

## **An Empirical Study on the Influence of Non-Debt Tax Shield on the Choice of Corporate Debt Levels----Based On the Tax Preference Policy**

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### **Abstract**

*This paper exploits the data from A-share listed corporations of China from 2008 to 2013, using the ratio of the sum of fixed assets depreciation and intangible assets amortization and R&D expenses and R&D expenses plus deduction to total assets as substitute variables of NDTs, attempts to check the impact of the non-debt tax shield on the choice of corporate debt levels, and further analyzes whether the effect of the non-debt tax shields is different in different nature of enterprise ownership or different industries. This study finds a negative and significant relationship between NDTs and corporate debt levels, which is consistent with the NDTs's effect theory of capital structure. In addition, we further find that the effect of the non-debt tax shields has ownership nature and industry characteristics.*

**Keywords:** Non-debt Tax Shields; Debt levels; State-owned Enterprises; Industries; Endogen-nous

### **Introduction**

Under the framework of MM (1958), the capital structure has nothing to do with the enterprise value. However, in consideration of the corporate income tax, the high the tax rate, the more debt interest deduction. Thus, companies which apply high tax rates may choose higher leverages to increase business values. MM (1963) supports this phenomenon that the value of the company with debt is higher than the debt free company. Therefore, it concludes that debt can generate profits because of interest tax credit. Accordingly, this tax credit effect is called debt tax shield. However, excessive leverage not only has the tax credit effect, but also has the risk of financial crisis; therefore enterprises should weigh their own debt levels (Miller, 1977). In addition, if the company issued too much debt, which may lead to tax depletion phenomenon and then further induce the debt extrusion effect (Ross, 1985). Not the higher the better, even though the debt tax shield may increase the incentive for business executives to choose more debts.

De Angelo and Masulis (1980) find that depreciation, investment tax credits and deferred tax losses can be against taxes like debt interest. Moreover, it can reduce the cash outflows and decrease the financing needs of enterprises, so as to cut down the costs of capital. Thus, such non-debt but equally having a tax credit factor is called non-debt tax shield (NDTS). The non-debt tax shield has a certain alternative effect on the debt. It can make up for the problem of debt tax shield is too low so it is used by most governments as tax incentives. The Chinese government is no exception. In order to encourage enterprises to carry out innovation activities, the Chinese government has encouraged corporations to increase R&D investment for many years.

Based on the non-debt tax shield, Chinese government issued a series of tax incentives policies such as the "Enterprise Income Tax Deduction Method" in 2000, "Notice of the Enterprise Income Tax Preferential Policies on the Enterprise Technological Innovation" in 2006 (No.88 Financial Tax [2006]) and "The Management Method of Enterprise Research and Development Expenses before Tax Deduction (Trial)" in 2008 (No.116 National Tax [2008]), etc. The implementation of these preferential policies likely enhances the motivation of managers to choose the non-debt tax shield evasion.

Especially, under the background of incomplete capital market and strict bank loan constraints in China, the incentives of non-debt tax shield have a very important practical significance. In macro terms, it can guide the development of the national industry and then adjust the economic structure. In micro terms, it can not only reduce the tax cost, directly affect the performance of enterprises, but also affect the financing behavior of the management by reducing the cash flow, thereby affecting the capital structure of enterprises. However, the research on this aspect is not enough at present in China. In addition, Great changes have been happened after the implementation of “No.6 Accounting Standard-Intangible Assets” in the recognition, measurement and accounting of the enterprise R&D expenses and independent research and development of intangible assets. Combined with the No.116 National Tax [2008], it is necessary to empirically analyze the relationship between the non-debt tax shield and the capital structure under the new institutional background and to verify whether the non-debt tax shield effect theory hypothesis is established in China. Furthermore, further to check whether the relationship between the non-debt tax shield and the capital structure has the nature of ownership and industrial characteristics from the point of view of the property rights and industry difference.

