The Impact of Auditor Switch on Private Sector’s Financial Constraints during the Implementation of the PPP Contract: Empirical Analysis Based on PSM-DID Model

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Abstract. Government intervention is the primary reason for the failure of PPP projects in China. Therefore, project implementing agencies should “loosen the shackle” of social capital or project companies (private sector), so as to give full play to their subjective initiative and innovative spirit. Practically, however, the winning of the social capital or the project company in the implementation of the PPP will tend to take opportunism behaviour in order to increase their income, resulting in the phenomenon of "the winner's curse", so the project implementing agencies still need through inspection, testing, auditing, and other ways to supervise and control the social capital or the project company. Based on the above research background, It will be of great significance to explore the impact of auditor changes on the subsequent financing constraints of the private sector during the implementation of PPP contracts. Using data from listed companies participating in PPP project construction from 2000 to 2017, through the PSM-DID model, we find that: After eliminating the selectivity bias, auditor changes result in additional costs of debt; Audit opinion shopping, accompanied by auditor changes, makes listed companies face greater debt financing constraints during the implementation of the PPP contract. The results of this study enrich the research on the influence factors of corporate financial constraints and the corporate governance mechanisms of audit market, and reveal the effectiveness of audit supervision in PPP mode to improve project management efficiency and project operation.

1. Introduction
The public-private-partnership (PPP) model is becoming an important force in promoting China's economic and social development. By the end of March 2017, the ministry of finance has announced three batch of PPP pilot projects, of which more than 455 projects have been input information of social capital, a total of 716 companies, with state-owned enterprises accounted for 55.2%, private enterprises accounted for 36.6%, foreign investment enterprise (including Hong Kong, Macao and Taiwan enterprises) accounted for 4.9%. In different periods, the types of private sectors in PPP projects are diversified. Therefore, it is necessary to conduct academic exploration and provide strategic suggestions on the audit supervision of public sector according to different types of private sector during the implementation of PPP contracts.

Undeniably, there is information asymmetry between investors and companies. In order to solve the problem of information asymmetry, the improvement of information disclosure quality is a feasible method. External audit is a key method to improve the quality of information disclosure, and the supervision and verification role of auditors effectively alleviate the agency problem. Creditors will trust internal control report and financial report more after the auditing, and are more likely to obtain useful
information, thereby lowering the risk premium of the information uncertainty, and reducing the extra cost of debt for asymmetric information. Therefore, creditors' attention and dependence on external audit make the decision and disclosure of auditor change contain important information.

Based on this, the core research question of this paper is: In PPP mode, does auditor change affect the cost of debt in China capital market? Positive or negative influence?

Manuel et al. (2015) addresses the relevance of auditor’s opinion and auditor’s reputation for the creditors of private companies. They find that Big-4 auditors’ clients bear a lower cost of debt. However, auditor’s opinion and auditor’s reputation are not equivalent to an auditor change, and the impact of auditor switches on costs of debt is still indistinct. Through the study of auditor change and bank loans, Francis (2017) found that auditor change companies would bear higher loan spreads and stricter nonprice loan terms, which to some extent supports the hypothesis that auditor change has a negative impact on cost of debt. However, there are still two problems unsolved in this study: Firstly, whether the research results of bank loan market can be directly grafted into the bond market? Secondly, in China security market, whether Francis (2017) research conclusion is still valid or not? The China debt financing market is unbalanced and immature, so it is worthwhile rolling out an even more ambitious in-depth study of the China debt financing market.

Standing on a giant's shoulders, the research is completed. This study has the following innovation points: Firstly, this study extends the scope and field of application from the United States credit market to China credit and bond market, providing reference for listed companies undertaking PPP projects to alleviate financing constraints and grasp the investment opportunities; Secondly, the study confirms that the creditors stay cautious towards auditor changes and have the ability to identify the potential audit opinion shopping. That is to say, when the enterprise has the possibility of audit opinion shopping, the creditors could identify more potential risks with their keen sense of smell, and impose relatively severe punishment on the auditor change companies, probably undermining the stable funding conditions for the benign operation of PPP projects.

