Comparison of the Effect of Value Added Tax and Direct Taxes on Iran's Economic Growth[1]

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Abstract

Taxes are generally divided into two categories: direct taxes, which are levied directly on individuals and households, and indirect taxes, which are added to the price of goods and services and are levied on consumers. Value added tax (VAT) is one of the indirect taxes in the category of consumption and sales taxes. Since this tax is levied on consumption and consumption fluctuates less as part of gross domestic product (GDP), the imposition of this tax creates a kind of sustainable income for the government. Considering the consequences and effects of the VAT system, an attempt has been made to identify the sensitivity of GDP compared to direct taxes and VAT. For this purpose, first, the theoretical foundations of endogenous growth models and studies conducted in the past were assessed. Then, the model was estimated based on time series data for the Iranian economy during the period 1973-2016, using the autoregressive distributed lag (ARDL) model. The variables of physical capital inventory, employed labor, direct taxes, and indirect taxes were used as VAT index, and the average years of education were used as human capital index. The results of the model estimate indicated that, in the short run, the direct taxes and VAT variables have a negative and significant effect on GDP, and in the long run, the effect of direct taxes on GDP is negative, but the impact of VAT is positive on production. And the error correction coefficient shows that, in each period, 23% of the imbalance in GDP is adjusted and approaches its long-run trend.

Keywords: *GDP, Direct Tax, VAT,* Economic Growth *,IRAN*

Introduction

Taxes in macroeconomic literature are considered as a tool for government economic policies, and it can be claimed that, at the same time with the formation of the first human societies, taxes have been used as a means of generating income for the rulers of societies. The economic system of any society consists of institutions such as the household, firm, and government. The government institution needs revenues to exercise collective sovereignty, the main of which is tax revenue. On the other hand, with the expansion of government responsibilities in the last century and pursuit of goals such as economic growth, employment, and equitable distribution of income, its problems have become more, especially in the economic field.

Despite the achievements of the value added tax (VAT) system in the country, given that the legal deadline for its pilot implementation has expired, any decision making with respect to the permanence of the so-called law and its extension to the final chain requires re-engineering in line with the needs of a modern tax system and the latest international developments. Therefore, identifying the impact of VAT on gross domestic product (GDP) can be a good guide to take steps to reform the country's VAT system. It is worth noting that in recent years, the tax to GDP ratio is about 7% on average, while the global average is 17%. This index is about 20 % in developing countries at the same level of development as Iran and more than 20 % in developed countries, taking into account the fact that Iran is one of the top 20 countries in the world in terms of GDP. One of the goals of the Fourth Development Plan and the Fifth Development Plan was to gradually fund all cost credits from non-oil resources. However, the statistics of government budget performance show that the share of taxes on the current government expenditures in recent years has been around 50 %, indicating the fact that despite the country's total capital budget (construction budget) being financed by oil revenues, the total taxes received do not cover even half of the government's current expenditures. Failure to do so emphasizes the need to cut off current expenditures' dependence on oil revenues in the Sixth Development Plan.

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This article discusses this relationship. In the first part, it summarizes the growth theories; the second part is dedicated to the research background from inside and outside Iran; the third section analyzes the data and its status in Iran; the fourth section collects data on factors and variables affecting GDP and assesses them in terms of reliability; the fifth section selects an appropriate model and specifies autoregressive distributed lag (ARDL) model; the sixth section experimentally evaluates the results of estimating the impact of direct taxes and VAT on GDP, using ARDL; the final section is devoted to conclusion.

1. Theoretical Foundations

1.1. Endogenous growth models

In the mid-1980s, a group of growth theorists led by Paul Romer (1986) criticized exogenous growth models. These criticisms raised other categories of growth models in which effective factors on growth are endogenously determined. Endogenous long-term economic growth makes possible the evaluation of the role of policies, such as tax policies, in determining growth rates.

The main feature of endogenous growth models is the elimination of diminishing returns to scale, and this is in contrast to exogenous growth models, where the law of declining returns prevails. Proponents of endogenous growth models rely on technological endogenous advances. In these models, the role of technology is determined by various economic characteristics such as personal characteristics, education, accumulated knowledge, research and development costs, and the amount of sustainable and unsustainable resources.

