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EFFECTIVE TAX BURDEN AND ITS DETERMINANTS IN THE CONTEXT OF COMPANIES FROM CHINA AND THE USA

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Abstract

This research examines the impact of specific determinants on the effective tax rate (ETR) of publicly listed companies in China and the United States. Panel data from the period 2021 to 2024 are applied, using the Generalized Method of Moments (GMM) model and the quantile regression model. The sample includes 48 companies. The research results suggest that there is a statistically significant relationship between leverage, liquidity, profitability, company size, and inflation, and the effective tax burden, with this influence being positive. The findings of the study will be useful for policymakers, business entities, investors, and academic researchers. The research results highlight the importance of understanding the impact of specific financial indicators, as well as a key macroeconomic indicator, on the tax burden of companies. This study demonstrates a high level of consistency, as it is supported by two different models, which confirms the reliability of the research.

Keywords: ETR, inflation, ROA, leverage, SIZE

1. INTRODUCTION

Taxes require significantly more attention in the decision-making process by investors or companies. When considering investments that are relatively risky, the tax rate on investment income which is also known in advance is a very important aspect. Therefore, companies strive to reduce this rate wherever possible, primarily through tax planning. However, there is a problem in finding evidence that identifies the existence of a link between the tax rate on investment income and its impact on asset returns (Kontoghiorghes 2024).

Hines & Rice (1994) analyze the subsidiaries of U.S. companies located in tax havens, noting that these entities account for more than 20 percent of U.S. foreign direct investment, as well as one-third of the profits

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earned by U.S. companies abroad. The authors find that U.S. companies report an exceptionally high level of profitability from investments in tax havens. The study conducted by Dharmapala (2014) focuses on issues related to income shifting within multinational corporations for tax-related reasons, a phenomenon also known as base erosion and profit shifting (BEPS). He emphasizes the importance of clearly defined legal and economic constraints that can act as barriers to BEPS activities. Heckemeyer & Overesch (2017) conduct a quantitative literature review that examines the behavior of companies in the context of tax shifting. Their findings highlight transfer pricing and licensing procedures as critical mechanisms for shifting profits.

Gebhardt and Siemers (2017) apply quantile regression to a German dataset covering the period from 1998 to 2007, aiming to assess the role of tax administration and its quality, particularly in the context of tax optimization, which is highly relevant to certain companies. The results indicate that the method of taxation is not neutral with respect to firm size, as mid-sized companies tend to face a less favorable position. Furthermore, the study finds that the effective tax burden was significantly reduced following the implementation of the "Steuerreform 2000" tax reform. Kraft (2014) investigates the influence of financial characteristics of companies on the effective tax rate (ETR). Using a longitudinal dataset of 540 German companies for the period 2005–2011, she finds that company size generally has a positive impact on the ETR. The study by Delgado et al. (2018), using a quantile regression approach on a sample of 4.356 German companies, suggests a nonlinear relationship between company size and the effective tax rate. Specifically, company size has a positive effect on the ETR at lower quantile levels, while the impact varies significantly at higher quantiles, indicating a non-linear relationship dependent on the distribution of effective tax rates within the sample.

Additionally, the research conducted by Behr and Schiwy (2024) focuses on the specific determinants of the effective tax rate among limited liability companies (GmbH) in Germany. The ETR was calculated based on local trade tax, corporate income tax, and solidarity surcharge, using a sample of 9.318 companies in 2020. The findings reveal an inverted U-shaped relationship between the effective tax rate and firm size. Moreover, companies with a majority of shareholders tend to have lower tax rates, while those with supervisory boards tend to pay higher taxes on average.

When companies avoid paying taxes, it contributes to the creation of inequality both between countries and within them. It often happens that companies shift their profits to tax havens, resulting in other countries reporting lower levels of profit and consequently lower tax revenues (Clausing, 2016; Nerudova et al., 2023). Two pillars were proposed (OECD, 2019) to address the issues related to tax avoidance, and more than one hundred countries adopted this framework during 2021. The first pillar provides for the allocation of part of the profit depending on economic activity, while the second pillar ensures that companies pay a certain minimum level of tax (OECD, 2023). This pillar requires companies to pay at least a minimum effective tax rate of fifteen percent. Tax avoidance is often realized through the use of the effective tax rate, and it is assumed that a low level of effective tax rates represents a high degree of tax avoidance, although some factors that are

not directly related to tax avoidance may also influence the effective tax burden (Schwab et al., 2022). To determine how much certain companies actually pay in corporate income tax, this is better represented through effective tax rates than through statutory tax rates (Janský, 2023).

