Financial Engineering and Risk Management (2022)
Clausius Scientific Press, Canada

DOI: 10.23977/ferm.2022.050616
ISSN 2523-2576 Vol. 5 Num. 6

An Empirical Analysis of the Influence of ETR Adjustment on Social General Equilibrium-Based on the Empirical Data of Listed Companies in Various Industries

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Keywords: ETR of Listed Company, OLS Model, CGE Model, Industry Adjustment, Social General Equilibrium

Abstract: According to the sample data from listed companies of various Industries in Shenzhen and Shanghai stock markets from 2008 to 2010, this article used the company size, profitability, capital structure and other firm features, and furthermore, introduced an annual, industry, the actual holding and the tax preference policy as dummy variables, did research on the factors affecting ETR. Based on this, we extracted the industry factor which is significant to the economic, and depended on the computable general equilibrium (CGE) analysis, by adjusting the industry ETR to determine the influence of social general equilibrium. The results indicate that, if the direct, indirect taxation under the premise of the same proportion, to reduce or to improve indirect tax rate of the real estate and departments of industry is an effective way to improve China's long-term economic development.

1. Introduction

When examining the enterprise income tax burden, the effective tax rate (ETR) of the company has become a better alternative measurement tool. Its level has a direct impact on the cash flow and after tax profit of the enterprise, and thus determines its survival and development. At the same time, it plays an important role in the national fiscal revenue, economic development and social stability. The research on the actual tax burden of enterprises, especially listed companies, has attracted the attention of tax policy makers and researchers. We find that in recent years, Chinese and foreign scholars have made certain achievements in the empirical research on the factors affecting the actual tax burden of listed companies.

Atulan Guha(2007)[1] Based on the panel data from 1992 to 2001, using explanatory variables such as financial leverage, net asset ratio, plant and equipment, and total assets, this paper examines the relationship between the company size and the ETR of private manufacturing industry in India in a multivariate model. The results show that there is a significant negative correlation between company size and ETR. And explain that large companies can reduce the effective tax rate by

taking advantage of certain factors in the domestic administrative system.

Lou Quan(2007)[2] Taking the data of China's listed companies from 1994 to 2004 as a sample, this paper investigates the tax burden of listed companies and its influencing factors since the implementation of the tax sharing system. The results show that there are regional and industrial differences in the overall tax burden of listed companies. The overall tax burden is significantly positively related to income tax burden, turnover tax burden, asset scale, profitability, capital intensity and annual variables, but negatively related to debt level and investment income.

Cao Shujun, Zhang Wanjun(2008)[3] Based on the panel data of 425 listed companies from 1998 to 2004, this paper applies the random effect model to deeply study the company characteristic factors affecting ETR. The results show that there is no significant relationship between the size of listed companies, the density of fixed assets and ETR. Financial leverage has a significant negative correlation with ETR. The over employment of employees will get tax preference from the local government. When listed companies generally enjoy tax preference, profitability and equity structure are significantly positively related to ETR. When the tax policy changes, their impact on ETR is no longer significant.

Wu Liansheng(2009)[4] Taking Chinese listed companies as samples, this paper studies the impact of state-owned equity on corporate tax burden. The conclusion shows that the higher the proportion of state-owned equity, the higher the corporate tax burden. The positive tax effect of state-owned equity of non tax preference companies is significantly higher than that of tax preference companies.Zhou Jing(2011)[5] Based on the panel data of Chinese listed companies from 2007 to 2008, the results show that ETR is significantly positively correlated with asset liability ratio, significantly negatively correlated with return on investment and equity structure, but not significantly correlated with company size and capital intensity.

The above scholars mostly discuss the relationship and stability with ETR from the factors such as the scale of listed companies, equity structure, capital structure, profitability, etc., but rarely involve the nature and proportion of actual shareholders, preferential tax rate of income tax and joint investigation by industry, which provides a thinking space for the research of this paper.

According to modern tax theory, the ideal goal of tax system reform is to achieve an optimal tax system structure, so that the functions of tax efficiency and fairness can be taken into account. Efficiency can be directly reflected by economic variables, but equity can not be directly observed. Therefore, some scholars such as Stiglitz (2002) think that "although we cannot define the optimal tax policy, we can simulate the method of changing the tax policy to increase welfare". After that, domestic and foreign scholars have applied various equilibrium models to discuss this issue. For example, Xu Pu and Su Zhentian (2012) have established an "inter period dynamic" equilibrium model, It simulates the situation of increasing indirect tax while reducing direct tax. The results show that this can bring about the growth of social welfare, the improvement of production efficiency, and the increase of GNP. However, the existing research has shown that reducing the proportion of direct taxes focuses on the realization of social efficiency, while reducing the proportion of indirect taxes is more helpful to improve social equity. Compared with most developed countries in the world, the proportion of indirect tax in China is relatively high, while the proportion of direct tax is relatively low. And such a tax system structure is increasingly not in line with the needs of social development. Based on these considerations, the tax Science Research Institute of the State Administration of Taxation proposed to increase the proportion of direct tax in tax revenue in 2005. Recently, scholars such as Liu Zuo (2010) have explained the necessity of tax system structure adjustment for the development of China's tax system. Therefore, the tax system adjustment simulated by Xu Pu and Su Zhentian is to reduce social equity and improve economic efficiency. This is not in line with the design idea of the optimal tax system and deviates from the long-term social development goal of giving consideration to fairness and efficiency.