1.1.1. AK Model

The main feature of endogenous growth models, as mentioned, is the non-diminishing return to capital, which can be justified by considering human capital. The simplest form of endogenous growth model is the AK model, also known as the Schumpeterian Model. In this model, the production function is $Y = AK$; based on this relation, the final and average production of capital is constant and equal to A , which reflects the level of technology. Therefore, the rate of capital growth is defined as follows:

$$g_k = \frac{\dot{k}}{k} = s\frac{f(k)}{k} - (n + \delta)$$

Now, if relation $\frac{f(k)}{k} = A$ is placed in the above equation, the following relation is obtained:

$$g_k = \frac{\dot{k}}{k} = s.A - (n + \delta)$$

Given that per capita production is a function proportional to per capita capital, both production and per capita capital will grow endogenously at the same $(g_k = g_y = g)$ rate; this is shown in Figure 1.

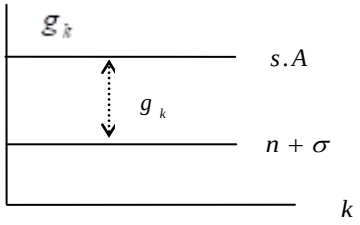

Figure 1: AK Model

Figure 1 shows that because of non-diminishing return to capital, the growth rates of per capita capital and per capita product are constant in the long run and are not related to the level of per capita capital (the growth rate is the distance between two parallel lines which is constant at all levels of per capita capital). As a result, unlike neoclassical exogenous models, any policy that increases the saving rate will lead to a higher long-term growth rate forever. Also, any factor that raises the level of technology will lead to a higher long-term growth rate in the economy (Barro, 1999, p. 105).

1.1.2. Research and development-based models $R\ \&\ D$

Today, economists attribute what one can produce more than what could be produced one or two centuries ago, with the assumed level of capital and labor, to the advancement of technology. Therefore, growth is determined within the model instead of being assumed constant, and one of the determining factors is investment in research and development ($R\ \&\ D$).

In this model, it is assumed that labor, capital, and technology are combined to improve technology. It is obvious that, assuming other conditions constant, allocating more resources to research and development will lead to more innovations and novel ideas (Shakeri and Ebrahimi, 2009, p. 88).

1.1.3. Models based on human capital

The relationship between growth and human capital can be examined in two main ways: the first method originates from the work of Lucas. In his famous article, "On the Mechanisms of Economic Development," he considered the accumulation of human capital as a source of sustainable growth. Lucas, in particular, distinguished between the two sources of accumulation of human capital, i.e. education and learning through work. In these models, as growth is primarily the result of the accumulation of human capital, difference in growth rates between countries is mainly attributed to difference in the rates of accumulation of human capital over time in these countries. The second method, which refers to the article by Nelson and Phelps (1996), attributes growth to "human capital inventory" that in turn affects a country's ability regarding innovation and reaching the developed countries. The difference in growth rates between countries is due to the difference in human capital inventory and consequently the difference in their ability to create technological growth (Alimardani, 2005, p. 48).

1.1.4. Endogenous growth with an emphasis on government expenditures

Barro (1999) discussed growth models, relating the roles of government in infrastructure services, protection of property rights, and tax policies. In this model, it is concluded that government activities can affect long-term growth rates, and in the absence of exogenous technical advances and population growth rates, growth in a monolithic situation is not zero, unlike neoclassical models.
In general, endogenous growth models that reflect the fundamental role of knowledge and human capital in growth can respond well to the following question: what factors determine growth over time?

2. Experimental studies

Today, economists have conducted many experimental and theoretical studies on the impact of taxes on the economic growth of different countries. According to neoclassical growth models (exogenous growth models), although government policies, including taxes, can affect the rate of economic growth, their impact is short-term and will not sustain in the long run. However, in the framework of endogenous growth models, permanent changes in variables such as taxes that are potentially affected by government policies can cause permanent changes in economic growth rates. Therefore, the impact of taxes on economic growth and its causal direction cannot be clearly defined in advance because it depends on how other factors such as human capital used along with physical capital include taxes (Faramarzi et al., 2015, p. 103).

The following are some research studies conducted in various dimensions, such as administrative effects, examining the effects of taxes, especially the impact of VAT on economic growth. In an article entitled "the Role of VAT on Pakistan's Economic Growth", Bilal (2015) sought an association based on experimental evidences between VAT revenue growth and economic growth using the traditional least squares regression method. A key result of this economic study revealed that the growth of VAT revenue had a strong and positive impact on economic growth in Pakistan, and 1% growth in VAT revenue brought about an economic growth of 0.24 % in this country.

Petru (2015) used the panel data approach to examine the impact of tax composition on economic growth. Using data from six Eastern European countries during 1995-2012, he proved that direct taxes had a significant negative relationship with economic growth, while indirect taxes had a positive but insignificant effect on economic growth.

