section we have clarified and estimated the model and finally conclusion is presented.

2. Literature

Background of studies and analyses of structural change and their results that have found a great importance especially in the second half of the 20th century onwards is very detailed. The first work in this area could be attributed to Smith (1776) who refers to the relationship between the structural composition of economy and the obtained development stage, so that each stage of development is characterized

by a specific combination of product and a change in this composition is seen as a basic requirement for achieving higher stages of development.

Hori et al. (2012) investigated the structural changes in the model of endogenous two-part growth and that existence of side effects of specific product consumption could be the source of structural changes. Under limited circumstances that side effects are the same, structural changes occur. Randall (2012) has investigated the structural changes in developing countries and the evolution of the labor market of women since 2008 with assessing the role of change in the workforce demand. Results show the importance of structural change in reducing gender inequality by reducing the demand for workforce for the physical properties. Dennis & Iscan (2011) carried out a study entitled "agricultural distortions, structural change and economic growth: a field analysis". The results showed that policies of agricultural deviation in weak economies could explain the departure from the convergence center and in the sample under study delay considerably their structural changes and economic growth. McMillan & Rodrik (2011) mentioning the importance of economy structure change for achieving development recognize the most important factor of difference between two groups of the successful and unsuccessful countries to be historically the speed of transition of agricultural structure of economy to industrial one. MuYi & Zhang (2010) by using the three-part model investigated the structural changes in the open economy. Their results showed that there is a relationship between the share of employment, share of expenses sector and net exports from GDP. Lucchese (2011) has examined innovation, demand and structural changes for the six largest economies in Europe in the period of 1995-2007. The results show that the structural changes play an important role in the attraction of economic growth. Mertens & Ravn (2013) examined the dynamic effects of personal income and corporate tax changes in the United States; the results show that it is the short-term effects of output of large tax shocks that due to their impact on the labor market and the main constituents of the costs are important for distinguishing the different types of tax. Sivadasan & Slemrod (2008) studied the tax law changes, changes in income and the wage inequality measure in the period 1986-1995 for

India. They found that there is a quick and comprehensive response by the partner companies for changing the tax law in the form of a significant change of income resulting from profit toward the managed wages. Lee (2012) were studied the tax effort and tax capacity of 110 developed and developing countries over the period 1994 to 2009. The results show that countries with better institutional quality such as quality of the bureaucracy can collect higher tax.

Moshiri & Eltjaee (2008) examined the effects of structural changes on economic growth of newly industrialized countries for the period 1970-2004 and the results show that besides traditional factors determining the economic growth the structural change has also a positive and significant impact on economic growth of newly industrialized countries. Moshiri & Eltjaee (2012) conducted a comparative study about the long-term trend of structural changes in the Iranian economy compared with the newly industrialized economies for the period 1973-2008. The results indicate that in the period before the oil price hike all structural variables under discussion in the Iranian economy have had the trends similar to the newly industrialized countries; but in the oil, revolution and war periods due to multiple economic and political shocks they exposed to inappropriate changes. In periods of reconstruction and third program, some indicators although have relatively improved, with compared to the level and trend of corresponding variables in the newly industrialized economies they are still in the relatively inappropriate situation. Yousefi et al. (2013) studied the structural changes and their impact on employment in manufacturing industries in Iran for the period 1995 to 2009 and the regression estimation results indicate that the impact of structural changes on employment in manufacturing industries in Iran has been positive. Rashidi (1995) has researched about the country's tax system reform. The research results show that moving away from indirect taxes, moving away from reliance on the wage tax and corporate tax and instead broadening the base of the tax system through reliance on the consumption tax and value added tax are necessary for the tax system reform. Hatamzadeh & Gheybi (2001) examined the state of country's tax system for the period 1963 to 2000; the results indicate that the index of taxes ratio to GDP as one of the criteria for measuring the efficiency of the tax system has had a

significant fluctuation in recent years. Mousavi & Shakeri (2003) studied the efficiency of the tax system in the Iranian economy according to the price attraction and tax interruption for the period 1979 to 2000. The results show that the tax system is not efficient in collecting taxes and in relation to changes in prices has not high sensitivity. Shakibayi & Khorasani (2012) examined the factors affecting the tax performance in Iran by using provincial data during the period 2001 to 2009. The results show that an increase in ratio of value added of the sectors of services, mining, industry and building to GDP has caused to increase the tax ratio. Shakibayi et al. (2015) examined the tax capacity of the country's Provinces with a spatial econometric approach. Results show that an increase in the human development index leads to increase of income, wealth, total and sales taxes and the share of value added of agriculture sector from the total value added is indirectly relevant in tax capacity.