## **1. Literature Review and Research Hypothesis**

### **1.1 Non debt tax shield and corporate debt levels**

The transaction cost theory indicates that the transaction cost is derived from the limit rationality of the manager, the uncertainty of the transaction and opportunism. One of the objectives of the enterprise is to minimize the transaction costs. At present, China's financial market is not perfect and there are many financing constraints. The debt contract is likely to increase the transaction costs of the enterprise because of the high interest of the bank loan. However, the non-debt tax shield does not require companies to pay the high cost, so it could reduce the amount of funds occupied. Therefore, companies have a strong incentive to choose the non-debt tax shield way to delay or reduce the taxes. All in all, the non-debt tax shield may be preferred over the debt tax shield (Beneish(1999); Kasznik(1999)). The non-debt tax shield plays a certain substitution effect on the debt tax shield; based on this, this paper puts forward the following hypothesis to be verified:

**Hypothesis 1:** Non debt tax shield is negatively related to the corporate debt levels, and Non debt tax shield has a certain substitution effect on the enterprise debt.

### **1.2 The influence of property right on Non debt tax shield effect**

Although China has completed the economic system reform, the influence of the planned economy still exists. A typical example is the managers in state-owned enterprises usually have complicated political connection. Et al Fan (2007) has found that the managers in the state-owned enterprises have a natural political connection and it is more obvious to the extent of government intervention. The reason of government appointed executives to the state-owned enterprises with the background of the government may be they have to bear and fulfill the social functions of the government. Yanjie Bian, Ming Lei (2015) found that managers of state owned enterprise have both political and economic double roles because the state-owned enterprise itself has the dual nature of politics and economy. They not only have the responsibility in achieving the national will, but also shoulder the duty of leading enterprises steady development and consistently profitable in the competitive market. It shows that the state-owned enterprises play an active role in the political and economic life. In addition, the President Xi points out that the owned enterprises are the backbone force of the development of national economy in China recently (Jinping Xi, 2015)<sup>i</sup>. Therefore the state-owned enterprises pay more attention to the constraints, when they choose the tax avoidance, in order to circumvent the political costs caused by illegal business.

Non debt tax shield is a national macro control means to guide industrial development and economic incentives to encourage enterprises to make full use of the national tax law to carry out business activities. Therefore, it is likely to be the best way to evade taxes for the managers of the state-owned enterprises. On the contrary, the management model of the non-state-owned enterprises is family business with a unique non-economic value target. In addition, non-state-owned enterprises are often subject to financial constraints. It has less risk resistance capacity and most of them pursuit the short-term interests. Therefore, they are less likely to carry out R&D investment because of research results in the presence of uncertainty. From this, puts forward the second hypothesis of this paper:

**Hypothesis 2:** Compared with the non-state-owned enterprises, the negative correlation between the non-debt tax shield and the debt level is more significant in the state-owned corporations.

### 1.3 The impact of industry difference on Non debt tax shield effect

In November 8th, 2012, the 18<sup>th</sup> meeting of Communist Party of China points out that technological innovation is the strategic support to improve the social productive forces and the comprehensive national strength. It must be placed in the core position of the national development, stressed the need to follow the path of independent innovation with Chinese characteristics and the implementation of innovation driven development strategy. In addition, during the APEC summit in November 2014, President Xi further has driven innovation development strategy to the world. There is no doubt that technology innovation has become the leading force to promote global economic development.

Moreover, investment in R&D is the key to improve enterprise innovation ability and core competitiveness. In order to encourage enterprises to increase R&D investment, the government issued a corporate research and development expenses tax deduction (Trial) (116) in December 10<sup>th</sup>, 2008. It made on a major adjustment for the R&D expenses of high and new tech enterprises in the pre tax deduction: Form of intangible assets, according to the cost of intangible assets of 150% to be pre tax amortization within the period permitted by tax law. If no intangible assets are formed, allowing for a further the actual amount of R&D expenses of 50% to be deducted directly from the amount of taxable income in the year. These policies directly reduce the enterprise's capital expenditures and improve the operating cash flow, which may reduce corporate debt financing needs, and further reduce the cost of capital. On the contrary, non-high and new tech enterprises are not allowed to enjoy such preferential policies. From this, the third hypothesis of this paper has been proposed:

**Hypothesis 3 :** Compared with the non-high and new tech enterprises, the negative correlation between the non-debt tax shield and the debt level is more significant in the high and new tech companies.