Segun Matthew and Okoli (2015) assessed the impact of VAT revenue on Nigeria's economic growth, using time series data of 1994 - 2012. They found that although the initial OLS estimate showed the positive effect of VAT on economic growth, the Engle and Granger test suggested that the relationship between economic growth and VAT is a fake regression and there is no relationship between these variables.

Fajardo Jojana and Lora (2012) studied the effect of VAT on the rate of economic growth and employment and demonstrated that the application or increase of the VAT rate has a positive effect on employment, assuming the government expenditure constant.
However, unemployment will increase if the government budget deficit is sustainable with the application or increase of VAT.

Adereti et al. (2011) found that VAT has a positive effect on the rate of economic growth and reduction of poverty. This occurs due to increase in the revenue needed to increase government expenditures and due to increase in capital expenditures.

In another study, Adereti examined the effect of VAT on the rate of economic growth in Nigeria 1994 - 1994 and concluded that VAT had a positive and direct effect on the country's rate of economic growth.
Arisoy and Unlukaplan (2010) examined the effect of direct and indirect taxes on economic growth in Turkey for the period of 1968-2006. The results of this study showed that real production is directly related to indirect tax revenues, but direct taxes do not have a significant effect on growth.

Lee and Gordon (2005) in an inter-country study entitled "Tax Structure and Economic Growth for Seventy Countries during the 1997-1980 period" in a data panel framework confirmed that 1% reduction in income tax would lead to 1 to 2 % increase in economic growth.

Kneller et al. (1999) distinguished between diversionary and non-diversionary taxes. Theses researchers introduced income taxes and property taxes as diversionary taxes and consumption taxes as non-diversionary taxes. They concluded that diversionary taxes reduce growth, but non-diversionary taxes do not reduce growth.

Nematzadeh and Memarnejad (2016) analyzed the effect of VAT on employment using dynamic data panel for 11 non-OECD (Organization for Economic Co-operation and Development countries) countries and 16 OECD countries, showing that the impact of VAT on non-employment in non-OECD countries is 0.089 and in OECD countries is 0.04, confirming the positive and significant effect of VAT on employment. In addition, according to the estimated results, the impact of other taxes on employment in non-OECD countries is -0.014 and in OECD countries is -0.029. Hence, if the tax type is VAT, it will increase employment, but other taxes will reduce employment.

Akbarpour and Haji Karami (2015) tested the relationship between tax composition change and long-term growth using data of 37 developing Asian and African countries during the period of 1972-2012 using the Pooled Mean Group Estimation Approach. They indicated that moving from consumption and property taxes to income taxes negatively affects economic growth. There is also a strong positive relationship between long-term growth and sales and property taxes, and VAT and sales taxes affect positively and significantly long-term growth.

Gholami (2014) evaluated the administrative components of the VAT system in 22 countries implementing the so-called tax and its comparative comparison with Iran to achieve the roadmap to reform VAT law and its executive procedures in Iran. The findings suggest that VAT in Iran, like the selected countries, is consumption- and destination-based. Registration criteria in most countries are annual turnover or financial turnover involving annual tax, while in Iran the nature of economic activities is also applied, in addition to using these criteria. Furthermore, the standard VAT rate is almost the same in almost all countries except Austria and India, as in Iran. In countries where there are no discount rates in the structure of their tax rates, the range of goods and services with a non-credit exemption is usually wider, which is observed in Iran, Armenia, etc.

Pejuyan and Wershosaz (2013) studied the effect of establishment of VAT on government revenues on GDP in selected countries of the MENA region (West Asia and North Africa) in two approaches: direct effect and interactive effect for the period of 1998-2008, using the panel data method and Eviews software. The results showed that in the direct effect model, VAT acceptance always leads to an increase in the ratio of government revenues to GDP, and in the interactive effect model, the establishment of VAT acts in the opposite direction of objectives that tend to get bigger in more open economies and have higher per capita incomes (purchasing power).

Abu-Nouri and Zivari (2014) examined the impact of tax revenues on economic growth and income distribution in Iran and OECD countries during the period of 1990 – 2011, using panel data. They used the OLS method to estimate the economic growth model of OECD countries and used the time series method to estimate the economic growth model of Iran, indicating that the increase in tax revenues is directly and positively related to economic growth.

