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The Impact of Intangible Assets on Tax Avoidance Prevention of Medical and Health Companies in China†

Junyuan Deng[1,*], Trairong Swatdikun[2], Alisara Salamolee[2] and Varaporn Prempanichnukul[3]

[1]*College of Graduate Studies, Walailak University, Nakhon Si Thammarat 80160, Thailand*
[2]*School of Accountancy and Finance, Walailak University, Nakhon Si Thammarat 80160, Thailand*
[3]*Mahasarakham Business School, Mahasarakham University, Maha Sarakham 44150, Thailand*

([*]Corresponding author's e-mail: eansir@qq.com)

Abstract

Since China's modern tax reform started late, Chinese scholars gradually began to study the impact of intangible assets on corporate tax avoidance prevention around 2000. However, the correlation research on the impact of China's intangible assets on corporate tax avoidance prevention is still in the primary stage. Since the global public health emergency, Chinese healthcare enterprises have achieved rapid development and become the fastest growing industry. This archive study uses Refinitive Eikon database to study Chinese medicine and health listed companies in Shanghai and Shenzhen during 2017 - 2021 as samples. Then Excel software was used for statistical analysis of relevant data. The empirical results show that intangible assets have a significantly positive impact on the tax avoidance, that is, when other variables remain unchanged, every increment of 1 unit of intangible assets will increase the tax avoidance of 0.0181 units on average. Therefore, it provides no evidence that intangible foster corporate tax avoidance as (Wu et al., 2022) proposed. further research should further explore appropriate model on detecting tax avoidance, estimation technique, and sophisticated analysis on detecting the relation among the variables.

Keywords: Medical and health listed companies, Intangible assets, Tax avoidance, China

Introduction

Traditional economy believes in investing on tangible assets which hold a position as profit generating mechanism. Ma (2020) research finds Chinese enterprises pay more and more attention to the development of science and technology, the input of knowledge and the cultivation of innovative research and development ability, which enables the rapid accumulation of intangible assets and becomes an important method for enterprises to enhance their competitiveness. As the Covid-19 outbreak causes the global public health emergency, China's listed medical and health companies have developed rapidly. Zheng (2013) found that the medical and health industry is recognized as "high technology, high investment, high risk, high return" industry. In recent years, the proportion of intangible assets of listed Chinese medical and health companies has increased significantly. This research aims to better understanding the role of intangible assets investment on anti-tax avoidance among Chinese listed medical and health enterprises.

In this research, variables such as intangible assets, pre-tax income, post-tax income, tax rate, corporate debt ratio and tax avoidance are selected as research variables. The research purpose is to explore whether intangible assets and other variables can significantly affect tax avoidance and explore the main influencing

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factors of tax avoidance, and finally provide targeted guidance for listed companies to increase tax avoidance in intangible assets, post-tax income, corporate debt ratio and other directions.

Literature review

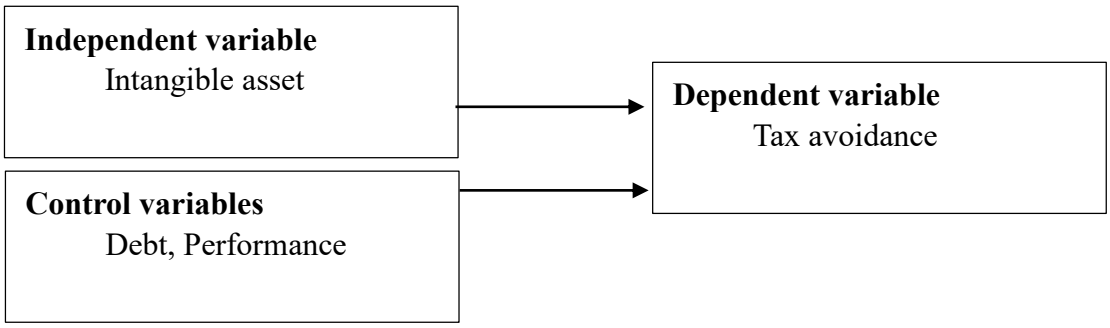
Neubig, T., & Wunsch-Vincent, S. (2018) indicates that the global decentralized production and related trade of intermediate products, including intangible assets, have changed the way economists study globalization and the formation of new public policies. Shao (2021) studies the role of tangible asset in medical and health companies is recently debate. Originally, Research in consequence of intangible asset was in central of attention. Pan (2013) took the data of listed medical and health companies in Shanghai stock market from 2009 to 2011 as the research object, combined normative and empirical analysis, and finally concluded that intangible assets of listed medical and health and health companies had a significant positive correlation with business performance, and unit intangible assets contributed more to the company's business performance than unit fixed assets. Gao (2015) selected 2012 - 2013 data of the medical and health industry in Shanghai and Shenzhen as the research object, software mechanical energy multiple regression and statistical analysis, and concluded that the total amount of intangible assets in China's medical and health industry was positively correlated with operating profit. Recently, (Hu & Wang, 2016) founded that intangible assets were significantly positively correlated with business performance. Additionally, the role of intangible asset on preventing tax avoidance was firmly grounded. Hanlon and Heitzman (2010) investment in intangible assets, e.g., through research and development programs, is both significant in magnitude and directly affected by tax policy and targeted incentives. Wu et al. (2022) found that firms with high off-balance intangible assets exhibit a lower extent of corporate tax avoidance. the negative association is mainly manifested in firms with less incentivized managers, a lack of foreign revenue, and lower diversification. Wang et al. (2022) found that sin firms engage in highly aggressive tax avoidance strategies to a lesser extent, because such aggressive tax avoidance strategies could result in more severe political backlash.