## 2. Methodology

### 2.1 Sample Selection and Data Sources

The new accounting standards issued at February 15, 2006 began to implement from 2007, and the No.116 national tax policy and the enterprise income tax law come into effect at the beginning of 2008. In addition, high and new tech enterprise income tax rate decrease from 25% to 15% with a time limit. Thus, in order to maintain the consistency and validity of data information, this paper selects the A-shares of listing corporation in Shanghai and Shenzhen from 2008 to 2013 of China as the research object. Furthermore, these samples are divided into 12 industries according to “the listing Corporation industry Classification Guidelines” promulgated by China Securities Regulatory Commission issued in 2001.

Financial data come from the Wind database and corporate governance statistics are from the CSMAR database. In order to guarantee the validity of the sample and the veracity of the results, this paper screens the samples according to the following principles:

1. Remove the corporations called ST and PT during the study period.
2. Remove the companies listed after the year of 2008.
3. Remove the enterprises which operating income is zero or less than zero.
4. Remove the companies which are lack of data.

Finally, In order to reduce the effect of the abnormal value, all continuous variables are winsorized by the tail of 1%. The final sample size is 10183 companies of the annual observations.

### 2.2 Definitions of Key Variables

Table 1 gives the definitions of the main variables in this paper.

**Table 1: Variable Definition**

Types	Names	Definitions
Dependent Variables	Asset Debt Ratio(ADR)	Total Debt /Total Assets
	Current Liability Ratio(CLR)	Current Liabilities/Total assets
Independent Variables	Non Debt Tax Shield (NDTS)	(Depreciation of Plant Asset + Amortization of Intangible Assets + R&D Expenses + R&D Expense Deduction)/ Total Assets
Control Variables	Company Size(Size)	Natural Logarithm of Total Assets
	Collateral Value of Assets (CVOA)	(Fixed Assets+ Inventory)/Total Assets
	Company Growth (Growth)	(Final Total Assets-Initial Total Assets)/Initial Total Assets
	Property Rights (PR)	Dummy Variables, State-owned Enterprise is 1, no is 0
	Board Size(BS)	The natural logarithm of the numbers of the board of directors.
	Company Age (Age)	The number of years from listing to t.
	Industry Variables (Industry)	Dummy Variables
Year Variables (Year)	Dummy Variables	

### 2.2.1 Dependent Variables

Rajian and Zingales(1995) point out that the choice of proxy variables of capital structure depends on the purpose of the study. Because of the soft constraints of the creditor governance and the proportion of non-tradable shares in the share capital structure is relatively high in listing corporations in China, this paper draws on the research of Guoliu Hu and Jinggui Huang (2006) to treat asset debt ratio (ADR) and current liabilities ratio (CLR) as substitute variables of the debt level.

### 2.2.2 Independent Variables

Foreign scholars use investment tax credits, fixed assets depreciation, deferred losses, R&D expenses, advertising expenses, stock options, pension plans, etc. as substitute variables of NDTS (De Angelo and Masulis,1980; Bradley et al., 1984; MacKie-Mason, 1990; Graham et al., 2004; Shivdasani and Stefanescue, 2010. In domestic studies, Guoliu Hu and Jinggui Huang (2006) use the ratio of sum of fixed assets depreciation and amortization of intangible assets and other assets to total assets as the replacement of NDTS. In this paper, the issue of R&D expenses plus tax incentives enhances the motivation for managers to choose the NDST evasion. Therefore, this paper uses the ratio of sum of fixed asset depreciation and intangible assets amortization and R&D expenses and R&D expense plus deduction to total assets as substitute variable of non-debt tax shield.

### 2.2.3 Control Variables

This paper draws on the research of Frank and Goyal Frank (2004), combined with the special institutional background of China, to control the following variables: Company Size (Size),Collateral Value of Assets (CVOA), Company Growth (Growth), Property Rights (PR), Company Age (Age), Industry Variables (Industry) and Year Variables (Year).

## 3. Model Design

This paper uses the following the multiple regression model to conduct empirical tests. This model studies the relationship between these variables and the substitute variables of capital structure, the form is:

$$Debt_{it} = \alpha_0 + \alpha_1 Nds_{it} + \alpha_2 Size_{it} + \alpha_3 Cvoa_{it} + \alpha_4 Growth_{it} + \alpha_5 State + \alpha_6 BS_{it} + \alpha_7 Age + Industry + Year + \varepsilon_{it}$$

The dependent variable is **Debt** in the model. ADR and CLR as the substitute variables for the debt level variable. NDTS is a non-debt tax shield, if the NDTS coefficient is negative; it shows that there is a negative correlation between the non-debt tax shield and the debt level. Therefore hypothesis 1 has been confirmed that there is substitution relationship between the non-debt tax shield and the debt.