2. Hypothesis discussion

With the continuous upgrading of corporate governance issues, agency theory is also evolving. On the basis of relatively dispersed ownership structure, the first type of agency relationship (Jensen and Meckling, 1976) between investors and managers emerges. On the basis of the relatively concentrated ownership structure, the second type of agency relationship between large shareholders and small shareholders comes into being. On the basis of the company's stakeholder organization, the third type of agency relationship between insiders represented by major shareholders or managers and external stakeholders emerges. Based on the overlap of the identities of major shareholders and senior executives, the fourth type of agency relationship between controlling shareholders and stakeholders other than the controlling shareholder comes into being.

Based on the result of the division of labour in society and the large-scale production, principal-agent relationship gradually emerges, among which the debt contract between creditor and operator is a typical principal-agent relationship. As there is information asymmetry between creditors and enterprise managers, it provides opportunities and conditions for opportunism behaviours of management, which eventually leads to moral obstacles of management and adverse selection of creditors, which constitutes the third type of agency conflict mentioned above. Creditors, in order to protect their own interests, will carry out pre-identification and post-supervision, resulting in agency costs; In order to reduce the risk of investment loss, creditors will require debtors to pay risk premium. Finally, agency costs and risk premium are transferred to the company in the form of loan interest rate.

External governance effects may change when auditor changes occur in listed companies. For one thing, the independence of successor auditors may be lost, and the role of external audit in supervision and assurance may be greatly reduced. For another, successor auditors’ professional competence may decline, as the auditor tenure is shorter, and the audit experience of the audited units is insufficient. Therefore, successor auditors may not be able to discover the misstatement of financial statements. As
mentioned above, auditor changes may lead to the failure of audit market and external governance mechanism.

To sum up, auditor changes aggravate agency conflicts between creditors and corporate managers, causing creditors to face greater information asymmetric risks and bear more identification and supervision costs. Creditors will demand higher returns out of consideration of maximizing their own interests, causing the rise in the cost of debt.

**Hypothesis 1**: other things being equal, listed companies bear higher costs of debt after auditor changes during the implementation of PPP contract.

The audit opinion is very important to the company, and any company wants a clean and favourable audit opinion. The type of audit opinion issued by auditors will cause the fluctuation of the stock price in the capital market. Once an enterprise is given an unfavourable audit opinion, it will not only face the investigation by the regulatory agency, but also be criticized by public investors, which will seriously damage the value of the company and even lead to bankruptcy. So the enterprise managers will pay close attention to the auditor, once they detect that there is a disagree of audit opinion between auditors and themselves. In order to avoid unfavourable audit opinions and guarantee their interests from harm, the management is likely to replace the current auditor and employ another auditor as partners to do opinion shopping (DeFond and Jiambalvo, 1993; Chen et al., 2016).

Listed companies change auditors motivated by opinion shopping, and some successfully purchase audit opinions through auditor changes. Once both the auditor change and audit opinion shopping are achieved, the auditor will most likely provide dependent audit opinion, and the audited financial statements at this time may contain huge uncertainty, hiding the managers’ real operational performance, aggravating the information asymmetry between internal management and external creditors, increasing information risk premium and costs of supervision, and rendering the listed company bear escalating costs of debt ultimately.

**Hypothesis 2**: other things being equal, as for auditor-changing companies, audit opinion shopping causes the company to bear a higher cost of debt than a company without audit opinion shopping during the implementation of PPP contract.

### 3. Research design

A total of 18 periods of original data from 2000 to 2017 were extracted from CSMAR database and IFIND database, and 63,234 lines of data were obtained, covering 3,513 sample companies participating in PPP project construction from 2000 to 2017. Procedures to preliminarily screen the original data are as followed: Firstly, excluding listed companies in the financial industry; Secondly, sample companies with missing observations are eliminated; Thirdly, ST or PT sample companies are excluded. After preliminary screening, 16470 lines of data were obtained, covering 915 sample companies.

Then, the samples were re-screened through propensity score matching (PSM), and DID model was applied to test hypothesis 1 and 2 with the data screened after two rounds. The reasons for using PSM-DID method are: Firstly, it can avoid endogenous problems caused by auditor changes as explanatory variables; Secondly, it can control the interference of unobservable but time-invariant factors; Thirdly, it can eliminate self-selection bias and confounding bias of non-randomized trials to a large extent.