Armstrong et al. (2012) find that tax executives' compensation is negatively associated with the GAAP ETR. Wooldridge (2013) organized around the type of data being analyzed with a systematic approach that only introduces assumptions as they are needed, this approach makes easier to understand and, ultimately, leads to better econometric practices. Dyreng et al. (2017) eliminate the effect of accounting changes by developing a cash flow-based ETR measure that uses operating cash flows in the denominator instead of pretax accounting income. Gebhart (2017) in the empirical tax research there are several proxies for tax avoidance, most of which rely on financial accounting data. Most prevalent are measures based on ETR and BTD. Besides these 2, measures from (Henry & Sansing, 2014). Tax Shelter Scores, and the Unrecognized Tax Benefits are used to proxy for tax avoidance. Henry and Sansing (2018) propose a new measure of corporate cash tax avoidance, Δ/MVA, which addresses the exclusion of loss firms and firms with negative current tax expense from the study of corporate tax avoidance.

Tian et al. (2012) believed that another challenge to implement the intangible assets cost sharing agreement is the strict protection of core technology by large transnational enterprises, the globalization of intangible assets has not made substantive progress with the economic globalization. Cui and He (2015) through the analysis of the "Microsoft tax avoidance case in the United States", we know that it is a new trend to use cost sharing agreements for tax avoidance in intangible asset research and development. Avi-Yonah (2017) analyzed Xilinx case and Veritas case in 2009 and Altera case in 2016 and proposed that Section 482 of the Internal Revenue Code now allows multinational corporations based in the United States to shift profits from intangible assets to low-tax jurisdictions through cost-sharing agreements, so it is proposed to repeal the rule. Wang et al. (2022) find that the negative relationship between the status of sin

firms and tax avoidance is less pronounced in firms that accumulate political capital via intensive lobbying activities. Septiawan et al. (2021) to overcome the limitations of GAAP ETR made variations by measuring the tax deferral strategy because the current tax burden reduction will not be compensated by the increase in deferred tax expense. Recently, Chernwiriyakul & Srijunpeth (2022) foun negative impact of cerporate governanceon tax avoidance when ETR adopted.

Through the review of the above literature, it is found that although there are few scholars at home and abroad who have studied the relationship between intangible assets and corporate tax avoidance. Therefore, this research takes listed medical and health enterprises with high technology. Based on the theory and existing literature, this study proposes the framework as:



Hypothesis development

The following assumptions are made for this study.

H1: Intangible assets have a negative impact on tax avoidance of China's medical and health listed companies.

This study is expected to prove that tax avoidance of China's medical and health listed companies has a significant impact, and this conclusion has not yet been proved.

Research methodology

This section mainly discusses the methodology on the influence between intangible assets and tax avoidance of listed medical and health companies in China. It covers research methods, population and sample, research model and variable measurement, data collection and data analysis.

Research method

On the basis of theory and practice as well as relevant academic researches, this archival research has carried out using quantitative data.

Population and sample

This research takes A-share and B-share listed medical and health companies in Shanghai and Shenzhen of China from 2017 to 2021 as the sample base. According to relevant laws in China, listed companies must timely disclose their annual financial reports. The annual reports of Listed companies in China can be found on database websites, which are relatively standardized and audited by accounting firms with high reliability. As of December 31, 2021, among the A-share and B-share listed companies in Shanghai and Shenzhen, there are 427 listed companies in the biomedical industry were taken as sample.