For hypothesis 2 and hypothesis 3, above model can be grouped into different groups according to the grouping variable to determine the size of the variable coefficient.

**4. Results**

**4.1 Unvaried Analysis**

**4.1.1 The Variation Tendency of NDTs**

Figure 1 is a time trend chart for mean of the non-debt tax shield (NDTS) of the listing corporations. The non-debt tax shield (NDTS) presents a "U" type of change that first declines then climbs up from 2008 to 2013. The reason may be the Chinese economy is impacted by the financial crisis in the second half of 2008. The crisis leads to PPI and CPI data continually to decline and the economy has suddenly turned from expansion to shrink. Enterprise management into trouble and non-debt tax shield effect presents a downward trend. To deal with the financial crisis and stimulate economic recovery, the Chinese government takes the monetary policy and fiscal policy of "Moderate Loose" in time. It helps to expand domestic demand, reduce foreign trade dependence and rapid economic recovery. The effect of non-debt tax shield increases with the economy's turnaround in 2011.



Figure 1: Annual Average non Debt Tax Shield

**4.1.2 The Relationship between NDTs and Debt Levels**

Figure 2 is a diagram of the relationship between the non-debt tax shield (NDTS) and the debt levels. The horizontal axis is the tenths digit trend of non-debt tax shield. The first point means the lowest NDTs enterprises and the tenth means the highest NDTs enterprises. The vertical axis is the mean of each variable in different parts of the corresponding. It can be seen from Figure 2 that the lowest NDTs corresponds to the highest level of debt and the highest NDTs corresponds to the lowest debt levels. Preliminary evidence suggests that there is a negative relationship between NDTs and debt levels.

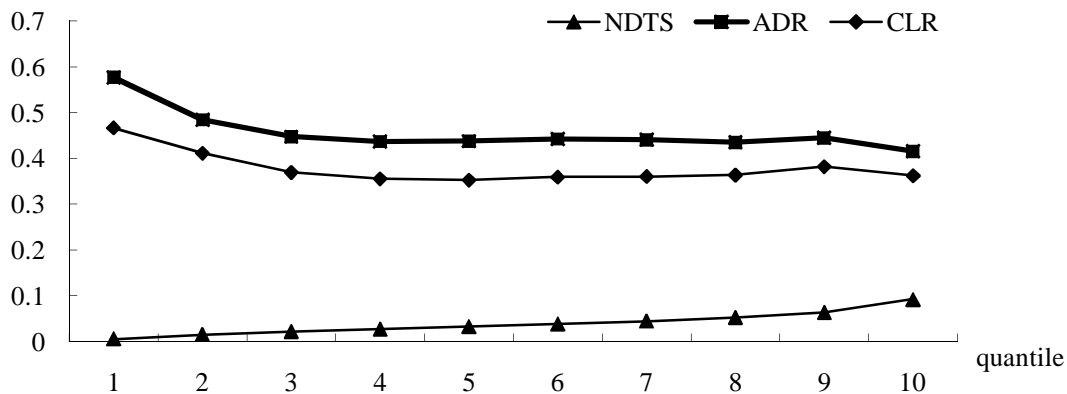


Figure 2: Relationship between non debt tax shields and capital structure

### 4.1.3 Descriptive Statistics

Table 2 is the descriptive statistics in this paper. The mean of ADR is 0.445. It shows that the debt levels in listing corporation in China are far below that in developed countries. Moreover, the mean of CLR is 0.361. It shows that the short-term debt ratio is low and the probability of default is small. Furthermore, the mean of NDTS is 0.035, the median of NDTS is 0.032, the maximum value is 0.128 and the minimum value is 0.001. It shows that some enterprises make full use of the tax effect of NDTS.