Faridzad, Parvin, and Banoui (2011) examined the value effects of VAT on the Iranian economy and proved that if VAT is applied at a rate of 3%, it is predicted that the general price index will increase by about 1.5%; this price increase will reach 0.8 % after exemption of products based on article 12 of the VAT Law.

The highest price increase among 119 products in the economy is 2.99 %, which is related to real estate services and is mainly due to non-tradability of this product in the economy and the increasing demand for its supply in the short run.

Saeedi and Nehtani (2009) evaluated and analyzed the effect of replacing VAT by income tax on non-manufacturing companies for 283 companies in Golestan Province using Wilcoxon non-parametric tests and Friedman test. The replacement of VAT at rates of 1.5 % and 3 % by income tax levied on non-manufacturing companies will reduce the Province's tax revenues. Moreover, replacing VAT at rates of 7% and 10% by income tax of corporates will increase the Province's tax revenues. If the government wants to replace VAT, which is a new, revenue-generating, transparent, and flexible tax, by the current income tax of corporates, it must at least use 7% and 10 % rates.

3. Data analysis

The role of tax revenues is more important in many countries compared to other sources of income. In most developed and industrialized countries, taxes cover almost all government expenditures. Figure 2 shows the ratio of tax revenues to Iran's GDP; over the past years, the ratio of tax to GDP (T/GDP) is about 7% on average in Iran, while it is 17% in the world. The T/GDP index in developing countries at the same level as Iran is about 20% and is more than 20% in developed countries, while Iran is one of the top 20 countries in the world in terms of GDP.

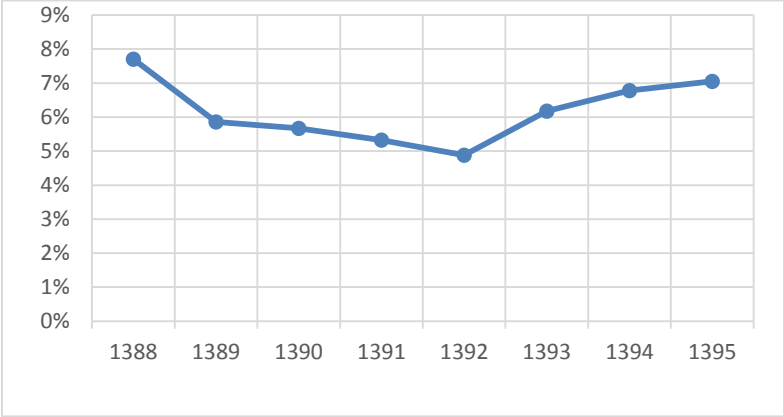

Figure 2: The trend of total ratio of tax revenues to GDP in Iran

Source: Central Bank of the Islamic Republic of Iran

An examination of the share of direct and indirect taxes of the country's GDP (Figure 3) shows that with the implementation of the VAT law since 2008, the share of indirect taxes has had an increasing trend and has even surpassed direct taxes.

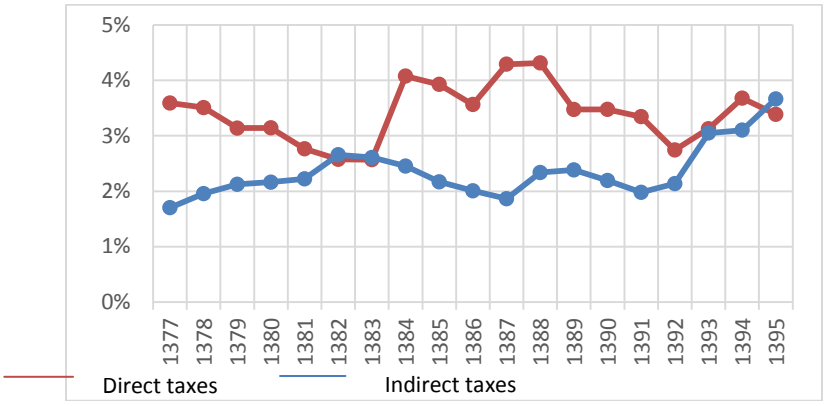

Figure 3: The trend of the ratio of direct and indirect taxes to GDP in Iran

Source: Central Bank of the Islamic Republic of Iran

4. Statistical data

The statistical data used in this study include a time series during the years 1973-2016 extracted from the data source of the Central Bank and the Statistics Center of Iran.

