Investigating the effect of changing the corporate income tax rate on employment level: A case study companies listed on the Tehran Stock Exchange

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Abstract

One of the key measures in any country's tax system is the selection of the tax base and its corresponding tax rate, which must be determined accurately based on rigorous scientific studies. Given the significance of this issue, as government fiscal policies through taxation can influence employment levels, this study investigates the effects of changes in the corporate income tax rate on companies listed on the Tehran Stock Exchange with respect to employment levels. The objective is to develop policy strategies aimed at reducing unemployment or increasing employment over the period from 2010 to 2023 (1389 to 1402 in the Iranian calendar) using the Generalized Method of Moments (GMM). The findings indicate that the first-order lag of the effective corporate income tax rate, the ratio of expenses to financial liabilities, per capita wages, and private ownership of companies harm corporate employment levels. Conversely, the size of corporate assets, return on assets, and the debt-to-asset ratio have a positive impact on employment growth. To assess the robustness of the results, the studied companies were divided into two groups: privately owned and state-owned companies. The effects of income tax rates on the employment levels of these groups were analyzed separately. For state-owned companies, the effective corporate income tax rate, the ratio of expenses to financial liabilities, and per capita wages negatively impacted employment levels, while the size of corporate assets, return on assets, debt-to-asset ratio, and the previous period's employment level had a positive effect on increasing employment. For privately owned companies, the size of corporate assets and the previous period's employment level positively influenced employment growth. In contrast, the effective corporate income tax rate, the ratio of expenses to financial liabilities, per capita wages, return on assets, and debt-to-asset ratio hurt employment levels.

Keywords: Employment, effective tax rate, companies listed on the Tehran Stock Exchang
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1 Introduction

In recent years, the increase in labor supply on the one hand and the low growth rate of labor market demand on the other hand have led to an increase in the unemployment rate. So that the issue of employment and the factors affecting it, as one of the most important economic issues and challenges facing governments, has attracted

the attention of many policymakers, experts, statesmen, and economic experts. According to economic literature, the issue of taxation is one of the important factors affecting macroeconomic variables, including employment, and the government's tax policies can change it in various ways. By creating an imbalance in the labor market, government tax policies cause changes in the unemployment rate and, as a result, the level of production and economic growth. Proponents of fiscal policy believe that intelligent and scientific management of changes in taxes can improve the efficiency and performance of economic elements and, consequently, affect the level of employment.

Several studies have examined the relationship between taxation and employment; Some of them have pointed out a negative relationship between taxes and employment, while others have pointed out the absence of a significant relationship between these two variables, and some other studies have pointed out the existence of a positive and significant relationship between taxes and employment. In general, studies have shown that tax policies have an ambiguous relationship with the employment variable and can have different effects depending on the economic situation of countries; in this regard, governments, within the framework of tax laws, collect taxes or grant tax exemptions according to existing conditions in order to achieve income and social justice goals, direct economic activities and affect the desired variables. In this regard, one of the solutions to reduce the unemployment rate is to implement government tax policies with the aim of creating jobs using human capacity, selecting a tax base and a rate appropriate to it.

Among the types of direct taxes, corporate income tax, in addition to being one of the important sources of government financing, has a major share in the composition of tax revenues and, as the most important component of direct taxes, has always been the focus of policymakers and economists and includes the profits and income of governmental and non-governmental legal entities; which are mostly levied annually on the income of legal entities. Governments are trying to impose tax rates appropriately. This type of tax is levied on corporate profits. In terms of economic dimensions, it is one of the most important financial policy instruments and a limiting factor in economic growth, investment and employment. In addition, tax reduction as a fiscal expansionary policy has a positive effect on the level of employment, because increased private sector consumption leads to increased demand, which also increases production and employment, and conversely, increasing taxes has a negative effect on employment; Therefore, examining corporate taxes of any type, given its role in providing government tax revenues and its impact on the level of investment, production, and employment, is one of the important issues that is considered in the formulation of development plans, tax laws and regulations, and annual budget plans, and is one of the main issues of concern to researchers.

In general, based on the foundations of economics and studies conducted, it can be said that tax policies have an impact on the level of employment and the unemployment rate. Therefore, the present study examines the effect of changing the income tax rate of companies listed on the Tehran Stock Exchange on the employment variable using the generalized moment econometric method. Also, the effect of changing the income tax rate of private and public companies listed on the Tehran Stock Exchange on the employment level of each of these companies is examined separately.

2 Theoretical foundations of the research

This section describes the theoretical foundations and empirical studies related to the present topic.

Tax is an efficient tool for implementing the government's economic policies and is one of the variables that the government, through changes in its base or rates, creates mechanisms that improve macroeconomic variables such as economic growth, inflation, unemployment, budget deficit, employment and many other issues.

Tax is a part of the income or assets of natural or legal persons that is collected in accordance with laws and regulations to pay public expenses and implement financial policies in order to preserve the country's economic, social and political resources.