This paper develops a dynamic two-step GMM model and a quantile regression model based on the analysis of stock index data from Chinese and U.S. companies, with the aim of examining whether both models confirm a statistically significant influence of the selected determinants on the dependent variable the effective tax burden.

Most of the findings from previous studies on the determinants of effective tax burden have been observed in the context of highly developed economies. Therefore, there is a need to include companies from less developed economies in the scope of research as well, which is considered one of the main contributions of this study. The research sample comprises large publicly listed companies. Additionally, the sample is based on firms from the manufacturing industry, the energy and mining sectors, the automotive industry, the IT sector, healthcare, the financial sector, and construction. The study includes 24 companies from China and 24 companies from the United States. Data were obtained from Investing.com, Yahoo Finance, and the publicly available official reports of the companies. The panel used by the authors in the study is of a heterogeneous nature, as it combines data from the US and China, which differ in terms of the level of economic development. The authors take this heterogeneity into account when selecting the econometric methodology. The applied GMM model ensures control over unobserved heterogeneity at the company level and also mitigates the issue of endogeneity. On the other hand, quantile regression, as the second applied model, provides additional insights into the impact of the observed factors on the ETR.

2. RESEARCH METHODOLOGY

We propose the following research hypotheses:

Hypothesis 1. There is a statistically significant impact of company size on the effective tax burden.

Hypothesis 2. There is a statistically significant impact of leverage on the effective tax burden.

Hypothesis 3. There is a statistically significant impact of company liquidity on the effective tax burden.

Hypothesis 4. There is a statistically significant impact of profitability on the effective tax burden.

Hypothesis 5. There is a statistically significant impact of inflation on the effective tax burden.

In this study, the Generalized Method of Moments (GMM) model and the quantile regression model are applied to examine the relationship between the observed variables. Based on the literature review, the equation (1) is formulated:

$$ETR_{it} = \beta_0 + \beta_1 ETR_{it-1} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 LIQ_{it} + \beta_5 ROA_{it} + \beta_6 INF_{it} + \varepsilon_{it} \quad (1)$$

ETR – effective tax burden;

ETR_{it-1} – effective tax burden in the previous year;

SIZE – company size;

LEV – company leverage;

LIQ – company liquidity;

ROA – company profitability;

INF – inflation;

β_1–β_6 – regression parameters to be estimated;

β_0 – intercept;

it – *i* (country) *t* (year);

ε – random error.

In this study, the dependent variable is represented by the effective tax burden (*ETR*), which can be defined as the ratio between income tax paid and profit before tax. The variable ETR_{it-1} represents the effective tax burden in the previous year. The independent variables include company size, leverage, company liquidity, company profitability, and the level of inflation. The methods of measuring these variables are presented in the following table (table 1).

Given that in research it often occurs that the instruments used in the difference GMM model are weak, leading to biased results, researchers frequently employ the available system GMM model to mitigate these shortcomings. The advantage of the system GMM model lies in its ability to use additional instruments and efficiently reduce the weaknesses of the previously mentioned model while simultaneously improving the efficiency of the obtained results. Arellano and Bond also establish estimators (one-step and two-step), with the two-step estimator being more efficient. The modification of this approach in the study includes testing the validity of the model's instruments through the application of diagnostic tests (Zarra-Nezhad et al., 2014). The application of this model is suitable for this analysis as it provides consistent estimation of dynamic models in the presence of endogeneity and certain firm-specific effects.

The limitations of this model include, among others, the fact that it provides conditional average effects and relies on the assumption that past values of the variables can serve as valid instruments. The application of quantile regression in research was initiated by its creator, Koenker (2005). The advantage of this method, when applied to panel data, is that it allows for the estimation of heterogeneous effects along the conditional distribution of the dependent variable while simultaneously controlling for individual- and time-specific factors (Graham et al., 2014). Although this method enables a detailed analysis of heterogeneous effects across the ETR distribution, it does not address the problem of endogeneity, and the results may also be sensitive to the choice of quantiles.