Based on the above considerations, this paper takes the non-financial listed companies in Shenzhen and Shanghai from 2008 to 2010 as a sample, uses the company characteristics such as company size, profitability and capital structure, and introduces the year, industry, actual holding and tax preference as dummy variables to empirically analyze the factors affecting ETR. On this basis, on the premise of not changing the proportion of direct tax and indirect tax, only adjust the actual tax burden of indirect tax in different industries to measure its impact on the general balance of society. Such simulation can analyze how the tax system adjustment can make the tax efficiency further without affecting the tax fairness, and make contributions to the optimization of the tax system in China.

The other parts of this paper are arranged as follows: the second part is the research design, including sample data sources and research methods. The third part is empirical analysis, including OLS model analysis and CGE model to simulate the impact of inter industry tax burden adjustment on social general equilibrium. The last part is the summary of the whole paper.

2. Data and Method

2.1 Sample Selection and Data Source

In this paper, the relevant data of A-share listed companies in Shenzhen and Shanghai from 2008 to 2011 are selected as the research samples, and the samples are screened according to the following steps: considering the impact of extreme values, the listed companies of ST and Pt in any year are excluded. Exclude any company whose total annual profit before interest and tax is less than or equal to zero or whose income tax expense is less than zero. Excluding financial (code I) listed companies. Eliminate a small number of companies with irregular and missing data information disclosure. According to the above criteria, we have selected a total of 437 eligible listed companies as sample companies (1311 observations in total). All data are from guotai'an data service center and Shenzhen, and have undergone necessary calculation and collation.

2.2 Variables and Study Definitions

2.2.1 Explained Variable: Actual Income Tax Burden (ETR) of the Company

ETR=Income tax expense / total profit before interest and tax.

The numerator reflects the income tax expenses actually paid by the enterprise in the current period, and the denominator reflects the total profit before interest and tax of the company. Since there is no economic significance when the value of ETR calculation is greater than 1 or less than 0, the samples with the value range in this range are excluded.

2.2.2 Explanatory Variables

Existing researches on the influencing factors of the company's ETR generally believe that the company's size, profitability and capital structure have a significant impact on the company's actual tax burden. This paper selects these variables as explanatory variables in the regression model, mainly to analyze the relevant factors affecting the company's actual tax rate. These include company size, asset liability ratio LEV, return on investment ROA, asset intensity capint and inventory intensity invint.

The company size is expressed by the natural logarithm of the total assets at the end of the period. There are two different views on the relationship between the size of the company and the effective tax rate: one view holds that large companies receive more public attention, and this "political cost" will lead to a higher effective tax rate. Another view is that the effective tax rate of

large companies is lower because they can use more resources for tax planning and political lobbying. Its coefficient sign is expected to be positive.

Asset liability ratio (Lev) = total liabilities at the end of the period / total assets at the end of the period. As the interest has the function of tax deduction, the effective tax rate of the company with high asset liability ratio is relatively low. On the contrary, companies with higher effective tax rates tend to borrow debt because the interest of debt has the function of tax deduction. In this way, there may also be a positive correlation between the effective tax rate and financial leverage.

Return on investment (ROA) = net profit / total assets. The return on total assets represents the profitability of the company. From the perspective of tax neutrality, there is no relationship between the tax rate and profitability. However, some studies show that there is a significant positive correlation between the effective tax rate and profitability. In addition, there are asset intensity (capint) = net fixed assets / total assets and inventory intensity (invint) = net inventory / total capital.

2.2.3 Dummy variable

Table 1: Definition and description of main variables

Variable type	Variable name		Variable description
Explained variable	Actual income tax burden	ETR	Income tax expense / total profit before interest and tax
Explanatory variable	company size	Size	Natural logarithm of total assets at the end of the period
	Asset liability ratio	Lev	Total liabilities at the end of the period / total assets at the end of the period
	Return on investment	Roa	Net profit / total assets
	Asset concentration	Capint	Net fixed assets / total assets
	Inventory density	Invint	Net inventory / total capita
Dummy variable	year	Year	Annual dummy variable, used to control the annual macroeconomic impact
	industry	Industry	Industry virtual variable, used to control industry differences
	Controlling	Control_Rate	Proportion of the actual controller holding the control of the listed company
		Control	The nature of the actual controller, distinguishing between state-owned holding and non-state-owned holding
	Tax preference	Tax_Rate	Tax preference virtual variable, used to control the impact of preferential tax rate