Taxes are usually divided into two groups: direct taxes and indirect taxes, where direct taxes are taxes that are collected from the same people who are subject to them. Indirect taxes are determined as taxes on the supply and demand for goods and services [7].

Corporate income tax is a type of direct tax whose source is the income and profits of state or non-state legal entities, which is levied annually on the income of legal entities and has a significant share in the government's tax revenues among the types of taxes. Another important economic variable that is one of the main issues in the economic growth and development of countries and one of the most important priorities of governments in spending their revenues is the issue of employment and the importance of human resources, which governments can use and change in various ways by implementing fiscal and monetary policies, which are important tools in the hands of the government to increase

employment (reduce unemployment). The mechanism of the impact of fiscal policies on employment has undergone changes over time, and different economic theories about employment and how fiscal policies affect this variable differ. The classics, believing in the market mechanism and prices, consider taxes as a neutral financial lever and state that fiscal policies are ineffective on employment, and therefore taxes should be imposed in a way that does not create a deviation in the economic decisions of individuals and firms. Keynes considered the issues in a short period of time, and in his opinion, all economic activities, especially the level of employment, depend on income. According to Keynesians, only fiscal policy and changes in total spending cause changes in employment and income. Monetarists, emphasizing the role of money in the economy, do not consider the application of fiscal policy to be effective on employment. The new classics, accepting the rational expectations hypothesis, emphasize the ineffectiveness of fiscal policy on employment. New Keynesians, assuming price flexibility and the existence of involuntary unemployment in the economy, believe that fiscal policies affect employment by limiting the power of unions and correcting labor market information by the government.

The implementation of fiscal policies by the government causes changes in government spending or the government's tax program, and as a result, causes a shift in the demand curve. In general, the adoption of any fiscal policies, including adjusting government spending or changing tax rates and incentives, affects labor market components, including labor supply and demand, and leads to the determination of new levels of employment and real wages. By creating imbalances in the labor market, the government's fiscal policies cause changes in the unemployment rate and, as a result, the level of production and economic growth. The characteristics of the fiscal policies applied, such as temporary or permanent and their origin (reducing public spending, increasing taxes, or reducing transfer payments to the people), can have different effects on these variables and the economy in general. Income policy attempts to shift the aggregate supply curve by vertically shifting the supply of labor. This changes the nominal wage demanded by labor for any given quantity of labor relative to the price level. Income policy is generally used to slow the rate of price increase in a situation where the labor supply curve is shifted upward due to workers' expectations of an increase in real wages. To better understand the effects of fiscal policy on macroeconomic variables such as employment, we use the following macro-static model.

On the demand side of the economy, the equilibrium conditions for the product market are:

$$IS: \ Y = C(y - t(y)) + j(r) + g \tag{2.1}$$

And for the money market we have:

$$LM: \ L(r) + K(y) \tag{2.2}$$

On the other hand, the equilibrium in the labor market is equal to:

$$P \cdot f(N) = P^e g(n) \qquad P > 0 \tag{2.3}$$

The equilibrium in the labor market gives employment as a function of price levels, and the change in employment in terms of production is carried out by the production function, which is as follows:

$$Y = Y(N, \overline{K}) \tag{2.4}$$

In this function, the level of production (Y) is a function of the labor input (N) and the level of capital accumulation and other inputs and with each increase in input, the level of production increases [8].

On the other hand, it can be said that taxes, which are sources of government revenue, can reduce the budget deficit and, as a result, prevent the use of expansionary monetary policies. Proponents of fiscal policy believe that small changes in taxes can have a significant effect on the level of aggregate demand and, consequently, affect the level of employment. Usually, revenues from taxes are used to finance government spending; but unlike taxation, which has a contractionary effect, government spending increases aggregate demand in society, which, by providing the possibility of expanding sectoral production, provides the basis for increasing production and employment for human resources. Thus, in a general summary, if the government levies taxes. The increase in prices resulting from taxes reduces the purchasing power of consumers and, as a result, reduces their consumption, which means it reduces aggregate demand and employment, in other words, it has a contractionary effect on the economy. On the contrary, when the government spends the money obtained from taxes, this policy has an expansionary effect and causes an increase in aggregate demand of the society, an increase in production and employment. In the short run, the result of these two effects, when the government spends all the taxes received, depends on the following:

a) On the one hand, it depends on the amount of reduction in household consumption, which in turn depends on factors such as the average propensity to consume and the combination of their consumption options.

b) On the other hand, it depends on the combination of types of government spending and their impact on the economy.

Therefore, if the result of the contractionary and expansionary effects of applying these policies leads to an increase in demand, the result is a shift of the demand curve to the right. The results of this policy affect the real output and employment level of the society through changes in aggregate supply and demand [21].