As can be concluded, although the aforementioned models are based on

Table 1. Measurement of the Observed Determinants

Dependent/Independent variable	Indicator measure
Dependent variables	
Effective tax rate (ETR)	Corporate income tax / Profit before tax
Independent variables	
Firm size (SIZE)	Logarithm of total assets
Financial leverage (LEV)	Total liabilities / Total assets
Net return on assets (ROA)	Profit after tax / Total assets
Macroeconomic impact (INFLATION RATE)	Inflation

Source: Hossain et al. (2024); Kraft (2024)

different econometric frameworks, their joint application in this study is methodologically justified. The system two-step GMM model is used as the primary model in the study, as it provides control for unobserved firm-level heterogeneity and mitigates the issue of endogeneity. Quantile regression is employed as a supplementary model to assess the heterogeneity of the effects of explanatory variables across the ETR distribution, thereby providing a deeper understanding of how companies behave under differentiated tax burdens.

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3. RESEARCH RESULTS

This section of the study presents the descriptive statistics of the observed variables in the following table. Table 2 shows that the average value of the effective tax burden is 0.27, while the median value of profitability is 15.40.

Furthermore, the highest standard deviation was found in the ROA variable, indicating a high degree of variability in company profitability. On the other hand, the lowest standard deviation was observed in LEV, suggesting minimal differences in leverage among the companies. The

increased level of variability is further supported by the obtained minimum and maximum values. The ADF – Fisher Chi-square test indicates the stationarity of the observed series (table 3). After analyzing the Variance Inflation Factors (VIF) for the independent variables in the model, it can be concluded that there is no significant multicollinearity among the analyzed variables.

The table 4 presents the results of the panel regression using the GMM model. The results focus on the dependent variable the effective tax burden (ETR).

As the author above indicates, the conducted analysis applies the available system GMM model to determine the impact of determinants on the ETR. In the study, the lagged value of the dependent variable, ETR, is treated as endogenous and instrumented with its own lagged values. To assess whether the results are valid, two additional tests are employed: the Arellano–Bond tests for first- and second-order autocorrelation (AR(1) and AR(2)) and the Hansen test. The Arellano–Bond tests suggest that the AR(1) test may yield low p-values, indicating the presence of serial correlation, whereas the p-value of the AR(2) test tends to show higher values, suggesting the absence of second-order correlation (Wintoki et al., 2012). The Hansen test is used in the study to examine the validity of the instrumental variables applied to address endogeneity. Observing Table 4, it can be seen that the AR(2) test value is not statistically significant, indicating the absence of second-order autocorrelation, while the obtained Hansen test value confirms the validity of the instruments used.

In addition, the model includes the lagged value of ETR, alongside the selected determinants of the dependent variable. The results indicate a significantly negative relationship between the current ETR and its previous value. The estimated coefficient of -0.58 suggests that companies often adjust their taxes in response to the previous year. Specifically, if the tax rate was higher in the previous year, companies tend to reduce it in the following period. Next, the coefficient for the leverage variable is positive and statistically significant. The estimated value of 0.51 implies that a higher level of

Table 2. Descriptive Analysis of the Observed Variables

	ETR	LEV	ROA	INFLATION	SIZE
Mean	0.27	0.41	15.40	2.70	8.66
Median	0.15	0.33	16.29	2.90	8.62
Std. Dev.	0.62	0.24	9.95	2.11	0.39
Minimum	-0.04	0.09	-0.58	0.20	7.61
Maximum	3.96	1.00	45.27	6.50	9.25
VIF		1.34	1.42	1.15	1.68

Source: Author's calculation

Table 3.Unit Root tests

Variable	ADF Fisher Chi-square	p-values
ETR	24.13	0.00
LEV	23.24	0.01
LIQ	15.07	0.00
ROA	38.34	0.00
SIZE	10.24	0.02
INFLATION	28.62	0.00

Source: Author's calculation

indebtedness contributes to a higher effective tax burden. This finding is expected and reasonable, considering that interest payments are typically recognized as deductible expenses. However, this could also indicate that highly leveraged companies may lack the capacity to efficiently utilize tax benefits. The next coefficient shows that liquidity has a positive and significant effect on the effective tax burden. This suggests that more liquid companies, with greater access to cash, are more likely to be subject to higher taxation. Profitability also has a positive effect on the ETR. The coefficient of 0.01 indicates that increased profitability leads to a higher effective tax burden. This is also expected, as profitable companies naturally face higher taxes. The variable representing company size shows a positive effect of 0.52. This implies that larger companies tend to pay higher effective tax rates. These findings related to microeconomic variables are generally expected. On the other hand, the coefficient for the macroeconomic variable — inflation — is also statistically significant and positive. The coefficient of 0.45 indicates that as inflation rises, the effective tax burden on companies also increases. Overall, the research results are consistent with the findings of Fernández-Rodríguez and Martínez-Arias (2014), Barbera (2020), and Allam (2020), confirming that certain determinants significantly influence the effective tax burden.