Considering that the above company characteristic factors are not all factors affecting ETR, on the basis of the research results of domestic and foreign scholars, we introduce macro factors that can affect ETR as virtual variables to consider. One is annual variable. Since the new enterprise income tax has been implemented since 2008, in order to compare the difference caused by the change of tax rate, year is used to represent the virtual variable of the year where the company's data is located, where year1 = 1 represents 2008, year1 = 0 and year2 = 0 represents 2009, and year2 = 1 represents 2010. Second, industry variables. It is found that the actual tax burden of different industries varies greatly according to the formulation of national tax policies and the

nature of industries. We divide the sample data into six categories, namely, real estate industry (FDC), commerce (SY), energy industry (NY), industry (except energy industry) (GY), service industry (FW) and comprehensive. In this paper, industry is taken as the control group (FDC = 0, FW = 0, Zh = 0, NY = 0, SH = 0), When FDC = 1, it represents real estate industry. When shy = 1, it represents commerce. When NY = 1, it represents energy industry. When FW = 1, it represents service industry. When shy = 0, it represents commerce. The third is the holding situation. In order to distinguish between state-owned holding and non-state holding, the dummy variable control is introduced. When control = 1 is state-owned holding, control = 0 is non-state holding. The fourth is the tax preference. In order to distinguish whether to enjoy the tax preference policy, the virtual variable tax is introduced_ Rate, where tax_ Rate = 1 indicates that the company enjoys preferential tax policies, tax_ Rate = 0 indicates that the company does not enjoy preferential tax policies.The variables and descriptions are shown in Table 1

2.3 Research Ideas and Methods

2.3.1 The Research Idea

Firstly, by analyzing the research results at home and abroad, it is determined that the annual, industry, holding, tax preference and other virtual variables will be comprehensively investigated with other company characteristics such as company size, profitability and capital structure. After descriptive statistics, OLS model will be used for regression to analyze the impact on the ETR of listed companies. On this basis, the industry attributes with important economic significance are selected as the key points for cross examination with the holding situation and whether the company enjoys tax preference, and the meaning of special economic policies in ETR is analyzed. Finally, based on the analysis of computable general equilibrium (CGE), without changing the proportion of direct tax and indirect tax, the impact on social general equilibrium is measured by adjusting only the actual tax burden of indirect tax in different industries.

2.3.2 Research Method

Carry out descriptive statistics on the observed sample data and analyze the distribution of ETR under the influence of industry attributes.

In order to verify whether the ETR of Listed Companies in China is influenced by the company characteristics such as company size, asset structure and profitability, and the virtual variables such as year, industry, holding and tax preference.This paper uses OLS model to verify. OLS model is shown in (1):

$$\begin{aligned} ETR &= \beta_1 + \beta_2 Control + \beta_3 Control_rate + \beta_4 Control * Control_rate \\ &+ \beta_5 Tax_rate + \beta_6 FDC + \beta_7 FW + \beta_8 QTGY + \beta_9 NY + \beta_{10} SHY + \beta_{11} SIZE \\ &+ \beta_{12} LEV + \beta_{13} ROA + \beta_{14} CAPINT + \beta_{15} INVINT + \beta_{16} Year1 + \beta_{17} Year2 + \varepsilon \end{aligned} \tag{1}$$

On the basis of static analysis, this paper applies CGE model to analyze the impact of adjusting the indirect tax rate on the real economy. In fact, it is to use a set of equations to describe the corresponding changes of output, price, demand and other factors during the change of indirect tax structure, the supply and demand sides in the market and the formation of various markets, and to analyze the effect of indirect tax structure adjustment.

3. Empirical Analysis

3.1 Descriptive Statistics of ETR

Table 2: Description statistics of actual tax burden of Listed Companies in various industries

	Comprehensive	Industry	Energy	Service	commercial	real estate
Average	0.4731	0.4240	0.5006	0.4644	0.4808	0.5608
Median	0.4195	0.3813	0.4638	0.4667	0.4632	0.5742
Std.	0.2579	0.2711	0.2805	0.2490	0.2312	0.2470
Min	0.0349	0.0002	0.0139	0.0033	0.0053	0.0578
Max	0.9885	0.9943	0.9960	0.9443	0.9231	0.9993

From table 2, it can be seen that the ETR of the real estate industry was the highest from 2008 to 2010, reaching 0.5608, mainly because the continuous rise of house prices in recent years has driven the rapid and high growth of the real estate industry, which has led to the increase of its ETR. The ETR of the energy industry reached 0.5006, second only to that of the real estate industry. This is mainly due to the fact that most of the energy industry in China is monopolistic and there are a large number of monopoly profits, which makes its ETR relatively high. The actual tax burden of Commerce, comprehensive industry and service industry is 0.4808, 0.4731 and 0.4644 respectively. These three industries show a high-speed growth trend with the rapid development of China's tertiary industry, so the ETR is high.Compared with other industries, the industrial ETR is at the lowest level, only 0.4240.