One of the types of direct taxes that has significant effects on real variables of the economy is the tax on corporate income and profits, which in many countries of the world constitutes a significant part of the government's tax revenues [16]

In recent years, this issue has also been of interest to governments, policymakers, and economists in Iran to replace oil revenues and stabilize revenue sources. It is known as one of the important bases of tax revenues and includes a significant share of tax revenues. So that according to the Central Bank data for the period (2001-2011), tax on legal entities (companies) has accounted for a major part of total tax revenues, and during this period its share of total tax revenues has fluctuated between 31.32 and 43.12 percent [14]

Currently, according to Article 105 of the Direct Tax Law, the total income of companies and income from profit-making activities of other legal entities that are earned from various sources in Iran or outside Iran (after deducting losses from non-exempt sources and deducting prescribed exemptions, except for cases that have a separate rate according to legal regulations) are subject to tax at a rate of twenty-five percent (25%) [7].

Based on economic literature and using mathematical relationships, it can be stated that legal entities or companies sell their goods and services and earn income from this, and also incur expenses for the production of goods and provision of services, the difference between the total income and expenses of the company is equal to their profit; which is obtained by the following method:

$$\pi = TR - TC^{BT} \tag{2.5}$$

where, π: the firm's profit, TR is total revenue and; TC^{BT} is total cost before tax. Based on the first-order condition of profit maximization, we have:

$$\frac{\partial \pi}{\partial q} = 0 \rightarrow P = MC^{BT} \tag{2.6}$$

By imposing a corporate tax at rate t, the total cost function of the firm is shifted upward by the amount of tpq.

$$TC^{AT} = TC^{BT} + tpq \tag{2.7}$$

the profit after tax is calculated as follows:

$$\pi = TR - TC^{BT} = TC^{BT} - tpq. \tag{2.8}$$

After taxes, the profit maximization condition

$$\frac{\partial \pi}{\partial q} = 0 \rightarrow P = MC^{AT} - MC^{BT} - tp. \tag{2.9}$$

As can be seen, taxing legal entities increases the total cost and marginal cost of the company. Consequently, decision-making based on the condition of profit maximization leads to a decrease in the company's production, an increase in the product price, and a decrease in production in the market [1].

Tax reduction, as an expansionary fiscal policy, leads to an increase in demand and prices, and subsequently to an increase in wages and employment. By increasing direct taxes in economic sectors in the long run, firms must spend a large part of their income on paying taxes, and therefore, by doing so, the total income in the economy decreases and economic firms are unable to pay wages to the labor force and reduce their demand for labor [3].

At the theoretical level, the general concept is that reducing the corporate income tax rate has a promotional effect and a suppressive effect on employment. On the one hand, the promotional effect indicates that a reduction in the corporate income tax rate improves corporate profits and reduces the cost of capital and, consequently, the cost of production, resulting in increased investment in companies. This causes increasing returns to scale to grow and increases the demand for labor.

On the other hand, with regard to the suppression effect, since capital can replace labor to some extent, a reduction in the corporate income tax rate causes a relative decrease in capital and labor, and as a result, the demand for

companies to invest in equipment and also invest in research and development increases, and ultimately the demand for labor in companies decreases. In addition, the relative effects of the promotional effect and the suppression effect are often affected by many factors such as the type of ownership of companies, the structure of companies' assets, the ratio of debt to assets of companies, and the return on assets of companies [5].

In summary, the channels of impact of corporate income tax on employment can be summarized as follows:

a) Reduced investment incentive: Increasing corporate income tax can reduce the incentive for investment and development in companies. As a result, companies will be less willing to hire new workers [17].

b) Increased production costs: Increasing corporate income tax is seen as an additional cost for companies. This increased cost can lead to layoffs and reduced employment[11].

c) Capital outflow: Increasing corporate income tax can increase the incentive for companies to transfer their activities to countries with lower tax rates. This can lead to capital outflow and job losses in the country [6].

d) Reduced demand: Increasing corporate income tax can lead to reduced demand for goods and services due to reduced corporate profits. This can lead to a decrease in production and ultimately a decrease in employment [13].

In general, it can be said that theoretical foundations indicate that corporate income taxes may have different effects on employment in different ways. Therefore, given the importance of the issue that the adoption of government fiscal policies can affect the level of employment, in this study we will examine the effect of corporate income taxes on the level of employment.

3 Research background

Numerous empirical studies have been conducted on the present study at home and abroad, which are briefly reviewed below.