**Table 2 Descriptive Statistics**

Variables	Samples	Means	Medians	Standard Deviation	Minimums	Maximum
<i>ADR</i>	10183	0.445	0.442	0.234	0.0425	1.2
<i>CLR</i>	10183	0.361	0.342	0.204	0.0327	1.07
<i>NDTS</i>	10183	0.035	0.032	0.022	0.001	0.128
<i>Size</i>	10183	12.5	12.4	1.27	9.06	16.2
<i>Cvoa</i>	10183	0.397	0.387	0.183	0.042	0.833
<i>Growth</i>	10183	0.15	0.113	0.204	-0.37	0.802
<i>BS</i>	10183	2.17	2.2	0.197	1.61	2.71
<i>PR</i>	10183	0.419	0	0.493	0	1
<i>Age</i>	10183	14.7	14	4.92	0	63

### 4.1.4 Correlation Analysis

Table 3 shows the results of Pearson correlation coefficient for each variable. The results show that there is a high correlation between the non-debt tax shield (NDTS) and the debt level. The correlation coefficients of NDTS on ADR and CLR are -0.131 and -0.087. Moreover, they are remarkable at the level of 1%. This is consistent with the discovery of Guoliu Hu and Jinggui Huang (2006) that non-debt tax shield is in line with the alternative of debt. In addition, the correlation coefficient between the variables is not more than 0.5, which indicates that the model does not have a problem of multi-co linearity.

**Table 3 Pearson Correlation Coefficient**

	<i>ADR</i>	<i>CLR</i>	<i>NDTS</i>	<i>Size</i>	<i>Cvoa</i>	<i>Growth</i>	<i>BS</i>	<i>Age</i>
<i>ADR</i>	1							
<i>CLR</i>	0.887***	1						
<i>NDTS</i>	-0.13***	-0.087***	1					
<i>Size</i>	0.287***	0.099***	-0.286***	1				
<i>Cvoa</i>	0.393***	0.282***	0.1***	0.185**	1			
<i>Growth</i>	-0.152***	-0.149***	-0.127***	-0.004	-0.248***	1		
<i>BS</i>	0.118***	0.053***	0.032***	0.298**	0.097***	-0.007	1	
<i>Age</i>	0.175***	0.122***	-0.184***	0.208**	0.098***	-0.215***	0.003	1

note : \*\*\*, \*\*, \* mean remarkable at the level of 1%, 5% and 10%.

### 4.2 Multivariate Regression Analysis

In this section, this paper tests the impact of the non-debt tax shield on the choice of corporate debt levels through multiple regression analysis, as well as if it could be affected by the nature of enterprise ownership and industry characteristics.

#### 4.2.1 Full sample regression

Table 4 is the full sample regression results of the relationship between NDTS and company debt level. Firstly, this paper checks the impact of NDTS on corporate debt levels by basic regression and binary cluster adjustment analysis. In particular, column 1 and column 2 is the basic regression results, the column 3 and the column 4 are the binary cluster adjustment regression results. In column 1 and column 3, the dependent variable is ADR and independent variable is NDTS. It shows that there is a negative correlation between the non-debt tax shield and corporate debt levels when it is significantly negative at 1% levels. That is, the greater the non-debt tax shields, the lower the level of corporate debt. In column 2 and column 4, the dependent variable is CLR and the independent variable is NDTS. It is significantly negative at 1% levels. Thus, hypothesis 1 is supported by the above conclusions.

At the same time, it is in line with expectations: the larger the company, the higher the collateral value of assets, and the older the enterprise and state-owned enterprises, Corresponding to the higher the debt ratio.

**Table 4 Results of Regression Analysis**

Variables	Basic regression		Binary cluster adjustment	
	(1)	(2)	(3)	(4)
	ADR	CLR	ADR	CLR
<i>NDTS</i>	-0.880*** (-4.73)	-0.652*** (-3.83)	-0.880*** (-6.04)	-0.652*** (-4.65)
<i>Size</i>	0.048*** (12.46)	0.020*** (5.56)	0.048*** (6.73)	0.020*** (3.07)
<i>Cvoa</i>	0.399*** (16.74)	0.298*** (13.42)	0.399*** (12.14)	0.298*** (8.71)
<i>Growth</i>	-0.101*** (-7.06)	-0.109*** (-8.44)	-0.101** (-2.38)	-0.109*** (-2.90)
<i>BS</i>	0.011 (0.59)	0.012 (0.70)	0.011 (0.69)	0.012 (0.82)
<i>PR</i>	0.042*** (4.84)	0.037*** (4.40)	0.042*** (4.34)	0.037*** (4.07)
<i>Age</i>	0.007*** (8.77)	0.006*** (7.98)	0.007*** (8.74)	0.006*** (8.04)
<i>Constant</i>	-0.414*** (-7.27)	-0.101* (-1.87)	-0.414*** (-4.57)	-0.101 (-1.15)
<i>Year</i>	YES	YES	YES	YES
<i>Industry</i>	YES	YES	YES	YES
<i>Samples</i>	10,183	10,183	10,183	10,183
<i>Adj_r2</i>	0.388	0.276	0.388	0.276

