Managerial Ability and Corporate Tax Avoidance Based on the DEA-Tobit Two-stage Model

Yanhui Cui
Email: 1817176441@qq.com

Beijing Jiaotong University, School of Economics and Management, Beijing, 100044, China

Abstract: We examine the relation between managerial ability and corporate tax avoidance. We adopt a two-stage DEA-Tobit regression model to measure the managerial ability of enterprises, and investigate the relation between managerial ability and corporate tax avoidance with multiple linear regression. Additionally, the relation between managerial ability and corporate tax avoidance is further investigated for different proprietary nature of the listed companies. We find that: (1) Corporate tax avoidance is negatively associated with managerial ability. Specially, more able managers are associated with fewer corporate tax avoidance; (2) In state-owned enterprises, the disincentive effect of managerial ability on corporate tax avoidance is more pronounced. Our study enriches the relevant studies on the level of corporate tax avoidance and the managerial ability, and provides some insights into the work of tax collection and management departments.

Keywords: Managerial ability; Business income tax; Enterprise ownership

1. Introduction

The report of the 19th Party Congress clearly puts forward that all sectors and departments should effectively implement the development concepts of green, open, shared, coordinated and innovative, and stimulate the vitality of market players. Enterprises, as the main body of the market, are the main force in promoting China's economic development. The decisive role in the allocation of resources in the market is not only, but also entrepreneurs. In a complex environment, management is the 'catalyst' for transforming resources into productive capacity and output efficiency, which affects corporate performance [1]. Tax avoidance is a 'double-edged sword' that brings profits to the firm through tax savings on the one hand, and costs to the firm in terms of tax planning and agency costs on the other [2, 3]. Currently, relevant research has focused on the factors influencing corporate tax avoidance behavior such as corporate characteristics, shareholding structure corporate governance [4]. However, the relation between managerial ability and corporate tax avoidance has not been conclusively established. Managerial ability can improve corporate performance and surplus quality, and the attractiveness of tax avoidance activities is reduced [5].

Based on this, we focus on the relation between managerial ability and corporate tax avoidance, while adding the nature of ownership to consider the extent to which managerial ability affects corporate tax avoidance, filling a gap in empirical research in this area. Our study delves into the impact of managerial ability on corporate tax avoidance with a view to providing a reference for rational tax avoidance and curbing aggressive tax avoidance.

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2. Hypothesis Development

2.1 The Impact of Managerial Ability on Corporate Tax Avoidance

In fact, corporate tax avoidance is a risky investment. On the one hand, tax avoidance increases profits for a business through tax savings. On the other hand, while tax avoidance can have immediate and significant economic benefits, it also imposes many costs on the business and its managers, including tax planning costs, restatement costs, litigation costs, political costs, and reputation damage and verification risks to the business. Competent management must be adept at risk prevention and cost prediction [6]. Management with high competence will allocate resources to other more efficient management activities, thereby maximizing overall corporate performance [7, 8]. The higher the competence of management, the lower the tolerance for the risk of corporate tax avoidance [9]. Once the tax avoidance attracts the attention of the tax authorities, the blow to the reputation of both the company and the management would be devastating.

In summary, we expect that the more competent management is, the less inclined it is to adopt aggressive tax avoidance practices. On the one hand, highly competent managers can achieve better performance through their day-to-day business activities and investment activities. On the other hand, competent management will have a lower tolerance for the risks arising from tax avoidance activities out of concern for their reputation. Considering the risks and costs of tax avoidance activities, tax avoidance activities are not the best choice for high-capacity management. Therefore, we propose hypothesis 1.

H1: Managerial ability is negatively associated with corporate tax avoidance.

2.2 Impact of The Nature of Ownership

Due to the different objectives of government and enterprises, with enterprises seeking to maximize profits and government seeking to maximize the public interest, the extent of tax avoidance by enterprises with different property rights will vary. Wen et al. (2019) [10] point out that the academic experience of top management has a significant disincentive effect on corporate tax evasion, and this disincentive effect is particularly prominent in non-state-owned enterprises. In addition, state-owned enterprises adopt more complex governance structures and decision-making methods when faced with problems such as the absence of owners, which affects corporate tax avoidance [11].