Zuo et al. [5]. Using data collected from 1998 to 2013 by the National Bureau of Statistics of the Chinese Enterprise Database and using a static panel model and a dynamic panel model, they examined the effect of reducing the corporate income tax rate on employment in China. The results of their study showed that reducing the corporate income tax rate can increase total employment by affecting employee wages, the company's debt-to-asset ratio, and the company's return on assets. Also, reducing the corporate income tax rate can increase employment in private and collective enterprises; but it does not have a significant effect on employment in state-owned enterprises. Ardalan et al. [2]. Considering the 2008 tax reforms in Germany, they examined the tax burden resulting from the imposition of corporate taxes and their performance in Germany. By matching the corporate tax rate in each state with the stock price of those companies, they observed that the further reduction of the corporate tax rate, the better their performance. Also, the majority of the tax burden falls on the owners of the companies. Wang & Sun [23]. In their study, they stated that increasing the corporate income tax leads to a decrease in the ability of companies to create jobs and expand businesses. Accordingly, companies paying more taxes are likely to reduce their financial resources for investment and increasing the size of production units, which can lead to a decrease in job creation and employment. Uemura [22]. In his study, he evaluated the corporate income tax rate reforms and the expansion of tax bases in Japan. He estimated the average effective tax rate and the effective marginal tax rate using data from Japanese companies; And by comparing the two through econometric methods, he evaluated the effects of corporate tax reform policy. The results of Amora's study showed that the policy of reducing the tax rate has more effects than reforming the depreciation method and leads to a decrease in the effective marginal tax rate. Bray [9]. He examined corporate income tax rates in different parts of the world. The results of his studies indicate that in 2021, twenty countries changed their tax rates, three countries increased the tax rate, and seventeen countries reduced it. The average corporate income tax rate worldwide, in which one hundred and eighty countries are measured, is 23.54 percent. Asia has the lowest, Africa has the highest average corporate income tax rate. Also, the average corporate income tax rate worldwide has decreased continuously since 1980. The largest decrease occurred in the early 2000s. Pham [18]. examined the impact of a temporary reduction in the corporate income tax rate on investment and employment in Vietnam, using panel data from 2004 to 2014. He concluded that with this policy, investment increased during the policy implementation year and returned to the pre-policy level after the policy ended. The evidence also shows no significant change in employment change. Yong & Liujie [24]. They examined the effects of tax incentives on investment and production in China during 2005 to 2013 using an autoregressive model with distributional lags. The results of their study show that the change in tax incentive policies had a positive effect on 38.4% of the investment sector and 9.9% of the

production sector of these companies and strengthened the financial structure of the companies. Lora & Fajardo [17]. They have stated that excessive reliance on corporate income taxes reduces investors' motivation for business activities. Reducing the corporate income tax rate increases investment and therefore increases employment levels. Fakhrhosseini & Kaviani [12]. They studied the effect of tax rates on some economic variables using a tax shock simulator including corporate income tax in a neoclassical model, for the period 1971 to 2010 and showed that overall, a decrease in corporate income tax rates will lead to a decrease in stock prices and an increase in consumption, production, and labor demand. Sepahrdoust et al. [20]. They studied the response of the employment rate to the tax structure. For this purpose, the vector error correction approach and the Toda-Yamamoto causality test and annual time series data during the period 1978-1977 for Iran were used. The results of the causality test show that corporate taxes and import taxes are factors that increase the unemployment rate in Iran. The results obtained from the vector error correction method have confirmed the existence of a positive and significant relationship between the variables of import tax, gross domestic product and consumer price index, as well as a negative and significant relationship between corporate tax and unemployment rate. Extraction of shock response functions also showed that with a positive shock from corporate tax variables, the unemployment rate increases in the short term and tends to zero in the long term. Also, with a positive shock from import tax and consumer price index variables, the unemployment rate decreases in the short term and tends to zero in the long term. Nematzadeh & Memarnejad [10]. They have examined the effect of value-added tax on employment during the period 2000-2012. This study was conducted using a dynamic panel data model and a statistical sample consisting of 72 countries, 11 non-OECD countries and 11 OECD countries. The results of this study indicate that the effect of VAT on employment in non-OECD countries is 9.980 and in OECD countries is 9.90; therefore, the positive and significant effect of VAT on employment is confirmed. Also, considering the estimated results of the effect of other taxes on employment in non-OECD countries, which is -9.910, and in OECD countries, which is -9.970, it can be said that if the tax is of the value-added type, it will lead to an increase in employment, but other taxes will lead to a decrease in employment. Khaleghi et al. [15]. In their study, they examined the long-term effects of government spending, taxes, and production on money supply and employment levels in Iran during the years 1971-2012 using the vector error analysis model and the Johanson convergence test. Their research results indicate that in the short term, increasing government spending in Iran can increase production, employment, and money supply, and increasing taxes can reduce production, reduce employment, and increase money supply.

RezaGholizadeh [19]. In their study, they used the vector error correction model, extracting instantaneous response functions, and variance analysis to examine the relationship between taxes and employment in Iran during the years 1971-2012. The evaluation of the short-term and long-term relationships between the variables indicates that the relationship between increasing taxes and employment is significant, and increasing taxes in each short-term and long-term time period has a negative effect on job creation.