note : \*\*\*, \*\*, \* mean remarkable at the level of 1%, 5% and 10%, and brackets for T values. binary cluster ,namely use Cluster2 to adjust the standard deviation in the company and the year.

#### 4.2.2 Sub sample regression

In order to further verify the relationship between the NDTS and corporate debt levels, this paper analyzes the differences between the non- debt tax shield effect in the two groups according to the nature of property rights and industry characteristics.

##### 1. The Regression Analysis of the Impact of Ownership nature on the NDTS Effect

This paper divides the observation samples into two groups: state-owned enterprises and non-state-owned enterprises according to the nature of ownership, to carry out the corresponding regression. Table 5 gives the results of the impact of ownership difference on the NDTS effect. In particular, the column 1 and column 2 is the regression results of ADR. Moreover, column 1 is the regression results of the non-state-owned enterprises, which regression coefficient is -0.650 and it is remarkable at the level of 1%. Column 2 is the regression results of the state-owned enterprises, which regression coefficient is -1.001 and it is remarkable at the level of 1%. The coefficient difference between state-owned enterprises and non-state-owned enterprises is significant at the level of 1%. It is shown that the correlation between NDTS and the ADR is more significant in the state-owned enterprises. That is, compared with the non-state-owned enterprises, NDTS plays a greater role in the state-owned enterprises. The dependent variable is CLR in column 3 and column 4. NDTS coefficient is significantly negative, and the difference between the two coefficients is significant at the level of 10%, which further supports the importance of NDTS in the state-owned enterprises. Therefore, hypothesis 2 set up. Finally, the corresponding control variables are consistent with the main regression results.

**Table 5: Results of Regression Analysis**

Variables	(1)	(2)	(3)	(4)
	ADR	ADR	CLR	CLR
	PR=0	PR=1	PR=0	PR=1
<i>NDTS</i>	-0.650*** (-2.87)	-1.001*** (-3.24)	-0.479** (-2.32)	-0.657** (-2.33)
	Prob (Difference)=0.00		Prob (Difference)=0.07	
<i>Size</i>	0.046*** (7.72)	0.047*** (9.35)	0.022*** (3.85)	0.018*** (3.93)
<i>Cvoa</i>	0.463*** (14.72)	0.313*** (8.69)	0.389*** (13.28)	0.192*** (5.79)
<i>Growth</i>	-0.101*** (-5.72)	-0.052** (-2.08)	-0.104*** (-6.65)	-0.075*** (-3.19)
<i>BS</i>	0.037 (1.53)	-0.018 (-0.67)	0.051** (2.23)	-0.034 (-1.30)
<i>Age</i>	0.008*** (6.53)	0.006*** (4.62)	0.006*** (5.71)	0.005*** (4.29)
<i>Constant</i>	-0.537*** (-6.43)	-0.292*** (-3.31)	-0.284*** (-3.56)	0.077 (0.93)
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Observations	5,916	4,267	5,916	4,267
Adj_r2	0.389	0.280	0.301	0.235

note: \*\*\*, \*\*, \* mean remarkable at the level of 1%, 5% and 10% and brackets for T values.