According to principal-agent theory and information asymmetry theory, owners of non-state enterprises have weaker regulation of agents compared to state-owned enterprises. From the shareholders' perspective, the government controls the state-owned enterprises and the management of the enterprises is basically appointed by the government, which reduces the degree of information asymmetry between the government and the state-owned enterprises. In addition, the tax regulator can conduct tax audits on the enterprise by way of administrative orders, and therefore has a stronger regulation over the SOE. From a management perspective, government intervention can be achieved through the presence of state-owned equity. Stronger regulation increases the difficulty and cost of tax avoidance activities by the management of state-owned enterprises. Government intervention also imposes multiple objectives on enterprises, making state-owned enterprises assume greater social responsibility. In addition to maximizing corporate value, the management of state-owned enterprises have to sacrifice cor-

porate value to achieve social objectives. However, due to the low sensitivity between remuneration and SOE management performance [12], higher corporate tax burdens do not harm SOE management and may even have a positive impact on their careers. Therefore, compared to state-owned enterprises, non-state-owned enterprises have stronger tax avoidance capabilities and incentives, and the management capabilities reduce the impact of tax avoidance is diminished. Based on this, we propose hypothesis 2.

H2: The disincentive effect of managerial ability on corporate tax avoidance is more pronounced in state-owned enterprises than in non-state-owned enterprises.

3. DATA, Variable Definitions

3.1 Data

We select and screen listed companies in the A-share market in Shanghai and Shenzhen from 2008 - 2021 as the initial sample, we finally obtain 28,873 samples, including 18,219 samples of state-owned enterprises and 10,654 samples of non-state-owned enterprises. The R&D expenditure were collected manually from the annual reports, while other were obtained from CSMAR and Wind databases. To eliminate the effect of extreme values, the 1% and 99% quartile of all continuous variables are winsorized to shrink the tails. We chose the DEA solverpro5.0 as the data envelopment analysis (DEA) step in the process of calculating managerial ability, and the rest of the data processing was done in Stata17.0.

3.2 Variable Definitions

3.2.1 Managerial Ability Measures

Our main measure of managerial ability, the MA, is developed by Demerjian et al.(2012) [13] who generated DEA models to construct a firm's efficiency frontier when quantifying the managerial ability. The efficiency values are then divided and managerial ability is measured after removing firm-level influences. We also use this approach to measure managerial ability, the process can be divided into the following two steps:

First, data envelopment analysis (DEA) is used to measure the productivity of a firm i, calculating with the following formula.

$$\max_v \theta = \text{Sales} / (v_1\text{PPE}+v_2\text{NetR\&D}+v_3\text{Goodwill}+v_4\text{Intan}+v_5\text{COGS}+v_6\text{Smc}). \quad (1)$$

Each sample firm is considered as a decision making unit (DMUS) and the DEA model is used to solve the optimization problem to obtain the production efficiency value of each firm, which takes values between 0 and 1. When the efficiency value reaches l, it means that the enterprise has reached the optimal production efficiency.

Secondly, the Tobit model was used to assess the managerial ability of the firm. As firm productivity includes both firm-level and management-level factors, there is a risk of mistaken estimate of managerial ability. Thus, we use the Tobit model to assess the managerial ability of the firm. The residual obtained from the model regression is the managerial ability (MA), and the larger the value, the stronger the managerial ability.

$$\theta=\alpha_0+\alpha_1 Size+\alpha_2 Marketshare+\alpha_3 FCF+\alpha_4 Age+\alpha_5 Div+\alpha_6 SOE+\varepsilon. \quad (2)$$

3.3 Model Design

We control for time-level and industry-level fixed effects in our model, while controlling for factors affecting the extent of corporate tax avoidance, in the following empirical model, while controlling for corporate tax avoidance influencing factors. We construct the regression model as follows:

$$TA_{i,t}=\alpha_0+\alpha_1 MA+\sum k_i\ Control+Year+Industry+\varepsilon. \quad (3)$$

TA denotes the degree of tax avoidance of firm in the year; MA represents managerial ability. Control denotes the control variable affecting the degree of tax avoidance. We refer to the literature of Minggui Yu et al. (2013) [14] and Longkai Zhao et al. (2014) [15] and uses firm size (Size), profitability (Roa), gearing (Lev), investment returns (Inv), nature of ownership (SOE), years on the market (Age), and firm growth opportunities (Growth) and nominal tax rate (Tax) as the main control variables in this paper. Year is a fixed effect of time; Industry is refers to industry fixed effects, and ε represents the random disturbance term.

