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Article

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Cogent Economics & Finance

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Suggested Citation: Qing, Han (2023) : The role of public-private partnerships in selling, general, and administrative cost stickiness, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 11, Iss. 1, pp. 1-22,
<https://doi.org/10.1080/23322039.2023.2174650>

This Version is available at:

<https://hdl.handle.net/10419/303969>

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To cite this article: Han Qing (2023) The role of public-private partnerships in selling, general, and administrative cost stickiness, Cogent Economics & Finance, 11:1, 2174650, DOI: [10.1080/23322039.2023.2174650](https://doi.org/10.1080/23322039.2023.2174650)

To link to this article: <https://doi.org/10.1080/23322039.2023.2174650>



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Published online: 08 Feb 2023.



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Received: 20 October 2022
Accepted: 26 January 2023

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Reviewing editor:
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ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

The role of public-private partnerships in selling, general, and administrative cost stickiness

Han Qing^{1*}

Abstract: Public-Private Partnerships (PPP) which promotes public welfare is greatly supported by the China government. The authority endorsements relax financial constraints and promote operation efficiency. Using a sample of 9,733 firm-years in the empirical study, it is found that companies participating in PPP projects are associated with greater selling, general, and administrative (SG&A) cost stickiness, and it is more prominent in companies with severe financial constraints. Meanwhile, SG&A cost stickiness is stronger in companies carrying PPP projects in provinces with great amount of PPP investments which alleviates hardship of the government by issuing debts. To verify the causal link between PPP and cost stickiness, it is found that PPP projects can reduce relative changes between productions and demands in companies, implying PPP improve the bargaining power against suppliers and the control of manufacturing cost. Typical PPP projects have great public interest that should be reinforced by high-quality construction and commitments on investments, thus the marginal stickiness brings out incremental social benefit. The overall actual performance of PPP projects in China is good.

ABOUT THE AUTHOR

Han Qing With the experience of doctoral and postgraduate study in both China and Australia. Providing consultation services to listed companies. 10 academic papers of the author have been published in Academic Journals with peer review. Recent fields of research focus on insurances for independent directors and economic consequence of public policy.

PUBLIC INTEREST STATEMENT

Public-Private Partnerships (PPP) which promotes public welfare is greatly supported by the China government. The authority endorsements relax financial constraints and promote operation efficiency. It is found that companies participating in PPP projects are associated with greater selling, general, and administrative (SG&A) cost stickiness. It is also found that PPP projects can reduce relative changes between productions and demands in companies, implying PPP improve the bargaining power against suppliers and the control of manufacturing cost. Typical PPP projects have great public interest that should be reinforced by high-quality construction and commitments on investments, thus the marginal stickiness brings out incremental social benefit. Policy makers are suggested to enhance the factors which alleviate the conflict between the public and the profit-seeking company. For example, the race for “Paradigm for Practice” created a virtuous circle and enhance sound applications of PPP, which should be strongly recommended.

Subjects: Environment & Economics; South East Asian Economics; Economics and Development; Corporate Governance

Keywords: PPP; SG&A cost stickiness; government debt; supply Chain

1. Introduction

1.1. Background

Public-private partnership (PPP) has been considered as the appropriate vehicle with which to implement projects for economic recovery under “New Infrastructure Construction” advanced by the Chinese Government.¹ Meanwhile, Chinese authorities are facilitating a larger role for the private sector in the nation’s basic health insurance system. In the future, once the new reform is implemented, the business model of health insurance could take the form of PPPs. Financial institutions are also motivated to provide financing services for infrastructure projects under the PPP framework.

Great outcomes come with great support. By the end of 2020, 13,298 PPP projects with a total investment of 19.17 trillion RMB had been recorded in the database of the Ministry of Finance of China. Among these, 9928 projects were ready for launch, with a total investment of 15.21 trillion RMB, while the initial intentions of 3370 projects with a total investment of 3.96 trillion RMB had been achieved.² The number of PPP projects, especially those “ready for launch”,³ has increased since 2018, signaling the prosperity and power of PPPs.