- Gross Domestic Product (GDP)
- Inventory of Physical Capital (K)

- Employed Labor Force (L)
- Ratio of direct taxes to GDP (TAX)
- Ratio of indirect taxes' revenue to GDP as VAT index
- The average years of employees' education as human capital (HC) index

All data used are at a fixed price of 2011. The use of traditional methods in econometrics for experimental works is based on the assumption of reliability of variables.
Studies show that this assumption is incorrect for many macroeconomic time series and that most of these variables are unreliable. Therefore, according to the cumulative theory in modern econometrics, it is necessary to ensure their reliability and unreliability.

For this purpose, augmented Dickey–Fuller unit root test was used. The results of the augmented Dickey–Fuller test at levels and difference are presented in the table below. Based on the test performed, the null hypothesis of the existence of a unit root for all studied variables at all critical levels is not rejected. However, the replication of test on the first and second order difference of variables shows that GDP logarithm, VAT logarithm, capital inventory logarithm, and human capital logarithm variables become reliable after computing the difference once, and the logarithm of direct taxes becomes reliable after computing the difference twice. Therefore, according to the augmented Dickey–Fuller test and software outputs, the LK, LGDP, LHC, LVAT, and LL variables have a cumulative degree of zero (1)I, and the variables and LTAX have a cumulative degree of two (2)I.

Table 1: Evaluating the reliability of the model variables using the augmented Dickey–Fuller test

Variables	Type	With y-intercept and with trend	With y-intercept and without trend	Reliability result
	Critical value	-3.53	-2.94	
	Statistic	-3.315	-0.451	Unreliable
	Statistic	2.059	0.121	Unreliable
LL	LK	-1.753	-1.46	Unreliable
LTax	LGDP	-3.37	-0.602	Unreliable
LVat	Statistic	-2.304	-0.606	Unreliable
LHC	Statistic	-2.086	-0.938	Unreliable
	Critical value	-3.53	-2.942	
dLK	Statistic	-4.79	-4.86	Reliable
dLGDP	Statistic	-3.79	-3.655	Reliable
dLL	Statistic	-4.76	-4.7	Reliable
dTax	Statistic	-2.64	-2.72	Unreliable
dLVat	Statistic	-3.83	-3.95	Reliable
dLHC	Statistic	-3.18	-2.96	Reliable
	Critical value	-3.94	-2.95	
ddTax	Statistic	-10.86	-10.9	Reliable

Source: Research Calculations

Assuming the unreliability of the data, it is not possible to use the conventional OLS method, and to estimate, one must use a method that eliminates this shortcoming, so ARDL method is used because it is not important to pay attention to the cumulative degree of the variables in this method. Also, by determining appropriate lags for the variables, an appropriate and unique model can be selected without bias and using economic theories.

5. Specifying ARDL model

Pesaran and Shin (1998) proved that if the convergence vector is obtained using the least squares method based on an ARDL relation whose lags are well defined, it will be less biased and more efficient in addition to the fact that the estimator has a minimum normal distribution in smaller samples. They also indicated the advantages of using this method, such as obtaining compatibility estimates from long-run coefficients regardless of I(0) and I(1) variables. When the sample size is small, using the OLS method in estimating the long-run relationship will not provide unbiased estimate due to the lack of dynamic short-run reactions among the variables. Using the Monte Carlo simulation method, Banerjee (1993) and Inder (1993) showed that the estimation bias may be significant in small samples.

Therefore, it seems logical to consider the estimation of such a complete model, having short-run dynamics and as a result bringing about model coefficients, to be estimated more accurately (Noferesti, 1999, p. 56).
The general form of the ARDL$(p, q_1, q_2, \dots q_k)$ model can be expressed as follows:

$$\emptyset(L,P)Y_t = \sum_{i=1}^{k} \beta_i(L,q_i)\, X_{it} + \delta W_t + \mu_t$$

$\emptyset(L,P) = 1 - \emptyset_1 L - \emptyset_2 L^2 - \cdots - \emptyset_p L^p$
$\beta_i(L,q_i) = \beta_{i0} + \beta_{i1} L + \beta_{i2} L^2 + \cdots + \beta_{iq} L^q$
$i = 1,2,3, \dots k$
L = the first order time lag operator, so $LY = Y_{t-1}$
Y_t = the dependent variable in the model
X_{it} = the explanatory variables' vector used in the model
$q_1, \dots, q_i$ = the number of optimal lags for each explanatory variable
p = the number of optimal lags associated with the dependent variable of the model
W_t = the vector of definite variables such as y-intercept, seasonal variables, time trend, or exogenous variables with constant lags.