3. Theoretical Foundations

By assuming the entry of induction and independent tax and its dependence on income and placement of the total supply instead of the total demand (equality clause), tax is relatively dependent on Y and the factors of production and moderating parameter of factors of production such as productivity. If the tax is considered as relative, we have:

$$\frac{T}{Y} = (K, L, Y, A) \quad (1)$$

In which K is the capital size and L the workforce, Y value added (national income) and A the productivity coefficient or technology coefficient.

Gordon & Li (2009) from the condition of maximization of social welfare and given that the aim of entering the state and taxation is the maximization of social welfare and with introducing the types of taxes (including capital tax, sale tax, imports tax, tariffs) in this function conclude that:

$$W = \max_{s_i^*, \tau_2} [V(p_1^*, p_2^*(1 + \tau_2), w, r) + U(\sum_i s_i^* p_i^* f_i^* + t_K K + \tau_2 p_2^* M_2)] = \max_{s_i^*, \tau_2} [V(p_1^*, p_2^*(1 + \tau_2), w, r) + U(\sum_i p_i^* (f_i - C_i))] \quad (2)$$

In the above equation V is an indirect benefit that one

representative of activity of private sector receives and U is a function of the total tax revenue that is the supplier of public expenses. Gordon believes that for identifying the effectiveness of tax we can argue whether the companies for financing act through banks or use the internal resources. In the above equation the capital is taxed with t_K rate, while any t_K of industry is faced conditionally with a maximum rate of sale tax $s_1^{max} < s_2^{max}$ and s_i^* . Suppose that a country exports the first goods and imports the second goods. Goods2 is imported with a tariff of τ_2 rate, while export of the first goods is done without tax.

We identify imports of the second goods by M_2 and domestic consumption of two goods by C_i . The domestic consumption prices are equal to p_1^* & $p_2^*(1 + \tau_2)$, while the prices that domestic producers are faced with them is equal to $p_1^*(1 - s_1^*)$ and $p_2^*(1 + \tau_2)(1 - s_1^*)$. To simplify the notation $f_1^* \equiv f_1$ and $f_2^* \equiv (1 + \tau_2)f_2$ suppose i for domestic production in industry as well as the total capital, r for domestic interest rate and w for the internal wage rate. Considering the total internal budget limitation the state tax profit is equal to the value of domestic consumption. The state maximizes this with limitation of $s_i^* < s_i^m$ for each given t_K .

The constituted condition of the first order for t_K is as following:

$$U' \left(\sum_i p_i^* \left(\frac{\partial f_i}{\partial \tau_2} - \frac{\partial C_i}{\partial \tau_2} \right) \right) = V_I \left(p_2^* C_2 - K \frac{\partial r}{\partial \tau_2} - L \frac{\partial w}{\partial \tau_2} \right) = V_I p_2^* (M_2 + s_2^* f_2) \quad (3)$$

where V_I measures the ultimate utility of income and L does the total workforce. The collective budget of individuals is equal to:

$$p_1^* C_1 + p_2^* (1 + \tau_2) C_2 = p_1^* (1 - s_1^*) f_1 (L - L_2, K - K_2) + p_2^* (1 + \tau_2) (1 - s_1^*) f_2 (L_2, K_2) - t_K K \quad (4)$$

which connotes:

$$\left(\sum_i p_i^* \left(\frac{\partial f_i}{\partial \tau_2} - \frac{\partial C_i}{\partial \tau_2} \right) \right) = p_2^* (M_2 + s_2^* f_2) + \tau_2 p_2^* \frac{\partial C_2}{\partial \tau_2} + \frac{s_1^*}{1 - s_1^*} \left(w \frac{\partial L}{\partial \tau_2} + (r + t_K) \frac{\partial K}{\partial \tau_2} \right) + t_K \frac{\partial K}{\partial \tau_2} + p_2^* \frac{\partial f_2}{\partial \tau_2} \left(1 - \frac{(1 + \tau_2)(1 - s_2^*)}{1 - s_1^*} \right) \quad (5)$$

by substituting equation (3) with equation (5) the following result is achieved:

$$\left(1 - \frac{V_I}{U'} \right) (M_2 + s_2^* f_2) + \tau_2 p_2^* \frac{\partial C_2}{\partial \tau_2} + p_2^* \frac{\partial f_2}{\partial \tau_2} \left(1 - \frac{(1 + \tau_2)(1 - s_2^*)}{1 - s_1^*} \right) + t_K \frac{\partial K}{\partial \tau_2} + \frac{s_1^*}{1 - s_1^*} \left(w \frac{\partial}{\partial \tau_2} + (r + t_K) \frac{\partial K}{\partial \tau_2} \right) = 0 \quad (6)$$