In terms of selling, general, and administrative (SG&A) cost stickiness, Anderson et al. (2003) found that SG&A costs increase more rapidly when demand increases than they decline when demand decreases. Among the incentives on corporate governance, Banker et al. (2011) identified to ease of cost adjustment and management optimism. Furthermore, Liu et al. (2019) provided evidence that corporate orientation toward different stakeholders can have different efficiency implications for two incentives: the association between customer orientation and SG&A cost stickiness is consistent with efficiency considerations, whereas the association between employee orientation and SG&A cost stickiness is consistent with agency motives.

A reasonable question arises: why do PPP projects exert marginal influence on the behavior of cost adjustments? Three issues are relevant for addressing this question:

Materiality in new investments. For PPP projects undertaken by listed companies in Mainland China from 2014 to 2019, the median percentage of PPP investments stipulated in contracts to total assets stated at the end of the year in which the contract was signed is 35%. Due to the heavy investments and a bundling mode of construction and operation, mergers and acquisitions seem to be shortcuts through which PPP participants can play along. In China, many companies, such as Fortune Land Development Co., Ltd., and Beijing Orient Landscape & Environment Co., Ltd., extensively exploit this approach.

Ongoing Commitments. PPP projects involve the whole cycle of construction and operation, leading to a longer duration than that of non-PPP projects. A great deal of incremental investments will be allocated over a long horizon. According to the samples of PPP projects in the present paper, the median duration is 18 years. For the bonus of subsidies and government endorsement, even profit-seeking companies are likely to maintain inputs and shift operations toward PPPs.

Offsetting effects from stakeholders in PPPs. With respect to the government, typical PPP projects, such as the operation of sewage treatment systems, have great public interest that should be reinforced by high-quality construction and commitments on investments; therefore, SG&A cost stickiness is expected to be consistent with efficiency considerations. However, the

positive externality may correspond to some loss in increments in company participants' value aligned with managerial interests (stock option plans), which motivates them to speed the cut-down of inputs once faced with a decreasing consumption of PPP goods or services.

1.2. Discussion of findings

There was a lack of consensus concerning the actual performance of PPP projects in China. Certain studies (Wan et al., 2015) showed that PPP projects appeared to be performing well in complying with the PPP contracts. Certain studies have highlighted the critical success factors (CSFs) through surveys and case studies from the macro-environment perspectives, such as the economic and legal environments, public support, cooperation between different parties, and project profitability. The success of PPP projects required the joint efforts of all stakeholders (Zhao et al., 2013).

Linking to this study, the joint efforts of CSFs (such as public support, reciprocity between government and company participants) could be signaled by the cost adjustments due to PPP projects. If PPP generates incremental cost stickiness and ongoing commitments on huge inputs, it will imply CSFs outweigh those "backfire" (such as offsetting effects from stakeholders) in the applications.

The present paper seeks to extend current studies in the following ways: (1) It verifies the marginal effects of PPPs on the SG&A cost stickiness of company participants, extending the boundary of PPP study. The CSF in place is the reciprocity between the government and the companies participants. In terms of public interest, typical PPP projects have great public interest that should be reinforced by high-quality construction and commitments on investments, thus the marginal stickiness due to PPP brings out incremental social benefit.

(2) The study shows that PPP projects are with reduced relative changes between productions and demands in participants' companies. The good match will enhance ongoing investments in production. As duration of PPP projects gets long and come along with high cost of construction and operation, the increasing stability due to predictable demand-supply pattern of public goods will help to control production cost and realize future benefit of current investment. It extends the list of critical success factors in PPP applications.

(3) It provides evidence of the association between SG&A cost stickiness and China stakeholders' concerns in PPP applications. To dismantle the mix of different incentives, local government debts constrained by the central government, the degree of companies' financial distress, and the binding duration of construction and operations will be introduced to measure different stakeholders' concerns. By this study, the joint effort of different stakeholders on the inputs in PPP projects is split up, and the volatility of different stakeholders' persistence in pursuing public interest could be projected.