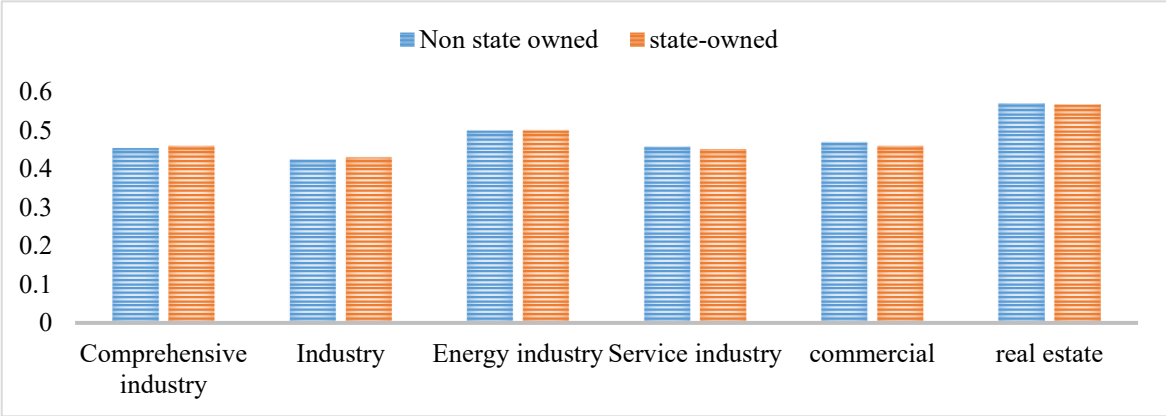

Figure 1: Comparison of ETR under different holding forms of various industries

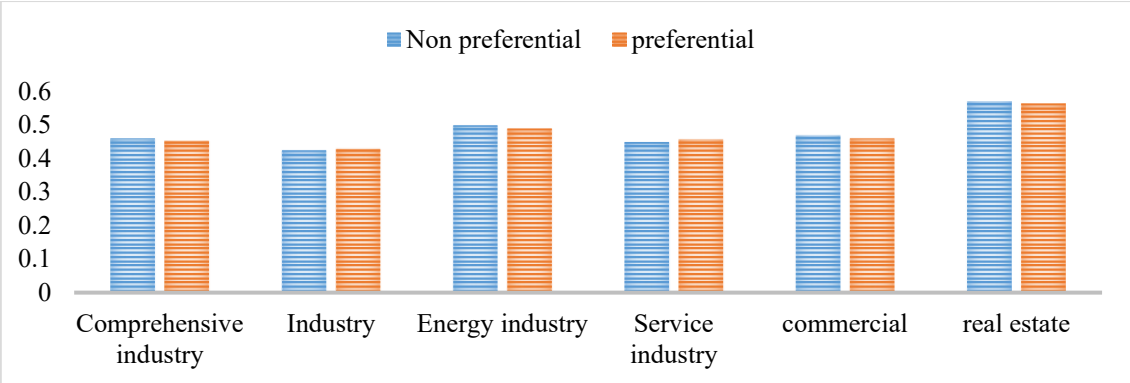

Figure 2: Comparison of ETR under different tax policies of various industries

It can be seen from Figure 1 that ETR is also different in different industries due to different

holding forms. The ETR of state-owned holding listed companies in Comprehensive industry[6] and industry[7] is slightly higher than that of non-state-owned holding listed companies. The actual tax burden of the state-owned holding listed companies in the comprehensive industry and industry is relatively high, which indicates that the state controls the basic industries related to the people's livelihood. The actual tax burden of non-state-owned holding listed companies in the energy industry, service industry, commerce and real estate industry is higher than that of state-owned holding listed companies.

It can be seen from Figure 2 that ETR varies among industries due to different tax preferential policies. Generally speaking, the ETR of listed companies enjoying preferential tax policies is lower than that of listed companies not enjoying preferential tax policies. In terms of specific industries, it is found that the ETR of listed companies enjoying preferential tax policies in industry and service industry is slightly higher, and other industries are affected by preferential tax policies, and their ETR is lower.