## 2. The Regression Analysis of the Impact of Industry Characteristics on *NDTS* effect

Moreover, the observation sample is divided into the high and new tech enterprise group and the non-high and new tech enterprise group based on the policy of management of the high and new tech enterprises to deal with the regression model. Table 6 shows the results of the impact of industrial characteristics on the non-debt tax shield effect. In particular, the dependent variables are ADR in column 1 and column 2. Specifically, column 2 shows the results of regression of high and new tech enterprises. The regression coefficient is -1.089, and the coefficient is significant at the level of 1%. Column 1 shows the results of regression of non-high and new tech enterprises. The regression coefficient is -0.801, and the coefficient is significant at the level of 1%. The difference between the high and new tech enterprise group and the control group was significant at the level of 5%. It is shown that the negative correlation between *NDTS* and the ADR is more significant in the high and new tech enterprises. The dependent variable is CLR in column 3 and column 4, non-debt tax shield regression coefficients are significantly negative, and the difference between the two coefficients is significant at the level of 5%. It further support for the above conclusions, thus hypothesis 3 is established. Finally, the corresponding control variables are consistent with the main regression results.



**Table 6: Results of Regression Analysis**

Variables	(1)	(2)	(3)	(4)
	ADR	ADR	CLR	CLR
	Non hi-tech	Hi-tech	Non hi-tech	Hi-tech
<i>NDTS</i>	-0.801*** (-3.56)	-1.089*** (-3.26)	-0.597*** (-2.88)	-0.788*** (-2.61)
	Prob(Difference)=0.04		Prob(Difference)=0.02	
<i>Size</i>	0.059*** (13.89)	0.044*** (6.78)	0.028*** (6.65)	0.019*** (3.17)
<i>Cvoa</i>	0.397*** (14.73)	0.441*** (9.30)	0.301*** (11.53)	0.321*** (7.83)
<i>Growth</i>	-0.109*** (-6.27)	-0.122*** (-4.75)	-0.117*** (-7.43)	-0.126*** (-5.47)
<i>BS</i>	0.014 (0.70)	0.037 (1.01)	0.017 (0.84)	0.031 (0.92)
<i>Age</i>	0.007*** (6.85)	0.009*** (6.27)	0.006*** (6.34)	0.008*** (5.42)
<i>Constant</i>	-0.557*** (-8.93)	-0.323*** (-2.86)	-0.213*** (-3.49)	-0.005 (-0.04)
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Sample	6,562	3,621	6,562	3,621
Adj_r2	0.412	0.321	0.277	0.249

note : \*\*\*, \*\*, \* mean remarkable at the level of 1%, 5% and 10% and brackets for T values.

### 4.3 Robustness Test

In order to verify the robustness of the above conclusions, this paper also considers the endogenous nature of the model. First, this paper takes the industrial mean as a tool variable of *NDTS*, and analyzes the regression of the debt levels and non-debt tax shield. The results are shown in Table 7 that there is a negative correlation between the non-debt tax shield and the level of corporate debt.

**Table 7 Robust test results of the industry mean instrumental variables**

Variables	Basic Regression		Binary cluster adjustment	
	(1)	(2)	(3)	(4)
	ADR	CLR	ADR	CLR
<i>MNDTS</i>	-0.776*** (-2.81)	-0.697*** (-2.67)	-0.776* (-1.81)	-0.697 (-1.61)
<i>Size</i>	0.048*** (23.49)	0.020*** (10.56)	0.048*** (7.10)	0.020*** (3.23)
<i>Cvoa</i>	0.369*** (27.34)	0.278*** (22.04)	0.369*** (10.79)	0.278*** (7.70)
<i>Growth</i>	-0.087*** (-7.48)	-0.099*** (-9.19)	-0.087** (-2.16)	-0.099*** (-2.82)
<i>BS</i>	0.005 (0.47)	0.007 (0.74)	0.005 (0.30)	0.007 (0.47)
<i>PR</i>	0.043*** (9.71)	0.036*** (8.51)	0.043*** (4.11)	0.036*** (3.89)
<i>Age</i>	0.008*** (17.74)	0.007*** (16.11)	0.008*** (9.53)	0.007*** (8.72)
<i>Constant</i>	-0.424*** (-13.00)	-0.105*** (-3.44)	-0.424*** (-4.83)	-0.105 (-1.20)
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
Samples	10,183	10,183	10,183	10,183
Adj_r2	0.377	0.266	0.377	0.266

note : \*\*\*, \*\*, \* mean remarkable at the level of 1%, 5% and 10% and brackets for T values. Binary cluster, namely use Cluster2 to adjust the standard deviation in the company and the year.