4 Specification and estimation of the research model

4.1 Specification of the model

In the present study, in order to investigate the effect of changes in corporate income tax rates on employment levels, based on theoretical foundations, previous empirical studies in this field, including the study by Zhu et al. [5]. The research model is specified as follows:

$$
\begin{aligned}
LnEMP_{i,t} =& \beta_0 + \beta_1 LnEMP_{i,t-1} + \beta_2 TAX_{i,t-1} + \beta_3 ASSET_{i,t} + \beta_4 WAGE_{i,t} + \beta_5 ROA_{i,t} \\
& + \beta_6 DAR_{i,t} + \beta_7 RATE_{i,t} + \beta_8 DUM_{i,t} + \varepsilon_{i,t}
\end{aligned}
\tag{4.1}
$$

In relation (4.1): Ln is the dependent variable at the beginning and its first interval represents the natural logarithm, indices t and i are time and sections (companies), respectively, width from the origin, to ; coefficients of the explanatory variables and the error component of the model are expressed. And the operational variables of the model are defined as shown in Table 1:

In the explicit model of equation (4.1), the dependent variable, namely the logarithm of the number of employees of the i-th company in the current period, is entered in terms of the dynamic effect with a time lag period on the right side of the model. $LN\ EMP_{i,t-1}$ The first lag of the dependent variable as an instrumental and independent research variable appears as the logarithm of the number of employees of the i-th company in the previous period on the right side of the model. Also, $TAX_{i,t-1}$ the main and independent variable, which indicates the effective tax rate on the income of the i-th company in the previous period $(t-1)$, is observed in the model with a time lag and as the first lag of the effective tax rate, because last year's tax affects this year's employment, and it indicates that the demand for labor by a company is a dynamic process and the current behavior of the company is affected by its past behavior.

Table 1: Detailed description of research variables

Type of Variable	Variable Name	Symbol	Operational Definition of Variable
Dependent Variable	Logarithm of Employment of Company i in Period t	$LN\ EMP_{i,t}$	Logarithm of the number of employees of Company i in Period t
Lagged Explanatory Variable	First Lag of the Dependent Variable Logarithm	$LN\ EMP_{i,t-1}$	Logarithm of the number of employees of Company i in Period $t-1$
Main Independent Variable	Effective Tax Rate of Company i in Period $t-1$	$TAX_{i,t-1}$	Total income tax of Company i in Period t/ Taxable profit of Company i in Period t
	Size of Assets of Company i in Period t	$ASSET_{i,t}$	Total assets of Company i in Period t
Control Variables	Per Capita Wage of Employee i in Period t	$WAGE_{i,t}$	(Salary + Benefits received) / Number of employees
	Asset Return	$ROA_{i,t}$	Net profit / Total assets
	Debt-to-Asset Ratio	$DAR_{i,t}$	Total assets / Debt
	Cost-to-Debt Ratio	$RATE_{i,t}$	Financial debt / Costs
Dummy Variable	Ownership Type of Company	$DUM_{i,t}$	State-owned companies, private companies, and all state-owned and private companies combined

Source: Research findings

The symbols ASSET, WAGE, ROA (Return on Assets), DAR (Debt Asset Ratio) and RATE (Cost to Debet Ratio) are the control and independent variables, respectively, total assets, wage per capita, return on assets, debt-to-asset ratio, cost-to-debt ratio, DUM (type of company ownership) and error component. In the above-specified model, to show the dynamics of the model, the employment variables and effective tax rate are entered into the model with one lag. Entering a variable with a large number of lags causes errors in the prediction, and variables with a small number of lags cause unusual results. For the above-mentioned reasons, we use Schwarz-Bayesian and Schwarz-Bayesian statistics in Stata software to determine the optimal number and length of lags. If all three statistics show the same optimal lag, there will be no problem, but if there is no similarity, the Akaike statistic, which shows a good result in annual data, is used. Other explanatory variables are entered without lags.

In this study, in order to investigate the effects of the above-mentioned independent variables on employment of private companies and state-owned companies and all companies (total of state-owned and private companies) listed on the Tehran Stock Exchange, the data and information necessary for estimating the model were collected from the Kodal database, audited financial statements of all companies listed on the Tehran Stock Exchange for 110 companies in the period 2010-2013, taking into account the limitations mentioned below, in order to cover macroeconomic developments and continuous access to data. After sorting in an Excel spreadsheet, the required data were classified according to the operational definition of the variables. Data analysis is performed using the panel data regression model and the generalized moments model, and the relationship between dependent and independent variables is examined, as well as the test of research hypotheses is performed in Stata software. Finally, the estimated model is estimated once for all companies, once for private companies only, and once for state-owned companies only.

A- The company was listed on the Tehran Stock Exchange before 1389 and has not been removed from the list of companies listed on the Tehran Stock Exchange until 1402.

B- The information they need is available and their shares are continuously traded on the capital market.

D- Their fiscal year ends on March 29 and the fiscal year has not changed during the period under review.

C- There is access to their financial statements.

4.2 Model estimation

If the specified model of the research, equation (4.1) is observed, the dependent variable appears with an interval on the right side of the equation. Therefore, we are faced with a dynamic panel data model. In this situation, due to the dynamic structure of the model, OLS estimates are not suitable and two-stage estimation methods 2SLS Anderson-Hsiao (1981) or the generalized moments model (GMM) should be used.