The above function can be written as follows:

$$(\alpha_1 M_2 + \alpha_2 f_2) + \beta \left(\frac{\partial C_2}{\partial \tau_2} \right) + \varphi \left(\frac{\partial f_2}{\partial \tau_2} \right) + \gamma \left(\frac{\partial K}{\partial \tau_2} \right) + \left(\mu_1 \frac{\partial L}{\partial \tau_2} + \mu_2 \frac{\partial K}{\partial \tau_2} \right) = 0 \quad (7)$$

Coefficients in the above equation are as follows:

$$\alpha_1 = \left(1 - \frac{V_1}{U'} \right), \quad \alpha_2 = s_2^* \left(1 - \frac{V_1}{U'} \right), \quad \beta = \tau_2 p_2^*, \quad \varphi = p_2^* \left(1 - \frac{(1+\tau_2)(1-s_2^*)}{1-s_1^*} \right),$$

$$\gamma = t_K, \mu_1 = \frac{s_1^*}{1-s_1^*} w, \mu_2 = \frac{s_1^*}{1-s_1^*} (r + t_K)$$

In equation (6) the first phrase measures the net welfare effects from the bulk transfer of specific amount by residents to state that indicates the total tax. Also the second, fourth and fifth phrases are tax on consumption, capital and sale. The third phrase measures the effect of net efficiency caused by changes in the composition of production; so changes function of changes in the efficiency (here per capita income) can be presented as follows that according to Gordon model is a function based on the types of tax:

$$E = f(T_i) \quad (8)$$

Theoretically there are different arguments about the importance of structural change for economic growth and the relationship between these two phenomena out of which we can refer to cases such as hypothesis of multi-sectoral economy, the income attraction and the law of parasite, capital deepening and innovation, higher allocation and growth, industrialization and the hypothesis of suitable or normal structure. One of the important foundations of the hypothesis of the effect of structural changes on the economic growth and development is that the structural changes cause the allocation of resources to sectors with the higher productivity; this situation helps the growth. Therefore, if structural change leads to a more complete and better exploitation, then the structural changes is seen as another source of growth (Chenery, 1986; Eltejayi, 2008). Hence, economists introduced the structural changes as a source of the economic growth. If the technological progress is large enough, the average propensity to save and national income will increase naturally (Lightner, 2000). Iginger (2001) with a mention to the hypothesis of norm structure suggests that if any income level creates a specific industrial structure, it can be hypothetically calculated a norm structure dependent on the

income. It is expected the countries that exhibit this norm structure, in other words have the natural structure consistent with income level, they can grow more rapidly, while the countries that do not have the natural structure consistent with the income level will have slower growth. The hypothesis of consistency of structure with the level of income in the Petroleum Exporting Countries that the vast oil revenues have caused the increase of their per capita income has very importance. In general, structural changes can be occur by various reasons such as war, economic adjustment, changes in the exchange rate regime, change of pricing system etc. that depend on year of breakpoint. In the following we provide descriptions about the structural break and its identification and determination.

In the present study based on the work method and way of estimating the model, it is necessary for investigating the structural changes of taxes first the structural breaks of tax system in the desirable period are specified; hence in the following some explanations about structural break and its diagnosis and determination are provided.

If the change in the process of variables due to conditions and circumstances prevailing on economic variables takes place alongside with changes in the parameters of model, or in other words if in the reliability of the parameters of a model a disorder occurs, these changes are called the structural break (Marzban & Nejati, 2009).

A statistic test of structural break can usually be divided into four categories:

- 1- Certain breakpoints against uncertain breakpoints.
- 2- A single break against multiple breaks.
- 3- The univariate relationship against the multivariate relationships.
- 4- The stable variables against unstable variables (Madala & Kim, 1998).