3.2 OLS regression analysis

Table 3: regression results

	Estimated coefficient
Intercept term	-0.3672***
Control	0.0487*
Control_rate	0.0968**
Control*Control_rate	-0.1475**
FDC	0.0700***
FW	0.0444**
ZH	0.0136
NY	0.0178
SHY	0.0893***
Tax_rate	-0.0317***
SIZE	0.0406***
LEV	-0.4833***
CAPINT	-0.1689***
INVINT	0.3116***
ROA	2.5125***
Annual effect	control
Adjusted R2	0.4590
F value	70.4511***
Sample size	1311

The regression results of OLS model are shown in Table 3. First, taking industry as the control group (FDC = 0, FW = 0, Zh = 0, NY = 0, SH = 0) and other industries as the comparison group, the results show that the estimated coefficients of real estate, service industry and Commerce are significantly positive, indicating that the ETR of these three industries is higher than that of industry. The estimated coefficients of energy industry and comprehensive industry are also positive, but not significant. This shows that the actual burden of income tax varies among different industries, and the ETR of real estate is significantly higher than that of industry.

Second, the estimation coefficient of state-owned holding (control) is significantly positive, indicating that the actual tax burden of state-owned holding listed companies is higher than that of non-state-owned holding listed companies. The estimated coefficient of control_rate is significantly

positive, indicating that the higher the control ratio, the higher the ETR of the company. The estimation coefficient of control * control_rate of state-owned holding is significantly negative, indicating that the higher the control ratio of state-owned holding, the lower the actual tax burden of the company. The regression results show that the actual tax burden of state-owned holding listed companies in comprehensive industries and industries is high, which indicates that the proportion of state-owned control rights is not high.The ETR of state-owned holding listed companies in other industries is low, mainly because the proportion of control rights of state-owned holding listed companies in these industries is high.

Third, the estimated coefficient of tax_rate is significantly negative, indicating that the actual tax burden of listed companies enjoying tax preferential policies is lower than that of listed companies not enjoying tax preferential policies.

Fourth, among other explanatory variables, the estimated coefficient of the logarithm of total assets (size) is significantly positive, indicating that the actual tax burden of large-scale companies is highe.The estimated coefficient of the asset liability ratio (Lev) is significantly negative, indicating that the tax credit effect of debt leads to the low ETR of listed companies with high asset liability ratio. The estimated coefficient of return on total assets (ROA) is significantly positive, indicating that the higher the profit level of listed companies, the higher the actual tax burden. The estimated coefficients of capital intensity (capint) and inventory intensity (invite) are significantly negative and significantly positive respectively, which indicates that the tax credit effect of asset depreciation reduces the actual tax burden of the company. The higher the inventory intensity, the lower the asset intensity. Therefore, the inventory intensity is positively related to the actual tax burden of the company.

Due to the changes in China's enterprise income tax system, the previous measurement analysis can only take three years of data, which makes the analysis conclusion a static result and cannot be used for prediction analysis. However, the purpose of analyzing the tax burden here is to provide reasonable suggestions for the overall adjustment of the tax. It is risky to predict the future situation only based on the static analysis. Therefore, this paper introduces a dynamic equilibrium model to analyze the impact of adjusting the indirect tax structure on China's macro-economy and welfare when the proportion of direct tax and indirect tax is unchanged.

3.3 Based on CGE Model, the Influence of Industry Indirect Tax Adjustment on Social General Equilibrium Is Estimated

According to the above, among all industries, the real estate industry and the energy industry have the highest indirect tax actual tax burden, the industrial actual tax burden is the lowest, and the actual tax burden of other industries is not much different. As for the phenomenon of high indirect tax burden in the real estate industry and energy industry, one view holds that its high tax burden is caused by its high profits, and its tax burden is not high enough, and there is still the necessity and space for levying "windfall profits tax". Another view is that these two industries, especially the energy industry, bear the responsibility of developing new energy, shoulder the heavy responsibility of energy price stability and energy security in China, and compete with international energy companies. If the actual indirect tax burden is higher than the average level, it is likely to affect the realization of the above functions. Therefore, it is necessary to set up a model to calculate the impact of changes in the internal structure of indirect tax on the general social equilibrium, and such calculation is often realized by Using CGE model.

The CGE model constructed here refers to ‘a CGE model for China policy analysis[8]’ established by David Roland Holst and Dominique van der mensbrugghe (2009),and make corresponding adjustments according to the acquired data. This paper focuses on the overall impact

of the actual tax burden of enterprise income tax in different departments on the macro-economy, so it is necessary to classify different sectors of society. Consistent with the above, it is mainly divided into five production departments, namely, commerce, energy industry, other industries, service industry, real estate industry and comprehensive departments. The whole process is carried out according to the steps of parameter determination, inspection, calculation and result description, as follows.