PSM is a common method in accounting research (Francis et al., 2017; Dehaan et al., 2013; Lennox et al., 2017). The author intends to use the PROBIT model (equation (1)) to estimate propensity score, and then use Psmatch2 command to match one non-auditor-change-company for one auditor-change-company by year (2003-2015). The matching rules are: one-to-one, no replacement, propensity score difference less than or equal to 0.001 (caliper = 0.001). Finally, the period of auditor change, the early period of auditor change, and the late period of auditor change are defined as: the year of auditor change, two years before auditor change, and two years after auditor change.

\[
\text{Probit}\left(\text{AUDIT \_ \ SWITCH}_n\right) = \beta_0 + \beta \_ \ LEV_{n1} + \beta \_ \ YOUXI_{n} + \beta \_ \ LEV \_ \ YOUXI_{n} + \beta \_ \ Z \_ \ SCORE_{n} + \beta \_ \ LAG \_ \ GCO_{n} + \beta \_ \ SOE_{n} + \beta \_ \ BIG \_ \ AUDITOR_{n} + \beta \_ \ LOSS_{n} + \varepsilon
\]  

As a method of estimating treatment effect, DID method is often used to evaluate the inter-temporal effect of policy implementation, which is itself a fixed effect estimation method. Therefore, the fixed
effects of year and industry are not controlled in the model to alleviate multicollinearity between TREATMENT, POST_SWITCH, year and industry indicator variables. This paper plans to use regression command to conduct regression of DID model (equation (2)), calculate DID estimator, and select heteroscedasticity robust standard error as prior researches do.

\[ COD = \beta_0 + \beta_1 \text{TREATMENT} + \beta_2 \text{POST} \times \text{SWITCH} + \beta_3 \text{TREATMENT} \times \text{POST} \times \text{SWITCH} \\
+ \beta_4 \text{LEV} + \beta_5 \text{YOUXI} + \beta_6 \text{Z} \times \text{SCORE} + \beta_7 \text{GCO} + \beta_8 \text{SOE} + \beta_9 \text{BIG_AUDITOR} + \beta_{10} \text{POST} \times \text{SWITCH} + \text{year and industry indicator variables.} + \epsilon \]  

(2)

Table 1. Variable declaration.

| Proxy Variable | Explanation |
|----------------|-------------|
| AUDIT_SWITCH   | If the incumbent auditor is not the same as the auditor of the previous year, the value of this variable is 1; Otherwise, it is 0. |
| COD            | Current interest expense / liability with interest at the beginning of the year |
| TREATMENT      | If the sample company is from the auditor change group, the value is 1, otherwise 0. |
| POST_SWITCH    | For samples after the auditor change year, the variable takes a value of 1, otherwise 0. |
| TREATMENT \times POST_SWITCH | the product of TREATMENT and POST_SWITCH |
| LEV            | Total liabilities divided by total assets |
| YOUXI          | Liability with interest / the total liabilities |
| LEV \times YOUXI | the product of LEV and YOUXI |
| Z_SCORE        | Z-value warning, measuring the possibility of enterprise financial crisis |
| LAG_GCO        | If the audit opinion with a delay of one period is modified opinion, the value is 1. |
| SOE            | If the sample company is state-owned, the variable value is 1, otherwise 0. |
| BIG_AUDITOR    | If the accounting firm is one of the Big Four global accounting firms or one of the Big Eight domestic accounting firms, the variable is 1; Otherwise, it is 0. |
| LOSS           | If the net profit of the enterprise is less than 0, then the value of this variable is 1; Otherwise, it is 0. |
| ROA            | Net income divided by total assets |
| SIZE           | The natural log of total assets |
| GROWTH         | (total assets of the year - total assets of last year) / total assets of last year |
| FCF            | Net operating cash flow of the current year / the average of total assets |
| AGE            | The natural logarithm of "year of observation-year of incorporation" |
| DA_EM          | TA minus NDA is known as DA_EM. (following the modified Jones (1991) model) |