The table 5 applies quantile regression to further validate the results obtained through the dynamic GMM model. The results from the quantile regression generally reflect similar patterns as those found in the GMM model. Specifically, the lagged value of ETR has a negative impact on the current ETR, suggesting that companies exhibit corrective behavior over time. Likewise, higher levels of leverage, liquidity, and inflation are consistently associated with a higher

Table 4. Panel Regression Results – GMM model

ETR	Coefficient	Std Error	t-Statistic	p-values
ETR(-1)	-0.58	0.00	-125.51	0.00
LEV	0.51	0.01	-34.72	0.00
LIQ	0.04	0.03	-1.20	0.00
ROA	0.01	0.00	4.86	0.00
INFLATION	0.45	0.40	2.85	0.00
SIZE	0.52	0.05	5.85	0.00
Diagnostic test				
AR(1)				0.012
AR(2)				0.326
Hansen test				0.125

Source: Author's calculation

Table 5. Quantile Regression Results

ETR	Coefficient
ETR(-1)	-0.67**
LEV	0.08**
LIQ	0.04***
ROA	-0.00***
INFLATION	0.07***
SIZE	0.08**

***, **, * represent statistical significance at the 1%, 5% and 10% level, respectively
Source: Author's calculation

effective tax rate. However, the results diverge when it comes to the variables of profitability and company size. In contrast to the GMM findings, the quantile regression results indicate that greater profitability and larger company size contribute to a reduction in ETR. The obtained coefficients are statistically significant, suggesting the stability of these relationships across quantiles. The charts presented in figure 1 display the results across quantiles.

The obtained research results suggest different findings, given that the applied models the system GMM model and quantile regression represent two distinct approaches and are based on different primary objectives. On one hand, the system GMM model estimates the average effects of ETR determinants while controlling for endogeneity and dynamic relationships. On the other hand, the quantile regression model allows for the analysis of heterogeneous effects across the ETR distribution. As can be inferred from the quantile regression results, higher profitability and larger company size contribute to a reduction in