Firstly, the process of model parameter determination and test. The CGE model is divided into five modules, namely, production module, income demand module, trade module, price module and closing module. Among them, the parameters of various price, elasticity and price, production and income demand modules need to be determined. The coefficient is set from the price module. Since almost all prices in the CGE model are relative prices, the initial value of some prices in the model is determined as 1 in advance. Then set the parameters of the production, income demand and trade modules. The share parameters of each department in the production function can be obtained through proportion accounting based on the data in the macro social accounting matrix. The share parameters and direct consumption coefficients in the income demand module function can be obtained through the initial data and parameters that have been set and calculated. After that, the remaining price is determined by closing the module and relevant optimization conditions. The elastic coefficient of the model is set in the test method first. Here, it is considered that Zhang Xin[9] Etc. are representative, and the elastic coefficient in the model is set according to several elastic values given by them. The influence of the change of elastic value on the result is also tested. It is proved that the measurement result is stable with the change of elastic value, indicating that the reliability of elastic value is high and can be adopted.

Secondly, the calculation process of the model. Taking the output of the i-th sector as an independent variable, the purpose is to find the general social equilibrium with the minimum total added value of all sectors under the constraints of a series of equations and inequalities. The restrictive conditions are:

Commodity equilibrium in the domestic market, that is, the supply of each commodity is equal to the demand of the commodity. In economic theory, the condition of social equilibrium is that the supply and demand of each commodity are equal and the market is cleared. However, in reality, this state is difficult to achieve, so there is an inventory item in the social accounting matrix. Here, the conditions for commodity equilibrium are changed according to the actual situation. If the supply of commodities fluctuates between 10% of the demand, the supply and demand of commodities are considered to be balanced, and the deviation is included in the current inventory.

The balance of supply and demand in the capital market and the labor market has been reached in the process of model setting.

The government is in balance. In the process of realizing this equilibrium, it is assumed that changes in the domestic economic situation will not affect the government's income and expenditure from abroad and domestic debt income, and the proportion of government expenditure is fixed.

The equilibrium between investment and savings has been reached in the process of model setting.

Balance of payments. In the classical economic theory, the condition for a country's general social equilibrium is that the total amount of imports and exports is equal. However, China maintains a trade surplus for a long time, and forcibly applying this assumption will enlarge the error of the model. Therefore, in the process of initializing the model parameters, the proportion of China's total import and export volume is determined by setting the import and export parameters of different commodities. It is believed here that China maintains this proportion of total import and export volume, which is the condition for achieving balance of international payments.

Under this condition, this paper studies the impact of the internal proportion change of indirect tax on the general balance of society, so it is necessary to keep the proportion of indirect tax and direct tax unchanged. The specific approach is to adjust the nominal tax rate of the indirect tax of the two types of goods in the opposite proportion without changing the nominal tax rate of the direct tax, and then add the constraint condition that the ratio of the indirect tax and the direct tax is unchanged, so as to obtain the result of the general social equilibrium. However, there are problems in the actual operation, because changes in indirect taxes will lead to changes in the output of various departments, and then lead to changes in direct taxes through a series of transmission mechanisms. And because the direct tax and the indirect tax are equal, the indirect tax changes again, thus forming an infinite cycle, and it is impossible to find a specific general equilibrium solution. However, it can be found through equation solution that there is a limit to the final value of this cycle. Therefore, the process in the cycle is split here, and the semi-automatic simulation has similar effects. The method is to keep the tax revenue of indirect tax unchanged and find a group of general equilibrium solutions first. Then change the total income of indirect tax to the total direct tax, and then find a set of equilibrium solutions, and so on. The results show that the total change degree of direct tax and indirect tax can be less than 0.1% after repeated three times, and the proportion of direct tax and indirect tax can be approximately considered as unchanged.

Finally, the model calculation results and explanation. As mentioned above, the indirect tax rates of the real estate industry and the energy industry are adjusted in the positive and negative directions respectively, and then the "other industry" is adjusted in the opposite direction. Among them, commerce and industry are selected as " another industry", because the comprehensive industry includes agriculture, forestry, animal husbandry and sideline fishery, and the actual tax rate is low, which is not suitable for adjustment. However, China's secondary industry accounts for a higher proportion than the tertiary industry, so choosing industry and commerce as the relative adjustment group can make the simulation starting point of the model closer to the final value and reduce the simulation steps. The reliability of the simulation can be improved.

Table 4: Increase and decrease of tax rate of real estate sector, and change of tax rate of commercial sector

Change rate of tax rate(%)	10	20	-10	-20
GDP(%)	0.153249	0.315947	-0.15576	-0.41375
Resident Welfare(%)	0.13977	0.288157	-0.3538	-0.60225
Enterprise income(%)	0.212238	0.437561	0.16352	-0.17019
Consumer demand(%)	0.13977	0.288157	-0.3538	-0.60225
Export level (%)	0.210167	0.433292	-0.67289	-1.05525
Investment demand (%)	0.236759	0.488115	-1.44124	-1.91445