4. Empirical results

4.1. Descriptive statistics

Table 2. Descriptive statistical results.

| variable | mean | N | sd | min | p25 | p50 | p75 | max |
|----------|------|---|----|-----|-----|-----|-----|-----|
| TREATMENT | 0.500 | 15584 | 0.500 | 0.000 | 0.000 | 0.500 | 1.000 | 1.000 |
| POST_SWITCH | 0.500 | 15584 | 0.500 | 0.000 | 0.000 | 0.500 | 1.000 | 1.000 |
| COD | 0.079 | 15584 | 4.763 | -177.600 | 0.034 | 0.054 | 0.073 | 415.700 |
| LEV | 0.697 | 15584 | 8.382 | -0.195 | 0.423 | 0.560 | 0.683 | 1013.000 |
| YOUXI | 0.456 | 15584 | 0.238 | 0.000 | 0.280 | 0.480 | 0.644 | 1.001 |
| LEV \times YOUXI | 0.305 | 15584 | 3.697 | 0.000 | 0.129 | 0.255 | 0.379 | 460.200 |
| Z_SCORE | 6.896 | 15584 | 571.918 | -11512.763 | 1.463 | 2.384 | 3.933 | 69789.000 |
| LAG_GCO | 0.081 | 15584 | 0.274 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| SOE | 0.641 | 15584 | 0.480 | 0.000 | 0.000 | 1.000 | 1.000 | 1.000 |
| BIG_AUDITOR | 0.303 | 15584 | 0.460 | 0.000 | 0.000 | 1.000 | 1.000 | 1.000 |
| LOSS | 0.137 | 15584 | 0.343 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| ROA | 1.436 | 15584 | 189.200 | -2186 | 0.008 | 0.026 | 0.051 | 23510.000 |
| SIZE | 21.820 | 15584 | 12.96 | 10.84 | 20.970 | 21.740 | 22.600 | 27.470 |
| GROWTH | 1.198 | 15584 | 48.840 | -1.000 | -0.012 | 0.082 | 0.210 | 3741.000 |
| FCF | 0.044 | 15584 | 0.104 | -2.052 | 0.000 | 0.043 | 0.093 | 1.728 |
| AGE | 2.628 | 15584 | 0.398 | 0.693 | 2.398 | 2.708 | 2.890 | 3.611 |
| DA_EM | 0.001 | 15547 | 0.147 | -7.940 | -0.042 | 0.001 | 0.043 | 3.569 |
After a one-to-one propensity score match, the sample firms of auditor change account for about 50%, and the remaining 50% are the non-auditor-changing sample firms (the control group). In the whole sample, the average cost of debt is 7.9%, that is, the rate of return required by creditors is about 8%. It is known that the updated benchmark rates of 3-5 years RMB loans provided by IFIND database is 4.75%. It can be seen that the cost of debt borne by listed companies is generally higher.

4.2. Basic test results

| Table 3. Basic test results. | (1) | (2) | (3) | (4) |
|----------------------------|-----|-----|-----|-----|
| Dependent variable         | Full sample | Full sample | Audit-opinion-shopping sample | Non-audit-opinion-shopping sample |
| TREATMENT                  | -0.226 | -0.265* | -0.842 | -0.205 |
| POST_SWITCH                | -0.268**b | -0.266* | -0.315* | -0.196 |
| TREATMENT×POST_SWITCH      | 0.296* | 0.337** | 1.119* | 0.262* |
| CONTROLS                   | NO | YES | YES | YES |
| Constant                   | 0.251* | 0.560 | -0.502 | 2.705*** |
| Observations               | 15,121 | 15,012 | 7,753 | 14,780 |
| R-squared                  | 0.000 | 0.003 | 0.005 | 0.103 |
| Prob>F                     | 0.175 | 0.000 | 0.024 | 0.000 |

*a* Robust t-statistics in parentheses

b *** p<0.01, ** p<0.05, * p<0.1

After controlling other variables, the DID model was constructed, and the OLS regression was carried out. The regression coefficient of interaction item TREATMENT×POST_SWITCH was positive and significant at the level of 5% (column 2), indicating that companies with auditor change bear more expensive costs of debt financing after changing auditors.