2. Theory and hypothesis development

2.1. The drivers of SG&A cost stickiness

According to Banker et al. (2011), the theories of incentive on SG&A cost stickiness can be classified as follows: eases of cost adjustment, management optimism and corporate governance. First, the ease of cost adjustment indicates whether committed resources are economical or time costly to adjust. Stronger SG&A cost stickiness was found in companies with titles of operation assets or long-term contracts with their employees compared with companies that opted for outsourcing or less committed investments (Anderson et al., 2003). Second, regarding management optimism, there are strong beliefs about high growth in demand, so occasional setbacks in sales do not result in the scale-down of resources that should be in place for rebounding demand (Banker et al., 2011). Third, the level of cost stickiness appears to be affected by the system of managerial oversight and cross-country differences in the system of corporate governance. The level of cost stickiness is higher in French and German firms, which are subject to systems of code-law

governance and historically less subject to the pressure of a market of corporate control. Wei, Yuming, Zhe et al. (2015) found that under poor investor protection and weak corporate governance, the problem of cost stickiness induced by accrual-based earnings management may be more serious in China. Specifically, upward accrual-based earnings management weakens firm cost stickiness, while downward accrual-based earnings management strengthens firm cost stickiness.

In summary, since the issues of management optimism and corporate governance are greatly driven by managers' discretion, the incentives related to cost stickiness can be generally reduced to two concepts: efficiency considerations of cost adjustment with an emphasis on the benefit of companies and managerial opportunism with an emphasis on egoism or agency problems. In practice, Liu et al. (2019) proposed that the association between customer orientation toward cost management and SG&A stickiness is consistent with efficiency considerations (i.e., adjustment costs); however, the association between employee orientation and SG&A stickiness is consistent with agency motives such as empire building or "a preference for a quiet life".

2.2. The bundling of construction and operation in PPP appropriate for Chinese public projects

It is worth highlighting that PPP development in China after 2013 experienced a new boom due to the promotion of the Chinese government, which was completely different from that before 2013, including the exploration (1984–2002), stable expansion (2003–2008), and development with fluctuations (2009–2013; Cheng et al., 2016). In 2017, the Ministry of Finance of the People's Republic of China stressed the regulation that PPP modes were prohibited for public projects without working plans of operation and reimbursement; in other words, projects concerned with construction only would not be sponsored.

In China, construction and operation are bundled together and managed by project companies or SPVs (Special Purpose Vehicles). By studying the trade-off between productive investments and unproductive investments, Hart (2003) inferred that conventional provision ("unbundling") is good if the quality of the building can be well specified, whereas the quality of the service cannot be. In contrast, PPP is good if the quality of the service can be well specified in the initial contract (or, more generally, there are good performance measures that can be used to reward or penalize the service provider), whereas the quality of the building cannot be. In other words, PPP modes are supported for projects where the future value of operation in stage two greatly hinges on the quality of complex construction in stage one. In China, the majority of PPP projects, such as hospitals, metro systems and sewage treatment facilities, fall within this category. Generally, the application of the PPP arrangement was found suitable for the Chinese institutional environment (Shen et al., 1996; Zhang et al., 2015).

2.3. Incomplete PPP contracts

In regard to the side effects of PPPs, the issue of incomplete contracting tops the list, where inefficiencies arise because it is difficult to foresee and contract activities in an uncertain future: (a) Due to the long duration of PPP projects, the business environment changes, and customer demands shift; thus, contingent items are virtually impossible to address ex ante. The uncertain factors will defeat the risk prediction, which will lead to the imbalance of contract interests and the deadlock of cooperation. Government ownership is influential in this case, and the government makes all decisions concerning the asset or firm that are not included in an initial contract. (b) In two-stage PPP projects, company participants opt for the allocation of resources to profit-sharing rules instead of prioritizing social benefit.⁴ For example, if the profit-sharing arrangement is designed according to abilities of profit generation, some private sectors, e.g., subcontracted parties in charge of operation, will be mostly awarded; being aware of this, the main contractors with general duties for both constructions and operations may take advantage of incomplete private-private contracts, reaping large profits by offering high prices (costs to subcontracted parties) for subcontracting in the operation stage and cutting down on investments in the first stage of construction, at the expense of the public interest. In this case, the government has to

step in by restructuring the profit or provide allowances for the private sectors to internalize the cost of serving the public. Otherwise, the moral hazard within the private consortium may undermine the interest of the public.