Perron is an economist that has done several studies in relation to structural breaks. He believes that most of macroeconomic time series are not characterized as having a unit root. He says that the existence of unit root that is confirmed in most of variables of macroeconomic time series may be caused by lack of attention to major structural breaks in the process of these variables. For this purpose the tests of Dicky-Fuller (DF) and generalized Dickey-Fuller (ADF) are used as

the most common stationary test methods of the time series. In the studies of Perron (1989, 1997) and Rappoport & Riechilin (1998) the levels of redirection has been determined as exogenous.

4. The Model Estimation

Since per capita income is one of the most important and macro indicators of economy, a lot of data and factors are influencing on this variable. With a study and analysis of conducted previous studies about per capita income and the various estimates that have been done on this indicator, two important effective indicators of per capita net capital and state expenses to GDP can be introduced and according to mentioned themes in the theoretical foundations, the final function of per capita income that is the desired function of this research is presented as follows:

$$E = f \left(T_i, \frac{GFC}{POP}, \frac{G}{GDP} \right) \quad (9)$$

In the above equation E , $\frac{GFC}{POP}$ and $\frac{G}{GDP}$ represent respectively the per capita income, per capita net of the capital stock and ratio of state's expenses to gross domestic product. Also T represents a variety of tax rates which include: the total tax ratio to gross domestic product, ratio of income tax, corporate, wealth and sale of goods tax that each one is estimated separately in an equation. It should be noted that the period under review Iran's consumption tax involved a small number of goods and services but from 2009 onwards, VAT gradually has spread out and covered most goods and services. In addition Iran's data in the period 1971-2012 are used for estimating.

Also for estimating the model, investigating and determining the structural break the GUASS software has been used.

The test of structure break in the linear regression models took place first by Chow (1960) and Quant (1958), then by Brown, Durbin and Evans (1975). In these studies the test of structure break is done exogenously in a predetermined point; but since 1990 other methods for testing the structural break have been used. In these methods the desired test is done endogenously in an undetermined or non-predetermined point or points. These methods are presented by Andrews (1993); Andrews & Ploberger (1994) Andrews for the one break state and by

Lee & Ploberger (1996); Liu et al. (1997); Bai & Perron (1998, 2003) for the multi break state. In the present research based on the method of Bai & Perron (1998, 2003) the number and place of breakpoints were estimated endogenously by using linear regression model. Yao (1988) for calculating the structural breaks proposes the use of Bayesian information criterion (BIC), while Liu et al. (1997) offer the modified Schwartz criterion (LWZ). Perron (1997) provides a simulated study about the behavior of these two information criteria and the criterion of AIC in the field of estimation of number of changes in the process function of a set and series concerning the existence of serial and sequential correlation and relationship. First it is assumed that there is a number (1+m) of the policy regime, as a result we have m structural change. So it has a linear regression with m break and (1+m) parameter that their statistical representation is as follows:

$$y_t = x_t' \beta + z_t' \delta_1 + u_t \quad t = 1, \dots, T_1 \quad (10)$$

$$y_t = x_t' \beta + z_t' \delta_m + u_t \quad t = T_1 + 1, \dots, T_2 \quad (11)$$

$$y_t = x_t' \beta + z_t' \delta_{m+1} + u_t \quad t = T_m + 1, \quad (12)$$

T_1, T_2, \dots, T_m is the undetermined structural breakpoints (non-predetermined), y_t the dependent variable in time t , z_t with dimensions $(q \times 1)$, the vector of independent variables with variable coefficients in the different regimes, x_t with dimensions $(p \times 1)$, vector of independent variables with the constant coefficients, β the vector of constant coefficients, $(m+1, \dots, 2, 1 = j)$ δ_j the vector variable coefficients and u_t is the error in the time t . $P=0$ is the model of pure structural break, this means that all coefficients change with δ_j , otherwise $(p > 0)$ is a model with partial break, because only δ_j changes. It is assumed that β is constant and δ_j changes with the regime change. The main objective is that we can estimate the coefficients and undetermined breakpoints of regression $(\beta, \delta_1, \dots, \delta_{m+1}, T_1, T_m)$ when T observation from (y_t, z_t, x_t) is obtained.

The statistics proposed by Bai & Perron in order to identify and estimate the breakpoints are as follows:

- 1- The test of $\sup F_T(k)$ with assuming zero ($m=0$) means the lack of structural change and opposite hypothesis ($m=k$) means the existence k break in the model.