The above equation can be estimated using Microfit software. This software estimates the so-called equation using the conventional least squares method for all values of $p = 0,1,2, \dots m$, $q_i = 0,1,2, \dots m$, and $i = 0,1,2, \dots k$, i.e. the number of $(m+1)^{k+1}$ different regressions. In the next step, the optimal lags of the model are selected using one of the Akaike, Schwarz-Bayesian, Hannan-Quinn, or modified coefficient of determination criteria.

From the above criteria, Pesaran and Shin suggested the Schwarz-Bayesian Criterion (SBC) for determining the optimal lags of the model. This criterion saves the number of lags due to the small sample size, so that smaller number of degrees of freedom is lost. In this study, this criterion was also used to determine the number of optimal lags. Based on the estimated coefficients of the selected ARDL model, the Microfit software estimates their long-run coefficients and standard error based on the estimated coefficients related to the selected ARDL model, presenting the results of the diagnostic test. The requirement for a short-run model to be a long-run model is that the sum of the dependent variable coefficients should be less than one. Now, if the sum of the coefficients of the dependent variable minus $\sum \alpha_i - 1$ is divided by the sum of the standard deviations of these coefficients, a test statistic of type (t) statistic will result, the quantity of which can be compared by critical quantities presented by Banerjee, Dolado, and Master (1992) to perform the test.

There is long-run convergence between the model variables.

$$H0: \sum_{i=1}^{p} \alpha_i - 1 \geq 0$$

There is long-run convergence between the model variables.

$$H1: \sum_{i=1}^{p} \alpha_i - 1 < 0$$

The quantity of statistic (t) is calculated as follows to perform the long-run convergence hypothesis test:

$$t = \frac{\sum_{i=1}^{p} \alpha_i - 1}{\sum_{i=1}^{p} S_{\alpha_i}}$$

If statistic (t) calculated by the above formula exceeds the value of the critical quantities provided by Banerjee, Dolado, and Master, the null hypothesis, no long-run convergence, is rejected.

In addition, the Microfit software offers the error correction model (ECM1) according to the selected model. In order to extract the error correction model based on the above ARDL $(p, q_1, q_2, \dots q_k)$ model, the variables $(W_t, Y_t, X_{1t} \dots X_{ky})$ are considered according to the lagged values and their first order difference, and the error correction model is considered as following:

$$\Delta Y_t = \emptyset(L,P)EC_{t-1} + \sum_{i=1}^{k} \beta_{i0} \Delta X_{it} + \delta \Delta W_t - \sum_{j=1}^{p-1} \emptyset_j^* \Delta Y_{t-j} - \sum_{i=1}^{k} \sum_{j=1}^{q_{t-1}} \beta_{ij}^* \Delta X_{i,t-j} + U_t$$

The error correction model is used to link the short-run fluctuations of variables to their long-run fluctuations.
The above equations are estimated by OLS method, and by performing the necessary tests, the short-run dynamic structure of the model is determined. In the error correction model, the EC_{t-1} coefficient indicates the speed of

equilibrium towards the long-run equilibrium. This coefficient indicates what share of the disequilibrium in the dependent variable Y_t during the previous period is corrected in the current period. The sign of this variable is expected to be negative, and its value is expected to change from 0 to-1

6. .Model estimation and representation of the results

The theoretical model used in this study is a model that Ajala (1999) used and has been specified as follows according to the ARDL estimation method for the present study (Samadian, 2013, p. 64):

$$LogGdp = \alpha_0 + \alpha_1 LogL + \alpha_2 LogK + \alpha_3 LogTaxg + \alpha_4 LogVatg + \alpha_5 LogHC + U_t$$

LogGDP is the GDP logarithm; Logk is the physical capital inventory logarithm; LogL is the employed labor force logarithm; LogTaxg is the ratio of direct tax revenues to GDP logarithm; LogVat is the logarithm of the ratio of indirect tax revenues (VAT) to GDP, and Loghc is the human capital logarithm.

6.1. Convergence test

To study the long-run convergent relationship, Banerjee, Dolado, and Master (1992) test was used. In this test, as mentioned earlier, the sum of the coefficients of lagged variables related to the dependent variable should be less than one for a short-run dynamic relationship to tend towards a long-run equilibrium. It is important to note a few points before conducting a long-run convergence test. The first point is to choose the number of optimal lags. On the one hand, the number of selected lags should be large enough to reduce the problem of serial correlation of residuals, and on the other hand, it should be low so that the problem of overestimation does not occur (especially in studies with a small number of observations) (Pesaran et al., 2001, p. 35).