4. Empirical analysis

4.1 Descriptive Statistics

The descriptive statistics are conducted using Stata17.0 statistical software, and the results are presented in Table 1. The average of ETR was 18.3% which was lower than the mean value of TAX. In addition, the mean value of Rate was 0.035, which was also smaller than the nominal average tax rate, indicating the prevalence of tax avoidance among listed companies. The mean and MA, which is the residual of the estimation of model (2), are -0.008 and -0.032 respectively, both approximately equal to 0. The descriptive statistics of the control variables are generally consistent with previous studies, since Chinese listed enterprises generally enjoy different tax incentives, the nominal corporate tax rate takes values ranging from 0% to 33%.

Table 1 Results of descriptive statistics

	N	Mean	SD	Min	Max
ETR	28873	0.183	0.162	0.000	0.814
Rate	28873	0.035	0.149	-0.632	0.250
MA	28873	-0.008	0.177	-0.384	0.345
SOE	28873	0.631	0.471	0.000	1.000
Size	28873	22.015	1.274	19.453	25.512
Lev	28873	0.462	0.198	0.095	0.935
PPE	28873	0.248	0.162	0.027	0.771
Ing	28873	0.047	0.063	0.000	0.308
Inventory	28873	0.184	0.140	0.001	0.743
Inv	28873	0.014	0.021	-0.006	0.142
Roa	28873	0.054	0.048	0.000	0.216
Growth	28873	2.125	1.411	0.747	7.416
Tax	28873	0.188	0.053	0.000	0.330

4.2 Regression Analysis

4.2.1 The correlation between managerial ability and corporate tax avoidance

The regression analysis of corporate managerial ability and the degree of corporate tax avoidance was conducted using Stata17.0 software. From Table 2, the regression coefficient of management ability (MA) and the actual corporate tax rate (ETR) is 0.071, which is significantly positively correlated at the 5% level; the regression coefficient of the difference between the nominal tax rate and the actual tax rate (Rate) is -0.071, which is significantly negatively correlated at the 5% level, indicating that the higher the corporate management ability, the smaller the degree of corporate tax avoidance, which verifies the hypothesis H1 of this paper and also proves that This confirms the hypothesis H1 and demonstrates that Chinese investors have a more negative perception of tax avoidance. As the costs of aggressive tax avoidance, including tax costs, non-tax costs and opportunity costs, may outweigh the income from tax avoidance, highly competent management is more likely to allocate resources to other investment and operational activities that can enhance corporate profits rather than tax avoidance.

Table 2 Basic regression results.

	ETR	Rate
MA	0.071**	-0.071**
	(3.359)	(-3.552)
Size	0.008*	-0.008*
	(1.818)	(-1.905)
Lev	0.012	-0.013
	(0.643)	(-0.612)
PPE	-0.177***	0.177***
	(-2.757)	(2.757)
Ing	0.111	-0.111
	(1.247)	(-1.167)
Inventory	-0.101***	0.100***
	(-2.857)	(2.843)
Inv	0.218	-0.217
	(1.253)	(-1.253)
Roa	-0.535***	0.532***
	(-5.293)	(5.178)
Growth	-0.001	0.001
	(-0.419)	(0.439)
Tax	0.027	-0.027
	(0.564)	(-0.576)
_cons	-0.043	-0.050
	(-0.434)	(0.422)
Obs	28873	28873
R^2	0.150	0.102

a. Sample of a Table footnote. (Table footnote)

4.2.2 The impact of the nature of business ownership

We further examine the effect of managerial ability on the degree of corporate tax avoidance for firms with different ownership. From the Table 3, the difference in the effect of managerial ability on the degree of tax avoidance among enterprises with different ownership properties is more significant. In the state-owned enterprises, the coefficient on ETR is 0.213 and the coefficient on Rate is -0.198, both of which are significant at the 1% level. The absolute value of the coefficient shows that the managerial ability of state-owned enterprises has a high correlation with corporate tax avoidance behavior, indicating that in state-owned enterprises, the stronger the managerial ability, the more willing the companies are to bear more tax burden, narrowing the gap between the effective and nominal tax rates. In the non-state-owned enterprises, the coefficient on managerial ability, while having the same sign as the state-owned enterprises, does not have a significant impact, indicating that research hypothesis H2 is tested. Specifically, managerial ability in state-owned enterprises is more effective in inhibiting corporate tax avoidance behavior relative to non-state-owned enterprises.