2.4. Theory application and hypothesis development

Trust refines incomplete PPP contracts. For incomplete PPP contracts, the deployment of a settlement mechanism for disputes and contingent items is vital. Mutual trust among contracting parties is critical to the mechanisms and thus transaction costs. Zaghloul and Hartman (2003) et al. stated that contractual relationships are based on confrontational situations that reflect the level of trust (or mistrust) in contract documents. The level of trust can be a driver to increase the total cost of a specific project and affect the overall relationship between the contracting parties. This effect has been tested in the construction industry in Canada and appears to be generalizable across North America. Koh and Rowlinson (2012) associated trust with general confidence that participants will engage in constructive interaction without the need to guess the hidden motives that the other participants might harbor. In other words, trust increases participants' anticipation of value from communications and enhances the positive interpretation of other participants' behaviors, so it is likely to provide subtle but indispensable help in the process of problem solving.

In Chinese context, the association between trust and PPP partnership has been verified. By using comparative analysis on terms of PPP contracts, Zhang and Jia (2012) provided evidence on the establishment of trust before contracting between the public and private sectors. The business reputation of private sectors helps to build up the ties in and around PPP projects, which resolves issues of information asymmetry in a subtle but effective way. Furthermore, It is an important way to maintain the stability and improve the performance of PPP projects to conduct risk cooperation governance by adjusting trust (Chu et al, 2022). Trust enhances the stipulations of contingency items in PPP contracts, which promote the transfer of controls from the public sector to the private sector. Given the incompleteness of PPP contracts, this role is critical to risk management and the control of transaction costs.

Correspondingly, it is reasonable to infer that the financial constraints of company participants will be relaxed in the presence of the trust of the government. The endorsements enhance company participants' capability to achieve settlements (such as payments for production material and labor) and capital financing, which in turn improve their bargaining power against suppliers and improve cost control. This edge is shaped by two instruments working on PPP contracts: trust and reciprocity. First, given the incompleteness of PPP contracts, it is critical to establish an efficient dispute settlement mechanism. Therefore, as mentioned above, trust among contracting parties is expected to be in place. Second, the reciprocity between governments and private sectors is derived from debt financing. Implicit debts may be incurred by raising funds assumed by municipal governments,⁵ which have been strongly constrained by the Chinese central government. If company participants agree to take them over, this transition will be a credit to performance evaluations on local administrations. In return, with the endorsement of government, company participants are likely to enjoy the benefits of tax breaks, subsidies and high credit in fund raising, which improve their bargaining power against suppliers and manufacturing cost control. All these factors would help to maintain committed resources when setbacks in operations arise. Thus, the paper proposes the following:

Hypothesis 1: The PPP mode is positively associated with SG&A cost stickiness.

As mentioned above, the incentives on cost stickiness could be reduced to two groups: efficiency considerations of cost adjustment with an emphasis on the benefit of companies and managerial opportunism with an emphasis on egoism or agency problems. According to existing studies, the effects of variances in funding difficulties on cost sickness also project incentives under PPPs. Given

the ease of cost adjustment, Wei¹, Yuming, Zhe et al. (2015) found that financial distress reduces cost stickiness, which seems reasonable because companies with less capital would prefer to withdraw more quickly when facing setbacks in revenue. Based on this premise, Xiaoli and Min (2018) attached efficiency considerations to companies' cost adjustments when companies suffer from limited external financing, whereas the incentives of managerial opportunism to companies are sufficiently financed. Therefore, the relationship between government subsidies and cost stickiness is more obvious under higher (lower) financing constraints, implying that this marginal stickiness is triggered by relaxing financial constraints (as well as overinvestment or agency issues).

Considering the great financing stress in PPPs, efficiency considerations are a factor for cost adjustments. PPP projects usually involve the construction and operation of public infrastructure, and it is inevitable for company participants to raise external capital, especially considerable debts. An analysis of the PPP projects charged by Chinese listed companies from 2015 to 2019 reveals that the inputs from companies' own funds are 18% of the total investment on average and more than 80% of that financed by debts. Similar to government subsidies, government endorsements embedded in PPP contracts enhance company participants' capability of settlements and subsequent financing.