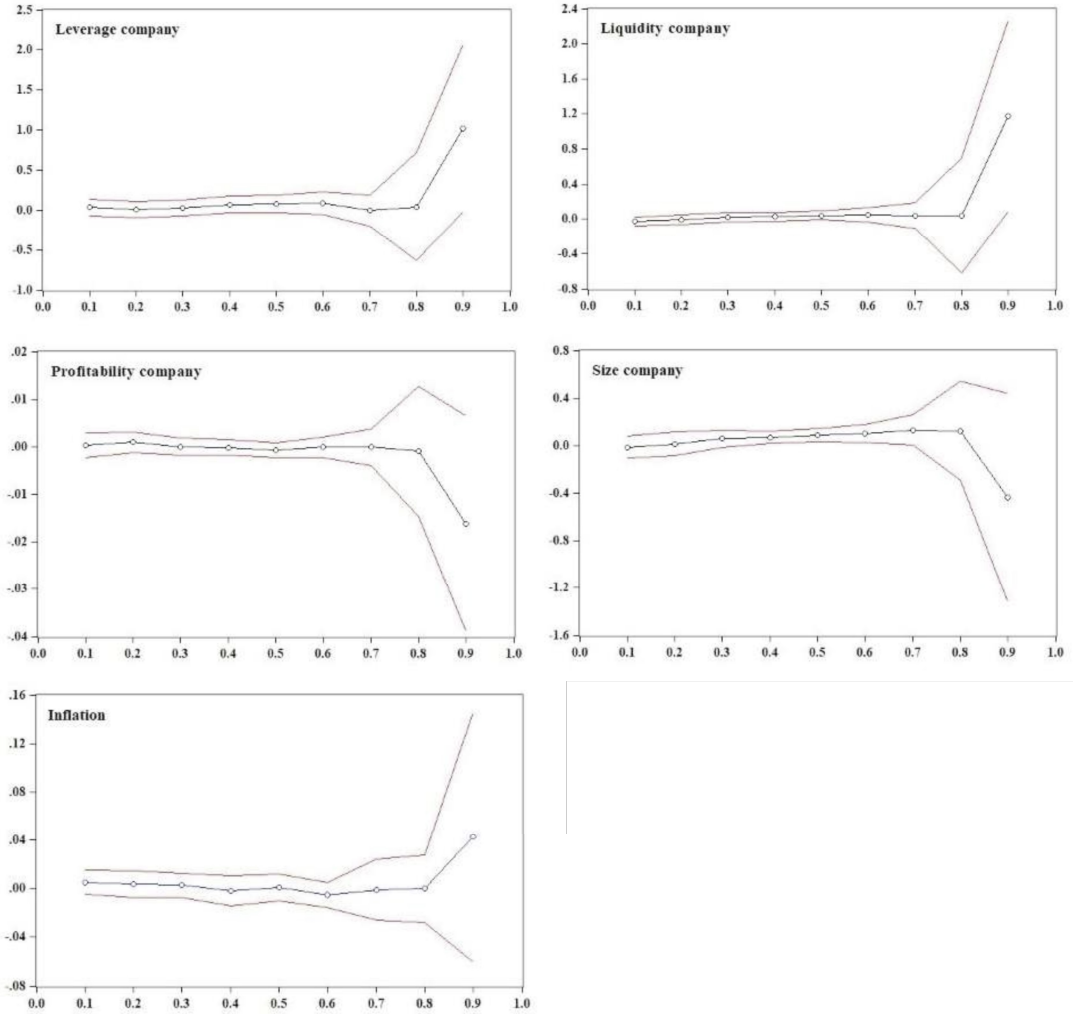

Figure 1. Visualization of Estimated Coefficients for the Observed Independent Variables
Source: Author's calculation

ETR, with this negative effect becoming more pronounced in the upper quantiles of the ETR distribution (figure 1), indicating that firms with higher ETR are more likely to reduce their effective tax burden through tax planning and the use of tax incentives. However, it cannot be stated that these effects are visible on average, due to heterogeneity among companies, and therefore they cannot be observed in the estimates produced by the system GMM model.

4. CONCLUSION

The conducted research focuses on companies from the United States and China, covering the period from 2021 to 2024. To obtain the research results, a dynamic GMM model and a quantile regression model were applied. The findings from both models indicate that the observed variables—leverage, liquidity, profitability, company size, and inflation—have a statistically significant impact on the effective tax burden. All variables show statistically significant results, confirming their influence on ETR and supporting the acceptance of all proposed research hypotheses.

The limitations of this research primarily relate to the sample size. Future studies could consider expanding the sample, including various industrial sectors, and applying the model in developing countries or companies from less developed economies. The obtained findings are of interest to investors, policymakers, and companies alike.

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ЕФЕКТИВНО ПОРЕСКО ОПТЕРЕЋЕЊЕ И ЊЕГОВЕ ДЕТЕРМИНАНТЕ У КОНТЕКСТУ КОМПАНИЈА ИЗ КИНЕ И САД

Сања Бакић

Извод

Ово истраживање испитује утицај одређених детерминанти на ефективно пореско оптерећење јавно листираних компанија у Кини и Сједињеним Америчким Државама. Примењени су панел-подаци за период од 2021. до 2024. године, уз коришћење модела генерализованог метода момената (GMM) и модела квантилне регресије. Узорак обухвата 48 компанија. Резултати истраживања указују на постојање статистички значајне везе између задужености, ликвидности, профитабилности, величине предузећа и инфлације, с једне стране, и ефективног пореског оптерећења, с друге стране, при чему је овај утицај позитиван. Налази студије могу бити корисни креаторима јавних политика, пословним субјектима, инвеститорима и академским истраживачима. Резултати истраживања наглашавају значај разумевања утицаја одређених финансијских показатеља, као и кључног макроекономског показатеља, на пореско оптерећење компанија. Студија показује висок ниво конзистентности, будући да је поткрепљена са два различита модела, чиме се потврђује поузданост истраживања.

Кључне речи: ETP, инфлација, ROA, задуженост, величина предузећа

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