Regarding the generalized moments (GMM) approach, the general form of a dynamic model in panel data is as follows:

$$y_{it} = \alpha y_{i,t-1} + \beta x_{i,t} + \mu_{i,t} + \varepsilon_{i,t} \qquad (4.2)$$

Where $y_{i,t}$ the dependent variable, $x_{i,t}$ the independent variable used as instrumental variables, $\mu_{i,t}$ the error factor related to the sections and $\varepsilon_{i,t}$ the error factor of the i-th section at time t. When in the panel data model, the dependent variable lag appears on the right side of the model and is associated with the error component, it causes the use of the OLS estimator to be biased and inconsistent, and also the random effects of the GLS estimator in the dynamic mixed data model are biased. One of the common solutions to solve this problem is to differentiate the original equation once to remove the cross-sectional effects and then use the GMM estimators. Arellano and Bond have proposed the following differential equation:

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta(x_{i,t} - x_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \tag{4.3}$$

That is, first, differentiation is performed to remove the effects of the sections or μ_i in order from the model, and in the second stage, the residuals remaining in the first stage are used to balance the variance-covariance matrix. In other words, this method creates variables called instrumental variables to have a consistent and unbiased estimate [4].

Stationarity is examined using the two unit root tests for each of the selected variables at the zero level (without differentiation) and their degree of cointegration is determined. The results of which are presented in Table 2. Based on

Table 2: Results of the unit root test for the variables

Variable	Im, Boys, and Shin		Len, Lin Cho		Result
	P-VALUE	Test Statistic	P-VALUE	Test Statistic	
EMP	-6.5110	0.0000	-5.49194	0.0000	Stationary at Level
$EMP(-1)$	-15.6814	0.0000	-21.8164	0.0000	Stationary with First Difference at Level
$TAX(-1)$	-19.9046	0.0000	-15.6623	0.0000	Stationary with First Difference
$ASSET$ 9	-3.10767	0.000	-7.56464	0.0000	Stationary at Level
$WAGE$	-16.9835	0.0000	-5.84579	0.0000	Stationary at Level
ROA	-4.30138	0.0000	-6.67651	0.0000	Stationary at Level
DAR	-2.91216	0.0018	-5.71618	0.0000	Stationary at Level
$RATE$	-9.35823	0.0000	-43.7681	0.0000	Stationary at Level
DUM	-1.84901	0.0322	-1.50668	0.0659	Stationary at Level

Table 3: Source: Research findings

Table 2, the results of the Len, Lin Cho and Im, Pesaran and Shin test show that the employment level of companies, the first lag of the employment level of companies, the debt-to-asset ratio, total assets, wage per capita, return on assets, the dummy variable of corporate ownership and the ratio of expenses to financial liabilities of companies are at a static level and the effective tax rate variable is stationary with one difference. All coefficients are statistically significant at the one percent level. The stationary of the variables refers to the reliability of the results and the absence of spurious regression.

Before estimating the model, the Sargan diagnostic test statistic was used to check the specificity of the equation, and the results of the instrument validity test are presented in Table 4. Then, the model is estimated by considering the instrumental variables and then, the existence of autoregressive disturbance terms in the aforementioned model is tested, and the results are shown in Table 4:

Table 4: Instrument validity test

103.7621	Chi2
0.1357	Prob > Chi2

Source: Research findings

In the validity test of the instruments, according to the results of Table 4, the null hypothesis of the validity of the instrumental variables used in the model is not rejected; therefore, the instruments used in the model are valid and the model is correct.

To avoid estimating incorrect parameters and an unstable model, violating the assumptions of data independence and accuracy in future predictions based on the model, the existence of serial correlation was examined using the conventional Arellano-Bond method, and the test results are presented in Table 5.

Based on the results of Table 5, in the autocorrelation test of the disturbance terms, the null hypothesis is the absence of autocorrelation between the disturbance terms and the value of the z-test statistic for the first and second

Table 5: Autocorrelation test of disturbance sentences

	Pr	Z	Lag
First	-2.3756	0.0175	
Second	1.4121	1.4121	

Source: Research findings

order autoregressive lag is 0.1579 and 0.0175, respectively. In this test, the null hypothesis of the absence of second order autocorrelation will not be rejected at the one percent significance level, considering the value of the obtained probabilities.