Auditor change is often accompanied by audit opinion shopping. If auditor change is accompanied by audit opinion transition from the previous year's unfavourable audit opinion to the current year's favourable opinion, then the auditor change sub-sample is defined as the audit-opinion-shopping sample; Otherwise, it is defined as the non-audit-opinion-shopping sample. For companies that purchase audit opinions by changing auditors, their costs of debt increase more (1.119, a significance level of 10%), indicating that creditors can effectively identify invalid external audit governance mechanisms.

4.3. Robust test results

| Table 4. Test results of parallel trend hypothesis. | (1) | (2) |
|-----------------------------------------------|-----|-----|
| Dependent variable          | COD | COD |
| TREATMENT                   | -0.311 | -0.363 |
| POST_SWITCH                 | -0.0804 | -0.0854 |
| TREATMENT×POST_SWITCH       | 0.170 | 0.151 |
| CONTROLS                    | NO | YES |
| Constant                    | 0.292 | -0.124 |
| Observations                | 7.595 | 7.541 |
| R-squared                   | 0.000 | 0.004 |
| Prob>F                      | 0.333 | 0.0262 |
| VIF                          | 3.003 | 6.173 |
A placebo trial was conducted using data from the two years prior to auditor change to examine the parallel trend of costs of debt in treatment group and control groups before auditor switch. The empirical results show that the estimated coefficient of interaction items TREATMENT×POST_SWITCH was not significantly different from 0, and the DID premise—parallel trend hypothesis was valid.

Before matching, the propensity score density function graph shows that: before PSM, there were differences in distributions of propensity score between the experimental group and the control group. After PSM, distributions of propensity scores between the experimental group and the control group are basically consistent. To some extent, this indicates that PSM makes the two groups of samples approximately identical, and the use of matched observation data can successfully simulate the randomized trial.

5. Research conclusions
As an important external governance mechanism, audit plays an increasingly important role in easing debt financing constraints of listed companies participating in PPP project construction. Exploring the impact of auditor changes on the cost of debt capital is of great significance for listed companies to reduce costs of debt and improve the operation efficiency of PPP projects. Additionally, it is of reference value for investors and public sector to effectively identify risks, improve social capital’s sense of trust, and then promote the success of PPP project. Our PSM-DID test findings are as followed:

(1) Compared with non-auditor-changing company, auditor change does cause abnormal increase in costs of debt; (2) With the auditor change, the listed company completed the shopping of audit opinions. Auditing collusion makes the auditor change company bear a greater cost of debt.

This paper provides an important reference and effective support for relieving the financing constraint of China listed companies undertaking PPP projects, promoting enterprises to grasp investment opportunities, and improving auditor switching information disclosure.

References
[1] Ke, Y., Wang, S.Q. (2011) Understanding the risks in China’s PPP projects: ranking of their probability and consequence. Engineering, Construction and Architectural Management, 18: 481-496.
[2] Manuel, C.R., Santiago, S.A., Torres, P.A. (2015) The influence of auditor’s opinion and auditor’s reputation on the cost of debt: evidence from private Spanish firms. Spanish Journal of Finance & Accounting, 45: 32-62.
[3] Francis, B., Hunter, D., Robinson, D., Robinson, M., Yuan, X. (2016) Auditor changes and the cost of bank debt. The Accounting Review, 92: 1-30.
[4] Jensen, M.C., Meckling, W.H. (1976) Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3: 305-360.
[5] Defond, M. (2010) Factors related to audit-client disagreements over income-increasing accounting methods. Contemporary Accounting Research, 9: 415-431.
[6] Chen, F., Peng, S., Xue, S., Yang, Z., Ye, F. (2015) Do audit clients successfully engage in opinion shopping? partner-level evidence. Journal of Accounting Research, 54: 79-112.

[7] Dehaan, E., Hodge, F.D., Shevlin, T.J. (2013) Does voluntary adoption of a clawback provision improve financial reporting quality?. Contemporary Accounting Research, 30: 1027–1062.