In this study, the criterion for lag determination is the SBC, and the optimal lag number is 1. In order to test the long-run convergence after determining the optimal lag number, first, the short-run dynamic model is estimated to identify the coefficients of the lagged dependent variable. The coefficients indicate that in the short-run, GDP affects lagged production with a coefficient of 0.77.

Regressor	Coefficient	Standard error	T-ratio [Prob]
LGDPR(-1)	0.77057	0.048059	16.0336 [000]

Source: Research Calculations

After estimating the ARDL equation, the long-run convergence is tested using the following statistic.

$$t = \frac{0.77-1}{0.048} = -4.79$$

Since this computational value is greater than the critical quantity provided by Banerjee, Dolado, and Master, i.e. t = -4.05 at 95% confidence level for the model with a greater y-intercept, the null hypothesis, no long-run relationship, is rejected, and its existence is accepted (Noferesti, 1999, p. 56). The results of the above statistic strongly confirm a convergent relationship between the variables.

6.2. Results of estimating model coefficients

The results of estimating the coefficients of short-run and long-run relationship are presented in Table 2.

Table 2: Results of estimating short-run and long-run coefficients using ARDL (1, 0, 1, 1, 0, 1) based on SBC criterion (dependent variable: GDP)

Estimation of long-run coefficients				Estimation of short-run coefficients			
Regressor	Coefficient	Standard Error	T	Regressor	Coefficient	Standard Error	T
LKR	2.362	0.478	4.942	dLKR	0.542	0.135	3.987
LL	3.438	1.379	2.492	dLL	2.399	0.608	3.942
LVATG	0.287	0.128	2.241	dLVATG	-0.069	0.036	-1.918
LTAXG	-0.444	0.181	-2.453	dLTAXG	-0.101	0.032	-3.096 dLHC
LHC	1.654	0.749	2.206		1.93	0.364	5.29
C	-85.36	26.55	-3.21	dC	-19.58	5.99	-3.26
				decm(-1)	-0.229	0.048	-4.774
$R^2 = 0.77$		$D.W = 2.446$		$F = 18.313$		$\sigma = 0.1$	

Source: Research Calculations

The results of the short-run relationship estimate demonstrated that capital inventory and the employed labor force have a positive and significant effect on GDP, and the VAT variable with a coefficient of 0.069 and direct taxes with a

coefficient of 0.1 have a negative and significant effect on GDP. It is noteworthy that the negative effect of the direct taxes is greater than VAT. Human capital also has a positive and significant impact on GDP.
The estimation result of the error correction coefficient (ECM) indicates that this coefficient is statistically significant and has the expected sign. Therefore, long-run equilibrium can be achieved. In addition, this coefficient shows that in case of shock and deviation from the equilibrium, in each period, 23% of the disequilibrium of GDP is adjusted to achieve long-run equilibrium.

The results of estimating the long-run relationship indicate that the inventory of physical capital, human capital, and employed labor force have a positive and significant effect on GDP. Direct taxes have a significant negative effect on GDP, but VAT has a long-run significant positive effect on GDP.

Comparing the coefficients of explanatory variables in the short-run and long-run models shows that the estimation coefficients in the short-run are lower than the estimated coefficients in the long-run, manifesting a logical relationship between the variables in the short-run and long-run.

The results of the diagnostic tests are presented in Table 3. Chi-square statistics for the normality test of residuals and serial correlation, which are equal to 0.935 and 0.107, respectively, indicate that the residuals are normally distributed, and the existence of serial correlation among residuals is not confirmed. Also, the Chi-square statistics for the heterogeneity variance and model specification are 0.235 and 0.891, respectively, indicating that the heterogeneity variance is not confirmed, and the subordinate form of the model is appropriate, hence the results presented in this section confirm the scientific validity of the model.

Table 3: Diagnostic test results

Self-correlation test	$\chi^2_{SC} = 2.603[0.107]$
Variance heterogeneity test	$\chi^2_{H} = 1.41[0.235]$
Model specification test	$\chi^2_{FF} = 0.0187[0.891]$
Normality test	$\chi^2_{Norm} = 0.134[0.935]$

Source: Research Calculations

Finally, in the ARDL method, the stability test of estimated coefficients is performed. CUSUMS and CUSUMSQ methods have been used to perform this test. In this test, the stability of the parameters is tested at a significance level of 5%. The confidence interval in this test is the distance between two straight lines, which shows 95% confidence level. If the test statistic is placed between these two lines, the null hypothesis (the coefficients are stable) cannot be rejected. The results of this test, based on the following diagrams, confirm that the coefficients of the estimated variables during the study period are stable.