In Table 6 and 7, the results of estimating the effect of the research variables on the employment level of companies listed on the Tehran Stock Exchange using the generalized moment method (GMM) are presented for all companies and separately for privately and publicly owned companies, respectively. The results are as follows. From the results

Table 6: Estimation of the model

Variable	Coefficient	t	P
$EMP(-1)$	0.2584228	68.2	0.000
$TAX(-1)$	0.000218	-7.55	0.000
$AASET$	0.3931535	94.79	0.000
$WAGE$	-0.4411233	96.5	0.000
ROA	0.0598865	4.26	0.000
DAR	0.2698937	23.63	0.000
$RATE$	-0.0024245	-5.77	0.000
DUM	-0.1127445	-10.96	0.000
$CONS$	2.971056	79.05	0.000

Source: Research findings

of Table 6, it can be seen that the effective corporate income tax rate has a negative effect on the level of employment of companies, and with a one-unit increase in the effective corporate income tax rate, the level of employment of companies decreases by 0.00218 units, and this variable was statistically significant at the 99% confidence level. The size of the company's assets has a positive effect on the level of employment of companies, and with a one-unit increase in the size of the company's assets, the level of employment of companies increases by 0.393 units, and this variable was statistically significant at the 99% confidence level. The return on assets of companies has a positive effect on the level of employment of companies, and with a one-unit increase in the return on assets of companies, the level of employment of companies increases by 0.059 units, and this variable was statistically significant at the 99% confidence level. The debt-to-asset ratio of companies has a positive effect on the level of employment of companies, and with a one-unit increase in the debt-to-asset ratio of companies, the level of employment of companies increases by 0.269 units, and this variable is statistically significant at the 99% confidence level. The ratio of financial expenses to debt has a negative effect on the level of employment of companies, and with a one-unit increase in the ratio of financial expenses to debt, the level of employment of companies decreases by 0.0024 units, and this variable is statistically significant at the 99% confidence level. Ownership of companies has a negative effect on the level of employment of companies, and with a one-unit increase in the ownership of companies to private status, the level of employment of companies decreases by 0.112 units, and this variable is statistically significant at the 99% confidence level. The per capita wage of companies has a negative effect on the level of employment of companies, and with a one-unit increase in the per capita wage of companies, the level of employment of companies decreases by 0.441 units, and this variable is statistically significant at the 99% confidence level. The level of employment of companies in the previous period has led to an increase in the level of employment of companies in the current period; so that with a one-percent increase in the level of employment of companies in the previous period, the level of employment of companies in the current period increases by 0.258 percent, and this coefficient is statistically significant at the 99% confidence level. The width from the origin of the model was also 2.971, so that the effect of other variables excluded from the model or not explicitly mentioned on the dependent variable is 2.971.

In order to examine the robustness of the results, the companies under study are divided separately into two groups of privately owned and state-owned companies, and the effects of the income tax rate on employment of state-owned and private companies are measured. The results of the model estimation are reported in Table 7:

According to Table 7, it can be seen that in state-owned companies, the effective corporate income tax rate has a negative effect on the employment level of state-owned companies, and with a one-unit increase in the effective corporate income tax rate, the employment level of companies decreases by 0.0004 units, and this variable is statistically

Table 7: Model estimates

coefficient	State-owned companies			Privately owned companies		
Variable	coefficient	t	$P > t$	coefficient	t	$P > t$
$EMP(-1)$	0.2723994	77.89	0.000	0.5435023	21.13	0.000
$TAX(-1)$	-0.0004004	-19.30	0.000	-0.0000992	-0.98	0.327
$ASSET$	0.3792636	82.163	0.000	0.2290157	27.23	0.000
$WAGE$	-0.4337207	173.78	0.000	-0.2714762	-23.35	0.000
ROA	0.0821277	26.8	0.000	-0.1334612	-81.2	0.000
DAR	0.273144	65.34	0.000	-0.1254368	-12.2	0.000
$RATE$	-0.0026746	-4.62	0.000	0-.0020757	1.49	0.000
$CONS$	3.043977	16.115	0.000	2.13091	7.90	0.000

Source: Research findings

significant at the 99% confidence level. The size of the companies' assets has a positive effect on the employment level of state-owned companies, and with a one-unit increase in the size of the companies' assets, the employment level of companies increases by 0.379 units, and this variable is statistically significant at the 99% confidence level. The return on assets of companies has a positive effect on the employment level of state-owned companies, and with a one-unit increase in the return on assets of companies, the employment level of companies increases by 0.082 units, and this variable is statistically significant at the 99% confidence level. The debt-to-asset ratio of companies has a positive effect on the employment level of state-owned companies, and with a one-unit increase in the debt-to-asset ratio of companies, the employment level of companies increases by 0.273 units, and this variable is statistically significant at the 99% confidence level. The ratio of expenses to financial liabilities has a negative effect on the employment level of state-owned companies, and with a one-unit increase in the ratio of expenses to financial liabilities, it decreases by 0.00267 units. The per capita wage of companies has a negative effect on the employment level of companies, and with a one-unit increase in the per capita wage of companies, the employment level of companies decreases by 0.433 units, and this variable is statistically significant at the 99% confidence level. The employment level of state-owned companies in the previous period has led to an increase in the employment level of state-owned companies in the current period; So that with a one percent increase in the employment level of companies in the previous period, the employment level of companies in the current period increases by 0.272 percent, and this variable is statistically significant at the 99 percent confidence level. The width from the origin of the model is also 3.043, so that the effect of other variables excluded from the model or not explicitly mentioned on the dependent variable is 3.043.