Research model and variable measurement

This study adopts corporate tax avoidance of Gebhart (2017) use a proprietary data set with detailed executive compensation information to examine the relationship between the incentives of the tax director and GAAP and cash effective tax rates, the book-tax gap, and measures of tax aggressiveness. It's a mathematical expression reflecting the regression relationship between 1 variable (dependent variable) and another or a group of variables (independent variable) obtained by regression analysis based on sample data.

Tax rate = Income after tax / income before tax

Effective Tax rate = Average tax rate – tax rate

Tax avoidance = effective tax rate* income before tax

Tax avoidance =β+β1 intangible asset + β2 Debt + β3 performance

Table 1 Variable measurement.

Variable	Measurement
Intangible asset	Total assets minus the remainder of tangible assets
Tax avoidance	Effective Tax Rate = tax liability/measure of pre-tax income
Debt	debt ratio
Performance	Net income

1.Dependent variable is measvred through effecfive Tax Rate.

2.Independent variables is firm performance of listed medical and health companies in China from 2017 to 2021 has changed due to the global public health emergencies, and the change of intangible assets is the focus of our research, so we take it as an independent variable.

3.Profit and debt are used as control variables in this study. Due to the huge market demand for vaccines, nucleic acid detection reagents and other anti-epidemic materials during the global public health emergencies, the investment and financing in biomedical field in China increased significantly in 2020.

Data collection

This research will use the data provided by EIKON database to investigate the listed medical and health companies of Shanghai Stock Exchange and Shenzhen Stock Exchange in China from 2017 to 2021. At present, 427 companies will be selected as the sample of the study. The second data source is the annual report provided on the websites of Shanghai Stock Exchange and Shenzhen Stock Exchange.

Data analysis

This research adopted (Chen, 2008) by using descriptive statistics of mean and standard deviation to summarize the maximum, minimum, mean and standard deviation of each variable.Secondly, this study use Pearson correlation analysis to test the correlation between variables, to avoid multicollinearity issue. Finally, Regression analysis, with tax avoidance as the dependent variables, and enterprise asset liability ratio, after tax income and other variables as independent variables, establishes a multiple regression model, hoping to find out the independent variables that significantly affect the growth of tax avoidance.

Research findings

Descriptive statistics

Descriptive statistics on Intangible asset and tax avoidance, during 2017 - 2021 of Chinese Medical and Health Listed Companies.

Table 2 Descriptive statistics.

	Mean	Standard deviation	Maximum value	Minimum value
Net income before taxes	62,818,295	193,519,222	1,878,285,093	−4,756,088,425
Net income after taxes	50,973,291	179,845,138	1,607,113,940	−4,765,674,083
Tax rate	0.142	0.685	13.909	−10.183
Tax avoidance	3,090,906	28,093,406	911,258,068	−149,685,725
Intangibles, Net	71,150,189	155,598,340	2,114,759,010	0.000
Total debt to total equity, percent	0.342	0.544	6.294	−0.006

Table 2 shows that in terms of capital structure, the mean value of pre-tax income is 62,818,295 and the standard deviation is 193,519,222, indicating that pre-tax income fluctuates greatly and is not stable, with a maximum value of 1,878,285,093 and a minimum value of −4,756,088,425. The mean value of after-tax income is 50,973,291, and the standard deviation is 179,845,138, indicating that the after-tax income fluctuates greatly and unsmooth, with the maximum value being 1,607,113,940. The mean value of tax revenue is 0.142, the standard deviation is 0.685, the maximum value is 13.909, and the minimum value is −10.183, indicating that the fluctuation of tax revenue is small. The mean value of tax avoidance is 3,090,906, and the standard deviation is 28,093,406, indicating that the fluctuation of tax avoidance is also large and unstable, and the maximum value is 911,258,068. The mean value of intangible assets is 71,150,189, and the standard deviation is 155,598,340, indicating that intangible assets fluctuate greatly and are extremely unstable, and the maximum value is 2,114,759,010. The mean value of Total Debt to Total Equity, Percent is 0.342 and the standard deviation is 0.544, indicating that the change of Total Debt to Total Equity is small, the maximum value is 6.294 and the minimum value is −0.006.

Correlation analysis

The correlation analysis of the above 4 variables shows that there is a significant negative correlation between after-tax income and tax avoidance, and the correlation coefficient is −0.6791. There is a positive correlation between after-tax income and intangible assets, and the correlation coefficient is 0.2764.

Table 3 Regression analysis.