Secondly, the paper uses the method of two stage least squares (2SLS) to reduce the endogenous nature of the model. In the first stage, this paper uses government quality GR and government regulation policy uncertainty EPU as tool variables for regression. In the second stage, it uses the tool variables which are from stage 1 as substitute variables for OLS regression. The regression results are in line with the regression results in Table 4.

**Table 8 Regression Analysis Results of 2SLS**

Variables	2SLS		2SLS	
	Stage 1	Stage 2	Stage 1	Stage 2
	NDTS	ADR	NDTS	CLR
<i>MNDTS</i>		-2.490*** (-15.33)		-1.917*** (-11.84)
<i>Size</i>	-0.002*** (-8.21)	0.043*** (20.48)	-0.002*** (-8.21)	0.014*** (6.85)
<i>Cvoa</i>	0.033*** (25.52)	0.428*** (34.84)	0.033*** (25.52)	0.288*** (23.94)
<i>Growth</i>	-0.013*** (-13.78)	-0.107*** (-8.75)	-0.013*** (-13.78)	-0.111*** (-9.70)
<i>BS</i>	0.005*** (5.08)	0.012 (1.14)	0.005*** (5.08)	0.001 (0.16)
<i>PR</i>	-0.001* (-1.91)	0.049*** (10.98)	-0.001* (-1.91)	0.033*** (7.54)
<i>Age</i>	-0.001*** (-3.79)	0.006*** (14.10)	-0.001*** (-3.79)	0.005*** (11.78)
<i>GR</i>	-0.062*** (-12.65)		-0.062*** (-12.65)	
<i>EPU</i>	0.001*** (2.88)		0.001*** (2.88)	
<i>Constant</i>	0.007** (2.09)	-0.303*** (-9.53)	0.007** (2.09)	0.065** (2.17)
Year	NO	YES	NO	YES
Industry	YES	YES	YES	YES
Samples	10,183	10,183	10,183	10,183
Adj_r2	0.342	0.266	0.325	0.162

Note:\*\*\*, \*\*, \* mean remarkable at the level of 1%, 5% and 10% ,and brackets of stage 1 for T values and stage 2 for Z values. The exogenous variable is GR and EPU<sup>ii</sup>.

## 5. Conclusion

This paper chooses the 10183 sample data as the research objective, through empirical tests, achieves the following conclusions:

- (1) Non debt tax shield is negatively related to the corporate debt levels, and the higher non-debt tax shield is accompanied by lower debt levels, so it has a certain substitution effect on the enterprise debt. The results of the research support the previous theory hypothesis of non-debt tax shield effect.
- (2) Considering the nature of ownership and industry characteristics, above conclusions are still set up.
- (3) Going a step further, it is found that the non-debt tax shield effect is affected by the property rights and industrial characteristics.

① Compared with the non-state-owned enterprises, NDTS effect is more significant in the state-owned enterprises;

② Compared to non high and new tech enterprises, NDTS is more effective in the high and new tech enterprises.

## 6. Enlightenments

This paper has some enlightenment on the theoretical study and the practice:

Theoretical side: firstly, this paper is an improvement on the substitute variable of non-debt tax shield. In China, existing research on NDTS mainly from the fixed assets depreciation, the amortization of intangible assets and deferred assets.

Based on the policy of No.116 [2008] state tax, this essay adds R&D expenses and its plus deduction as important factors, which is an improvement of the non-debt tax shield. Secondly, this paper shows that the non-debt tax shield has the property rights and the industrial characteristics, and may have a reference value for the future research.

Practical aspect: on the one hand, the policy of national R&D expenses plus deduction has long-term effect for corporations. Therefore companies should be encouraged to making full use of the substitution effect of NDTs. It could reduce capital costs and increase business value. On the other hand, the government should improve the supervision mechanism of the non-debt tax shield tax evasion in order to prevent companies to carry out the discretionary earnings management and improve the quality of accounting information.

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<sup>i</sup>Jinping Xi. State-owned Enterprises are the Backbone of the Development of the National Economy, Xinhua net, 7/17/2015.

<sup>ii</sup>Government quality data GR comes from the World Bank report data, government regulatory policy uncertainty variable EPR data from the Baker team estimates the index.