Compared to subsidies, government endorsements may have stronger effects on the improvement of the indirect costs of financial distress. As mentioned above, this edge is shaped by two instruments featured by PPP contracts—mutual trust and reciprocity between participants and government—which will address stakeholders' concerns about the impaired ability to conduct business if any financial distress occurs.

Hypothesis 2: The relationship between PPP projects and SG&A stickiness is more obvious in company participants with heavy financing constraints.

The reciprocity between governments and private sectors is derived from arrangements of debt financing between the government and social capital. If company participants agree to take on a large share of total funding, it would be a favor to local government administrations with performance KPI on debt control. The greater the total investment in PPP projects, the more explicitly governmental debts could be deferred or even avoided. As the payoff, governmental endorsement, which seems implicit but contributes greatly to companies' financing, will be provided.

Hypothesis 3: The relationship between PPP projects and SG&A stickiness is more obvious in company participants with higher PPP investment.

On the other hand, the fringe benefit of the external reciprocity could be compromised due to companies' internal pressures from commitments on PPP investments. If the investments hold up a great amount of capital, the companies will fast-track adjustments. In the context of PPPs, many public projects feature larger initial cash outflows but long payback periods and low rates of return. In good years, shareholders and management may withstand the large inputs, where the pros of government endorsements outweigh the cons of PPP projects; in bad years, the effect is reversed, especially for small and medium-sized companies, in which decisions of scale-down will be persuasive. Therefore, I propose the following:

Hypothesis 4: The relationship between PPP projects and SG&A stickiness is less obvious in company participants with higher pressure from commitments on PPP investments.

3. Variable measurement and sample description

3.1. The pool regression for hypothesis 1 and hypothesis 2 testings

$$\begin{aligned} \text{Insgabysgala} = & \beta_0 \text{Contant} + \beta_1 \text{lnrevbylagrev} + \beta_2 (\text{lnrevbylagrev} \times \text{DecDummy}) \\ & + \beta_3 (\text{lnrevbylagrev} \times \text{PPP}) + \beta_4 (\text{lnrevbylagrev} \times \text{DecDummy} \times \text{PPP}) \\ & + \beta_5 \text{PPP} + \beta_6 \text{Decminus1} + \beta_7 \text{top1nature} + \beta_8 \text{AI} + \beta_9 \text{EI} + \beta_{10} \text{FCF} \\ & + \beta_{11} \text{toinsthold} + \beta_{12} \text{pctIndep} + \beta_{13} \text{dmboth} + \text{Year Indicator} \\ & + \text{Industry Indicator} + \epsilon \end{aligned} \quad (1)$$

In reference to Liu et al. (2019), the regression model will be applied to test the relation between PPPs and SG&A cost stickiness. “Insgabysgalag” is the log of the ratio of annual selling, general, and administration expenses in year t to that in year $t-1$. “lnrevbylagrev” is the log of the ratio of annual sales revenue (SALE) in year t to that in year $t-1$. PPP equals one if companies posted that PPP contracts had been approved and signed in each of the sample years and zero otherwise. DecDummy equals one if $\text{SALE}_t < \text{SALE}_{t-1}$ and zero otherwise. In this case, a negative coefficient of “lnrevbylagrev×DecDummy” signals that the cost stickiness increases more rapidly when demand increases than it declines when demand decreases; a negative coefficient of “lnrevbylagrev×DecDummy×PPP” indicates that the marginal cost stickiness is enhanced by PPP.

Hypothesis 2 tests the effect of financial constraints on the relation between PPPs and SG&A stickiness. The indicators of KZ are constructed according to the study of Kaplan and Zingales (2000).⁶ The company samples are divided as follows: if the predicted KZ of the company is greater than the median of the underlying industry, the variable “constrain” equals 1, which indicates a greater likelihood of financial distress, and zero otherwise. Applying the regression to the two groups allows the diversified effect on cost stickiness caused by differences in financial constraints to be examined.