	Tax avoidance	Intangibles, Net	Total debt to total equity	Net income after taxes
Tax avoidance	1			
Intangibles, Net	0.0755	1		
Total debt to total equity	0.1095	0.1561	1	
Net income after taxes	−0.6791	0.2764	−0.0416	1

Regression analysis

Tax avoidance was selected as the dependent variable, and the other 3 variables were used as independent variables. Adjusted R^2 was 0.5373/, and the Significance F of the equation was adjusted. Is 0.0000 < 0.05, indicating that the regression equation is significant. The standardization coefficients of intangible assets, the proportion of total liabilities in total assets and the after-tax income are 0.1003, 0.0106 and −0.7081, respectively. The *p*-values are 0, 0.0576 and 0.0000, respectively, indicating that intangible assets have a significant impact on tax avoidance, that is, when other variables remain unchanged, every increment of intangible assets by 1 unit will increase tax avoidance by 0.0181 units on average. This hypothesis 1 is rejected.

Select tax avoidance as the dependent variable, and intangible assets, net income after tax, and asset liability ratio as the independent variables to establish a multiple regression model. The model analysis results are shown above. Since the model is a multiple regression model, the adjusted R side is selected as the test of model goodness of fit, and the adjusted R side is 0.5363, indicating that 53.63 % of the changes in tax avoidance in the model can be attributed to intangible assets, net income after tax Explanation of multiple regression model composed of 3 independent variables of asset liability ratio. The F statistic of the model is 559.6872, and Significance = 0.0000 < 0.05, indicating that the model is significantly effective, that is, statistically significant. According to the *p*-values of the 3 independent variables, they are respectively 0, 0.0576 and 0, which are significantly less than 0.05, indicating that the 3 independent variables in the model have a significant impact on tax avoidance.

The coefficient of intangible assets is 0.1003, that is, when other variables remain unchanged, every additional unit of intangible assets will increase tax avoidance by 0.1003 units on average.

The coefficient of net income after tax is −0.7081, that is, when other variables remain unchanged, every increase in net income after tax will reduce tax avoidance by 0.7081 units on average.

The coefficient of the asset liability ratio is 0.0106, that is, when other variables remain unchanged, every increase in the asset liability ratio will increase the tax avoidance by 0.0106 units on average.

Table 5 Regression analysis on the impact of intangible assets on tax avoidance prevention.

	Coefficients	**Standard error**	**t Stat**	***P*-value**
Intercept	0.6752	0.0132	51.0446	0.0000***
Intangibles, Net	0.1003	0.0068	14.7443	0.0000***
Debt to equity	0.0106	0.0056	1.9000	0.0576
Net income after taxes	−0.7081	0.0175	−40.3816	0.0000***
R^2 = 0.5373, Adjusted R^2 = 0.5363, F = 559.6872***, Significance F = 0.0000				

*, **,*** denotes significant level at 10%,500%1% respectively

Conclusions

Based on the above statistical analysis and empirical analysis, the relationship between intangible assets and tax avoidance of Chinese listed medical and health enterprises can be concluded as follows:

1) The scale of intangible assets is large. Through the analysis of EIKON's data, it can be seen that the investment of Chinese listed medical and health enterprises in intangible assets is increasing year by year, but the proportion of the total assets is still very small. There is a large gap between different companies in the investment of intangible assets, indicating that most companies have fully realized the importance of

intangible assets to the development of the company and also began to pay attention to the development of intangible assets.

2) Intangible assets have a significant positive correlation with the tax avoidance of enterprises. Through multiple regression analysis, we can see that intangible assets have a significant positive correlation with corporate tax avoidance, that is, the greater the investment of intangible assets, the greater the contribution of intangible assets to help enterprises avoid tax. Conversely, less investment in intangible assets will lead to increased tax burden, smaller profits and lower business performance.

3) The motivation of after-tax income is to increase the value of corporate cash holdings. Through multiple regression analysis, we can conclude that after-tax income has a significant negative correlation with corporate tax avoidance, that is, enterprises avoid tax in order to increase the value of cash holdings, and a large number of enterprises increase the input of intangible assets to achieve tax avoidance, increase the value of cash holdings, and increase the technological competitiveness of enterprises.

Recommendation drawing from research finding, this research recommends to increase investment in intangible assets. Although enterprises realize tax avoidance by investing in intangible assets, the proportion of intangible assets in the total assets of listed medical and health companies is still very low. Therefore, on the 1 hand, we should strengthen the tax regulation of listed medical and health enterprises. On the other hand, we should continue to encourage enterprises to invest in intangible assets.

There is a significant positive correlation between intangible asset and tax avoidance of enterprises, which indicates that intangible asset ratio can significantly affect tax avoidance. When intangible asset increases, it can increase enterprises avoid taxes. Therefore, it is necessary to appropriately increase intangible asset of the firm.

Thus make appropriate the investment in intangible assets. Although enterprises realize tax avoidance by investing in intangible assets, the proportion of intangible assets of listed medical and health companies in total assets is still very low.

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