In privately owned companies, the effective corporate income tax rate has a negative effect on the employment level of private companies, and with a one-unit increase in the effective corporate income tax rate, the employment level of private companies increases by 0.00009 units, and this variable is not statistically significant. The size of the company's assets has a positive effect on the employment level of private companies, and with a one-unit increase in the size of the company's assets, the employment level of private companies increases by 0.229 units, and this variable is statistically significant at the 99 percent confidence level. Return on assets of companies has a negative effect on the employment level of private companies, and with a one-unit increase in return on assets of companies, the employment level of companies decreases by 0.133 units, and this variable is statistically significant at the 99% confidence level. Debt-to-asset ratio of private companies has a negative effect on the employment level of private companies, and with a one-unit increase in debt-to-asset ratio of companies, the employment level of companies decreases by 0.125 units, and this variable is statistically significant at the 95% confidence level. The ratio of expenses to financial liabilities has a negative effect on the employment level of private companies, and with a one-unit increase in the ratio of expenses to financial liabilities of companies, the employment level of companies decreases by 0.002 units, and this variable is statistically significant at the 99% confidence level. The per capita wage of companies has a negative effect on the level of employment of companies, and with a one-unit increase in the per capita wage of companies, the level of employment of companies decreases by 0.271 units, and this variable is statistically significant at the 99% confidence level. The level of employment of private companies in the previous period has led to an increase in the level of employment of private companies in the current period; so that with a one-percent increase in the level of employment of companies in the previous period, the level of employment of companies in the current period increases by 0.543 percent, and this variable is statistically significant at the 99% confidence level. The width from the origin of the model is also 2.13, so that the effect of other variables excluded from the model or not explicitly mentioned on the dependent variable is 2.130.

5 Conclusion and suggestions

Corporate income tax, as the most important component of direct taxes, has always been the focus of policymakers and economists and includes both governmental and non-governmental legal entities, which are mostly levied annually on the income of legal entities. Since the tax revenue of governments is mainly derived from this type of tax, governments try to impose tax rates appropriately. This type of tax is levied on corporate profits and provides a significant share of government spending. Given the importance of this issue, the government's goal in imposing taxes on various tax bases is not simply to earn income, and its economic effects are considered. In this regard, one of the main bases of direct taxes is corporate income tax. Since companies benefit more from the goods and services produced by the government and as a result, they must pay their price by paying a separate tax, and also based on the principle of ability, in terms of having the power to pay taxes until they are bankrupt, this type of tax is of interest to legislators in most countries of the world, and they act to impose and apply this type of tax based on the principles of utility and ability to pay taxes. In Iran, corporate tax is also one of the important issues that has been considered in the formulation of development plans, tax laws and regulations, and annual budget plans, given its role in providing government tax revenues and its impact on the level of investment, production, and employment. Therefore, the present study examines the effects of income tax rates on employment of companies listed on the Tehran Stock Exchange during the years 2010-2023 using the generalized moment method. The results of the study show that the effective corporate income tax rate, the ratio of expenses to financial liabilities, the wage per capita of companies, and the private ownership of companies have a negative effect on the employment level of companies, and the size of the assets of companies, the return on assets of companies, the debt-to-asset ratio of companies, and the level of employment of companies in the previous period have a positive effect on increasing the level of employment of companies. Then, in order to examine the effect of changes in the income tax rate of the companies under study on the level of employment, these companies were divided into two groups of companies with private and state ownership, and the effects of the income tax rate on the level of employment of each of the companies with state and private ownership were measured separately. In the group of companies with state ownership, the effective corporate income tax rate, the ratio of expenses to financial liabilities, and the wage per capita of companies have a negative effect on the level of employment of state-owned companies, and the size of the assets of companies, the return on assets of companies, the debt-to-asset ratio of companies, and the level of employment of companies in the previous period have a positive effect on increasing the level of employment of state-owned companies in the current period. In the group of privately owned companies, the size of the company's assets and the level of employment of the companies in the previous period had a positive effect on increasing the level of employment of private companies, and the effective tax rate on corporate income, the ratio of expenses to financial liabilities, the wage per capita of companies, the return on assets of companies, and the ratio of debt to assets of companies have a negative effect on the level of employment of private companies.

Based on the findings of the research, the following suggestions are made to economic planners and policymakers:

- According to the findings of the research, the relationship between the effective tax rate on corporate income and the level of employment in companies is negative, and this indicates that increasing the tax rate can increase the cost of companies and consequently reduce the motivation of company owners for growth and development, and as a result, they put the policy of adjusting and firing employees or refraining from attracting new workers on the agenda. Therefore, it is recommended that governments refrain from implementing policies to increase the corporate income tax rate in order to create job opportunities and increase employment.

- By applying tax exemptions to companies, governments can not only encourage existing companies to continue production in the country, but also provide the opportunity to attract foreign companies to operate within the country, thereby creating job opportunities, increasing employment levels and reducing unemployment rates.

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