3.2. Adjustments for hypothesis 3 and hypothesis 4 tests

In this part, the samples of PPP participants will only be tested. Their properties, which affect the transformation of implicit government endorsement to the explicit release of financial constraints, are highlighted. As for the proxy of external reciprocity between the government and the company participants, the ratio of PPP investments to government debts in the provinces where participants’ PPP projects are located is in use, referred to as “avePPPtoba”. The higher the ratio, the greater the “favor” offered by the social capital, leading to reciprocal outputs of government endorsement. With respect to companies’ internal pressures from commitments on PPP investments, the ratio of a company’s PPP investments to sales revenues is in place, referred to as “investtorev”. The higher the ratio is, the greater financial pressures shouldered by company management, thus impairing the positive effect of reciprocal benefit on investment commitments and cost stickiness.

In general, the variables measuring change in SG&A expenses, change in sales and control variables are defined consistently with prior cost stickiness literature (Chen et al., 2012; Liu et al., 2019; Wei1, Yuming, Zhe et al., 2015). The control variables help to include other explanations to cost adjustment in the regression. In the case with all the control variables in the regression, if the coefficients of the main independent variables, such as PPP, are still significant, their functions proposed by the hypotheses above will be verified. To be specific, Decminus1 _{t} equals one if $\text{SALE}_{t-1} < \text{SALE}_{t-2}$, and zero otherwise. If companies suffer from sales declines two years in a row, top management will be urgent to cut down the cost. State _{t} equal one, if the company is state-owned, zero otherwise. State companies will enjoy some benefit in fund raising. AI _{t} (asset intensity) and EI _{t} (employee intensity) control the level of hardship in discharges of assets in different companies. Dmboth _{t} and FCF _{t} control behaviors due to managerial opportunism or agency issues: managers with great power and free cash flows are over-optimistic and reluctant to withdraw investment. The percentage of institutions holding (toinsthold _{t}) and the ratio of independent directors (pctIndep _{t}) control the efficiency of decision making in cost adjustments. The

Table 1. Variables description

Titles	Descriptions for the Test of SG&A Stickiness
$\ln\text{sgabysgalag}_t$	the log of the ratio of annual selling, general, and administration expenses in year t to the one in year $t-1$
$\ln\text{revbylagrev}_t$	the log of the ratio of annual sales revenue (SALE) in year t to the one in year $t-1$
DecDummy_t	equals one if $\text{SALE}_t < \text{SALE}_{t-1}$, and zero otherwise.
Decminus1_t	equals one if $\text{SALE}_{t-1} < \text{SALE}_{t-2}$, and zero otherwise.
State_t	equal one, if the company is state-owned, zero otherwise.
AI_t	asset intensity: the ratio of total assets to sales revenue
EI_t	employee intensity: the ratio of the number of employees to sales revenue (in thousands)
FCF_t	free cash flow divided by total asset, defined by CSMAR ⁷
toinsthold_t	cumulative number of shares held by institutional investors divided by the total shares outstanding
pctIndep_t	percentage of independent (outside) directors on the board
Dmboth_t	agency issues: if the chairman of the board takes the office of CEO, equal 1, zero otherwise.
constrain_t	financial constrain: if the KZ of the company is greater than the median of the underlying industry, the variable “constrain” equals 1, zero otherwise. Specifications in footnote 6.
Characteristics Descriptions for PPP Projects	
PPP_t	equal 1, if companies posted that PPP contracts had been approved and signed in sample years, zero otherwise.
avePPPtoba_t	the ratio of PPP investments to government debts in the provinces where participants’ PPP projects locate. If two or more provinces are concerned, the average will be applied.
investtorev_t	the ratio of company’s PPP investments to sales revenues
term_t	measures PPP projects’ duration in the observation of company year. If there are more than one projects for the company each year, the average of those projects’ duration will be adopted.
notice_t	equal 1, if any PPP project of company participants had been assessed as “Paradigm for Practice” by China Ministry of Finance, zero otherwise .
morethan1_t	equal 1, if a company participants acquired more than one PPP projects in an observation year, zero otherwise
Year_t	dummy variables for the sample periods in the pool regressions, from the year 2015 to the year 2019
industry_t	dummy variables for industry classification set by China SEC. After eliminating financial institutions with code “J”, there are 18 industries in the sample.

dummy variables for years and industries control fixed effects across time and different industry sectors. The complete descriptions of the variables are presented in Table 1.