It can be seen from the above table 4 that increasing the indirect tax rate of the real estate sector and reducing the tax rate of the commercial sector have a positive effect on GDP and other indicators. On the contrary, increasing the indirect tax rate of the commercial sector while reducing the tax rate of the real estate sector has a significant negative effect on the above economic indicators. When the change of the tax rate is around 20%, the inhibitory effect of the tax increase on the economic development of the commercial sector is greater than the promotion effect of the same degree of tax reduction. This shows that the real estate sector has a stronger ability to bear the tax burden than the commercial sector. According to the above analysis, although the actual tax burden of indirect tax in China's real estate industry is high, and the indirect tax rate in the commercial sector is moderate, balancing the two tax rates has a restraining effect on the macro economy. In 2010, with the continuous rise of house prices and the rapid development of the real estate industry, if we further increase the indirect tax rate of the real estate sector and

correspondingly reduce the indirect tax rate of the commercial sector, we believe that it can promote the development of the macro economy.

Table 5: Increase and decrease of tax rate of real estate sector, and change of tax rate of industrial sector

Change rate of tax rate(%)	10	20	-10	-20
GDP(%)	2.521601	6.102676	-1.34512	-0.71826
Resident Welfare(%)	2.299806	5.388455	-1.43344	-1.41542
Enterprise income(%)	3.492214	9.557456	-2.04309	-2.01503
Consumer demand(%)	2.299806	5.388455	-1.43344	-1.41542
Export level (%)	3.458141	7.220084	-2.16698	-2.0891
Investment demand(%)	3.895687	6.266632	-2.59023	-2.5659

From the above table 5, we can see that the indirect tax rate of the real estate sector increases while the tax rate of the industrial sector decreases, which promotes the development of the macro-economy, and this effect increases with the increase of the degree of change. On the contrary, it has a restraining effect on macroeconomic development, but all indicators show that this change has not become more obvious with the further change of tax rate. Different from the commercial sector, there are some state-owned companies in the industrial sector, which have a strong monopoly in the industry, so they have a strong ability to bear the tax burden. As a result, compared with commerce, industry has a stronger ability to bear indirect taxes.

Table 6: Increase and decrease of tax rate of Energy sector, and change of tax rate of commercial sector

Change rate of tax rate(%)	10	20	-10	-20
GDP(%)	-0.14593	-0.30085	0.065526	0.02764
Resident Welfare(%)	-0.13309	-0.27439	-0.14068	-0.17717
Enterprise income(%)	-0.2021	-0.41666	0.449764	0.400757
Consumer demand(%)	-0.13309	-0.27439	-0.14068	-0.17717
Export level (%)	-0.20013	-0.41259	-0.34492	-0.40107
Investment demand(%)	-0.22545	-0.4648	-1.03533	-1.10483

Table 7: Increase and decrease of tax rate of Energy sector, and change of tax rate of industrial sector

Change rate of tax rate(%)	10	20	-10	-20
GDP(%)	2.208921	3.444951	-1.42358	-0.87594
Resident Welfare(%)	2.014628	3.14194	-1.4357	-1.41995
Enterprise income(%)	3.059177	4.770979	-2.0466	-2.02209
Consumer demand(%)	2.014628	3.14194	-1.4357	-1.41995
Export level (%)	3.029329	4.724429	-2.17673	-2.10869
Investment demand(%)	3.412619	5.322195	-2.59328	-2.57202

It can be seen from the above table 6 that, on the premise of maintaining the stability of the total indirect tax revenue, the positive and negative adjustment of the tax rates of the energy sector and the commercial sector has a restraining effect on the macroeconomic development. This shows that the two departments have similar characteristics, that is, the reduction of tax burden has limited stimulation to them, while the increase of tax burden is relatively obvious. This shows that the indirect tax burden between the two departments was designed reasonably in 2010, and the tax rate of one of the departments was relatively reduced or increased, which did not significantly promote the macro-economy, indicating that the tax rate at this time reached a relatively optimal value.

Similar to the economic facts described in Table 7, the indirect tax rate in the energy sector increases while the tax rate in the industrial sector decreases, which promotes the development of the macro-economy, and this effect increases with the increase of tax rate change. On the contrary, it has a restraining effect on macroeconomic development, and this effect does not increase with the increase of tax rate change. However, different from the real estate sector, raising the tax rate of the energy sector and lowering the tax rate of the industrial sector have little effect on the economy, indicating that the energy sector has a lower ability to bear the indirect tax burden than the real estate sector.