Due to the principal-agent relation and information asymmetry, the owners of non-state enterprises are unable to monitor the actual managers of the enterprises, and senior managers have more autonomy in business activities and decisions, including corporate tax avoidance activities. Under stronger supervision, the management of state-owned enterprises are somewhat restricted in their decision-making due to the explicit and implicit costs of tax avoidance activities. The managerial ability to influence tax avoidance activities is diminished by the fact that non-state enterprises have a greater ability and incentive to avoid tax than state-owned enterprises.

Table 3 Grouped regression results

	ETR		Rate	
	State-owned	Non-state-owned	State-owned	Non-state-owned
MA	0.213***	0.138	-0.198***	-0.128
	(4.689)	(1.196)	(-4.552)	(-1.112)
Size	0.013**	0.101	-0.016**	-0.001
	(2.349)	(1.199)	(-2.199)	(-0.267)
Lev	-0.018	0.081	0.018	0.068
	(-0.832)	(1.368)	(0.568)	(1.439)
PPE	-0.819	-0.167**	0.067	-0.159**
	(-1.536)	(-2.159)	(1.590)	(2.159)
Ing	0.128*	-0.604	-0.104*	-0.613
	(1.776)	(-0.590)	(-1.780)	(-0.690)

Inventory	-0.132*	-0.152**	0.083*	0.133**
	(-1.736)	(-2.298)	(1.887)	(2.187)
Inv	0.562*	-0.152	-0.552*	-0.127
	(1.936)	(-0.268)	(-1.987)	(-0.323)
Roa	-0.53***	-0.450***	0.573***	0.438***
	(-4.531)	(-3.031)	(4.031)	(2.831)
Growth	0.003	-0.005	0.003	-0.005
	(0.420)	(-1.545)	(-0.645)	(-1.453)
Tax	0.349***	0.374***	0.648***	0.612***
	(3.711)	(2.490)	(6.984)	(3.984)
_cons	-0.702	-0.119	-0.849	-0.102
	(-1.326)	(-0.581)	(-1.311)	(-0.517)
Obs	18219	10654	18219	10654
R^2	0.191	0.202	0.123	0.112

4.3 Robustness Tests

We use two indicators to measure the degree of corporate tax avoidance and the regression results are somewhat convincing. To further verify the accuracy of the findings, this paper replaces the proxies for the degree of corporate tax avoidance and managerial ability for robustness testing. (1) We use the accounting tax difference (BTD) in the second category of indicators to regress the relevant model. Specifically, BTD = (accounting profit - taxable income) / total assets at the end of the period, where taxable income = (income tax expense - deferred income tax expense) / nominal income tax rate. (2) In order to eliminate the possible noise interference of managerial ability, we construct new managerial ability variables by referring to the method of re-regression of the relevant model proposed by Lijie Yao (2020) [16]. Specifically, the regression residuals representing managerial ability are divided into three levels, i.e. new managerial ability variables, and managerial ability is assigned to 1, 2 and 3 in descending order. Overall, the robustness test results are not materially different from the previous findings.

5. Conclusions

We investigate the relation between managerial ability and corporate tax avoidance in a sample of Chinese listed companies, further examining the differences in the impact of managerial ability on corporate tax avoidance in companies with different ownership characteristic. We find that managerial ability has a disincentive effect on corporate tax avoidance, i.e. the stronger the managerial ability, the higher the degree to which corporate tax avoidance is re-

duced. Further, the impact of managerial ability on tax avoidance behavior varies depending on the nature of the firm's ownership. For the management of state-owned enterprises, due to the importance of their own reputation, as well as considerations of political components and risks, capable management will be more inclined to choose daily business and investment activities to generate more profits for the firm rather than resorting to aggressive tax avoidance. The disincentive effect of managerial ability on corporate tax avoidance is more pronounced in state-owned enterprises than in non-state-owned enterprises. After robustness tests, the above findings still hold.

Our study enlightens the work of tax collection. At the government level, the relevant authorities should be targeted in their tax collection and management efforts, save on supervision costs and focus on enterprises with weak managerial ability. As to the difference in the influence of managerial ability on tax avoidance among enterprises with different property rights, it is suggested that tax supervision can be increased for state-owned enterprises with weak managerial ability. At the enterprise level, we provide more detailed clues to understanding the impact of management capabilities on the scope of a company's financial behavior. Boards of directors should pay attention to hire managers with higher competence, so that management decisions are more concentrated in the hands of competent management, which can maximize economic efficiency with available resources.

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