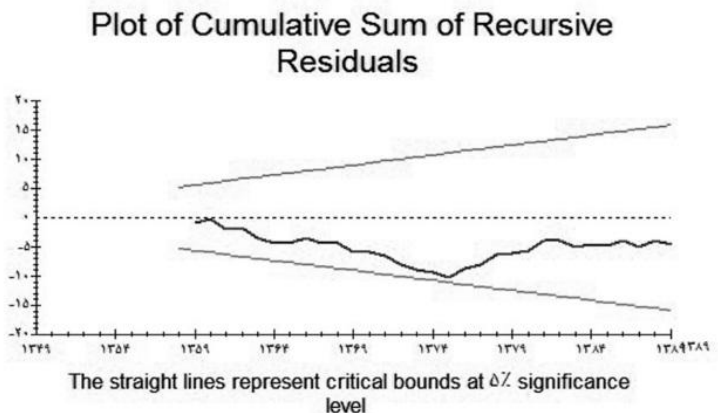

Figure 4: CUSUMS test

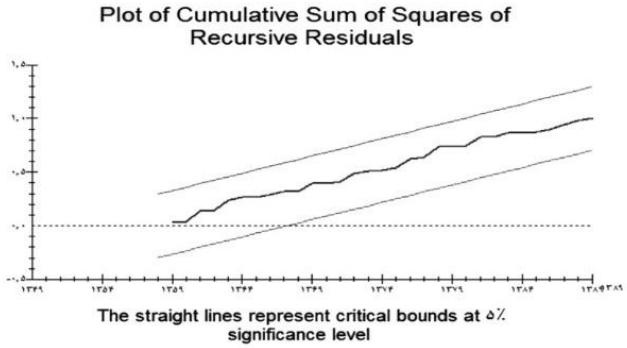

Figure 5: CUSUMSQ test

7.Conclusion and Recommendations

In this study, using time series data and cumulative technique in econometrics, dynamic ARDL models and error correction mechanism, in particular, long-run and short-run relationships, and the effect of direct taxes revenue and VAT on GDP were estimated. Also, in order to assess the reliability and existence of a unit root, the augmented Dickey–Fuller test was used, and the optimal lag duration was selected based on SBC. The results indicated that the null hypothesis of the existence of a unit root for all model variables at all critical levels is not rejected. The variables of GDP logarithm, employed labor force logarithm, physical capital inventory logarithm, VAT logarithm, and human capital logarithm become reliable after computing the difference once. In other words, the mentioned variables have a cumulative degree of I(1). And the logarithm of direct tax revenues becomes reliable by computing the difference twice (cumulative degree of I(2)).

The findings revealed that the variable of physical capital inventory in the short-run (0.54) and long-run (2.36) has a positive effect on GDP at 95% confidence level. The effect of this factor on the long-run period is stronger and more significant.

The effect of the employed labor force variable in the short-run (2.39) and long-run (3.43) on GDP is positive at 95% confidence level. The effect of this factor is also stronger and more significant in the long-run.
The results of estimating the long-run and short-run models indicate that the VAT variable significantly affects GDP at 90% confidence level in the short-run with 0.069 negative effect and in the long-run with 0.28 coefficient positive effect.

The effect of direct taxes in the short-run (0.101) and long-run (0.44) is also negative and significant on GDP. The effect of this factor in the long-run period is stronger and more significant.

It is noteworthy that the negative effect of the direct taxes is greater compared to VAT. The effect of human capital variable on GDP in the short-run (1.65) and long-run (1.93) is significantly positive at 95% confidence level. The effect of this factor is also stronger and more significant in the long-run.

In the short-run, GDP affects production by a lag with 0.77 coefficient. In other words, last year's GDP also affects production.

The error correction model also shows that the effect of equilibrium in this model is equal to 0.23, which indicates that 23% of the disequilibrium created between the GDP values of the long-run trend is eliminated in each period. The following suggestions are provided according to the research results:

1) Reduction of tax rate: contrary to the theories governing the economic status of the country and constantly seeking to increase new sources of income, including taxes, the government must take steps to achieve financial discipline and reduce current and unnecessary costs.
2) Considering that the negative effect of direct taxes is more than indirect taxes, it is suggested to gradually reduce the rate of direct taxes if the VAT rate is increased.
3) Changing the current method of obtaining VAT through the direct credit factor method by direct differential method.

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