Based on these four tables, we can rank the degree of reflection of the four departments on indirect tax changes, as shown in the following table 8:

Table 8: Sensitivity matrix of four departments to indirect taxes

	Affordability to increase tax burden	Promotion of tax burden reduction on industry development
Very Strong	Real estate industry	Industry
Strong	Energy industry	Energy industry
Weak	Industry	Commercial
Very weak	Commercial	Real estate industry

Compared with the real estate industry and the energy industry, although both are industries with high monopoly and high profits, their ability to bear the indirect tax burden is very different. Because China's state-owned energy enterprises bear the responsibility of stabilizing national energy security, and at the same time, they also have the mission of developing new energy. They also have to face the competition from domestic and foreign competitors in the same industry. In fact, the development pressure is great, and even the state subsidies are required. However, with the rise of house prices, the real estate industry did achieve a high profit in 2010. Therefore, the tax bearing capacity of the two is different. This should be noted when adjusting the indirect tax rate. Because the profits of small and medium-sized manufacturing enterprises in China are very thin and the pressure for survival is very great, the promotion effect of indirect tax rate reduction on industry is very obvious. Based on the above analysis, it is suggested that the tax rate of the real estate sector should be appropriately increased and the tax rate of the industrial sector should be reduced according to the economic situation in 2010, which can play a positive role in promoting the macro-economy.

4. Conclusions

According to the existing theories and the above analysis, the conclusion of the empirical study is: From 2008 to 2010, there were significant differences in the actual burden of income tax among different industries in China. From the perspective of holding form and proportion, the ETR of state-owned comprehensive industry and industrial listed companies is slightly higher than that of non-state-owned listed companies. The actual tax burden of non-state-owned holding listed companies in the energy industry, service industry, commerce and real estate industry is higher than that of state-owned holding listed companies. From the perspective of income tax preferential policies, except that the ETR of listed companies enjoying the preferential tax policies in the industrial and service industries is slightly higher, other industries are affected by the preferential tax policies, and their ETR is lower.

In recent years, the continuous rise of house prices has driven the rapid and high growth of the real estate industry, making the ETR of the real estate industry significantly higher than that of other industries. ETR of energy industry with monopolistic characteristics is second only to real

estate industry. With the rapid development of the tertiary industry, commerce, comprehensive industry and service industry show a high-speed growth trend, so the ETR is also high. Compared with other industries, industry is at the lowest level.

However, although the real estate sector has the heaviest actual tax burden, its ability to bear the tax burden is also the strongest. And reducing the tax burden has the most obvious promotion effect on industry, even though the actual tax burden is the lightest. Therefore, on the premise that the proportion of direct and indirect taxes remains unchanged, the indirect tax rate of the real estate industry can be increased and the indirect tax rate of the industrial sector can be reduced. It is believed that it can help promote the economic development and improve the social welfare level of China.

In addition, the analysis also found that the total assets representing the size of the company and the return on total assets representing the profitability were significantly positively correlated with ETR, indicating that the larger the size of the company, the stronger the profitability, and the higher the actual tax burden of the listed company. The asset liability ratio and asset concentration, which represent the asset structure, are significantly negatively correlated with ETR, mainly due to the tax offset effect of debt and asset depreciation.There are still shortcomings in this paper:

The actual control nature of municipal companies is only divided into state-owned holding and non-state-owned holding, without considering the state-owned enterprises controlled by the local government in the state-owned holding, which will cause some companies that are actually state-owned enterprises not to be classified as state-owned holding companies.

When determining whether listed companies enjoy tax preference, only tax preference is considered, and the diversification of tax preference forms is ignored. This will cause a small number of Companies in the sample to actually enjoy the subjective tax preference and tax base preference of the local government and not be classified as tax preference companies.

The above shortcomings may have a certain impact on the conclusions of this paper, which needs further empirical verification.

References

[1] Atulan Guha. Company Size and Effective Corporate Tax Rate:Study on Indian Private Manufacturing Companies [J]. Economic and Political Weekly, Vol.42,No.20.2007, pp. 1869-1874.

[2] Lou Quan. Analysis of tax burden of listed companies and its influencing factors, financial and accounting communication, 2007, issue 3.

[3] Cao Shujun, Zhang Wanjun. Research on the influencing factors and stability of the enterprise's effective income tax rate - Empirical Evidence from China's A-share listed companies, Caijing Lun Cong, 2008, issue 6.

[4] Wu Liansheng. State owned equity, tax preference and corporate tax burden, economic research, 2009, issue 10.

[5] Zhou Jing. Research on the influencing factors of the effective income tax rate of listed companies, financial and accounting communication, 2011, issue 2.

[6] Cao Shujun, Liu Xing and Zhang Wan. Fiscal decentralization, local government competition and actual tax burden of listed companies, world economy, 2009, issue 4.

[7] Stiglitz J. E. New Perspectives on Public Finance: Recent Achievements and Future Challenges[J]. Journal of Public Economics, 2002.

[8] Xu Pu and Su Zhentian. Economic efficiency and social welfare of tax system reform is based on Dynamic CGE simulation analysis under the framework of a_kolg, contemporary finance and economics, 2012, issue 1.

[9] Liu Zuo. Research on the change trend of the proportion of direct tax and indirect tax in China, finance and trade economics, 2010, issue 7.