2- The tests of UDmax and WDmax that WDmax is the weight type of Udmax. The weight used in these tests is dependent on the number of explanatory variables and significance level of test. The zero hypothesis in these two tests is the lack of structural break ($m=0$) and the opposite hypothesis is the uncertain number of break with the maximum number m (Marzban & Nejati, 2009).

Table 1: Results of UDmax, WDmax and SupF_T Tests at a Significance Level of 5%

Tax on Goods and Services	Tax on Wealth	Tax on Corporates	Tax on Income	Total Tax	Critical Value	Test	Break
39.822	25.325	38.02	61.223	41.942	8.01	UDmax	
53.966	34.32	51.524	82.968	41.942	8.69	WDmax	1
22.459	14.175	25.955	23.445	41.942	7.86	SupF _T	
39.822	25.325	38.02	61.223	26.36	5.8	SupF _T	2

Resource: Estimate Calculation

Due to the Table (1) it is observed that based on the UDmax and WDmax tests there is at least one breakpoint in the movement process of all taxes of Iran, also based on SupF_T test there are two breaks that both of them are significant.

Table 2: Results of BIC and LWZ Tests at Significance Level of 5%

Taxes	Intercept	The first regime	The second regime	The third regime	Number of Break
Total Coefficient	15.892	0.084	0.176	-----	1
Income Coefficient	15.637	-0.74	-0.4	-0.682	2
Corporates Coefficient	16.812	0.359	0.869	0.447	2
Wealth Coefficient	15.99	-0.426	-0.235	-0.371	2
Goods and Services Coefficient	15.513	-0.422	-0.196	-0.449	2

Resource: Estimate Calculation

Hint: The results of the BIC and LWZ tests are the same and for this reason the results come at one table.

Based on the table (2) for all taxes, except total tax has had two breaks, but total tax has exposed to one break.

The results of the sequential procedure are expressed in the following,

Table 3: Break Specifications of Kinds of Tax

Coordinates break	Total Tax	Tax on Income	Tax on Corporates	Tax on Wealth	Tax on Goods and Services
Number	2	2	2	2	1
Number of years	10	10	10	19	27
	22	22	22	31	
Year	1980	1980	1980	1989	1997
	1992	1992	1992	2001	

Resource: Estimate Calculation

According to the table (3) all taxes in the examined period have had structural breaks that all have two breaks and tax on sale of goods and services have had one break. Breaks for total tax, income and corporate one have happened in the similar years. Wealth tax and the imports one also in the same years have suffered a structural break.

Table 4: Results of Estimating Equations Related to Kinds of Tax

Taxes	Intercept	The first regime	The second regime	The third regime	
Total	Coefficient	16.143	0.063	0.158	0.142
Income	Coefficient	15.637	-0.74	-0.4	-0.682
Corporates	Coefficient	17.642	0.179	0.781	0.443
Wealth	Coefficient	11.733	-0.213	-0.332	-0.517
Goods and Services	Coefficient	13.333	-0.235	-0.548	---

Resource: Estimate Calculation

The results show that all structural breaks in Iran have not lead to the structural changes and income tax has not exposed to the structure changes.

5. Conclusion

Structural evolutions have created important changes in the growth of countries' economy, international trade and the expansion of urban centers. Structural change is defined as a change in the relative weight of the important constituents of the macro-economic index such as production, state's expenses, taxes etc. Since the changes in the traditional structure of the economic factors into new structures is one of the main reasons for the economic growth and development of countries,

the states' attention to important factors affecting the economy and investigating the trend of changes of the important economic constituents such as tax is of importance. So considering the very important position of taxes in the countries' economy, investigating the trend of changes in the tax structure has the paramount importance. Therefore, in this study we have investigated the structural changes of tax in Iran for the period 1971-2012 by Bai and Perron tests and GUASS software. The results based on UDmax and WDmax tests show that at least there is one breakpoint in the movement process of all taxes of Iran. Also based on the results of Bai & Perron method, all taxes have had structure breaks.

The shaped breaks years in the income tax and corporate tax have been similar to the structural breaks of total tax (years of 1980 and 1992); this shows how the breaks of income and wealth tax can have a high effect on the total tax breaks. The wealth and imports tax in years of 1989 and 2001 was exposed to two structural breaks, but tax on sale of goods and services has had a different behavior in relation to other taxes in structural breaks and only in 1997 has exposed to the structural break.

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