3.3. Sample description

The paper starts with all listed firms in Mainland China from 2015 to 2019. Milestones on the way toward PPP development were established in 2015: (1) The blueprint for PPP development was specified and released by the Chinese Central Government, and the General Office of the State Council clarified that the scope of PPP application extended from infrastructure construction to public services; (2) Responding with specifications on enforcement, The National Development and Reform Commission and the Ministry of Finance enacted regulations governing the practice of PPPs, including feasibility study and evaluation, procurement procedures, contract management and budget control. The China Development Bank agreed to provide financial aid to PPP projects; (3) Furthermore, the Ministry of Finance set up a database of the “Paradigms for Practice”, in which company participants with paradigm projects are deemed to have good compliance with PPP regulations and sound performance in raising funds, construction and operation. The paradigm companies act as role models for PPP applications.

After the financial institutions⁸ and the samples with missing values in variables are dropped for the regression, the final sample consists of 9.733 company-year observations. Financial data of the observations are derived from the CSMAR database. For those observations with PPP projects, the contract specifications are derived from the Wind database.⁹ To control the effect of extreme values on the regressions, the values of continuous variables are adjusted by a two-tailed 1% winsorized function in STATA software.

4. Test results

4.1. Descriptive statistics

First of all, VIF test is applied to all variables in the regression. The individual and the mean of VIF are all below 2, which justifies small multicollinearity according to the standards established by chatterjee et al. (2000).

According to Table 2, the mean and the median of annual sales revenue is 9590 millions and 1800 millions, respectively; the mean and the median of annual SG&A cost is 920 millions and 263 millions, respectively. In terms of SG&A to sales revenues, the mean and the median of annual SG&A cost is 22.23% and 15.19%, respectively.

According to Table 3, Difference-in-Means test is applied to the comparative samples which are grouped by taking PPP projects or not. Compared with other companies, PPP participants see significant difference in some variables which lead to less cost stickiness. First, the employee intensity (EI) of PPP group is significantly lower than the counterpart, indicating lower opportunity cost of human resource adjustments. Second, the significant lower ratio of free cash flow (FCF) for PPP group signals the greater financial constraints which also reduces the likelihood of cost stickiness. In the end, both the significant higher proportion of institutional holdings and the corporate governance that less chairman in the office of CEO in PPP group, urge management to act for the best interest of shareholders and speed the cost adjustments.

Table 2. The statistics of sale revenue and SG&A Cost

Variables	Mean	Standard Deviation	Median	upper quartile	lower quartile
(1) Sale Revenue (RMB in millions)	9590	64,000	1800	4940	747
(2) SG&A Cost (RMB in millions)	920	4460	263	639	124
The ratio of (2) to (1)	22.23%	31%	15.19%	23.46%	9.43%

Table 3. Difference-in-means test for PPP group and others

	PPP = 0 Mean	PPP = 1 Mean	Difference	T value	P value
Revenue (RMB in millions)	9120	44,800	-35,700	-3.4097	Pr (T < t) = 0.0004
SG&A (RMB in millions)	898	2630	-1730	-3.2836	Pr (T < t) = 0.0006
state	0.3166	0.3468	-0.0302	-0.8276	Pr (T < t) = 0.2045
AI	3.1172	3.4320	-0.3149	-1.4772	Pr (T < t) = 0.0706
EI	0.0146	0.0095	0.0051	5.8805	Pr (T > t) = 0.0000
FCF	-0.0011	-0.0232	0.0221	2.3063	Pr (T > t) = 0.0111
toinsthold	0.0519	0.0654	-0.0135	-2.3081	Pr (T < t) = 0.0111
Dmboth	0.2956	0.2096	0.0860	2.7010	Pr (T > t) = 0.0038
	9267	466			

To sum up, there are many factors which weaken cost stickiness in the PPP Group. However, it helps to avoid the issue of multicollinearity in the regression test and assure the result of positive effect of PPP on the stickiness, if any.

4.2. The pool regression result for Hypothesis 1 and Hypothesis 2

The results in Table 4 focuses on the effect of PPP on SG&A stickiness. In result 1, the coefficient of the interaction between *lnrevbylagrev* and *DecDummy* is negative (significant level: 1%) which proves the stickiness: the costs increase more rapidly when demand increases than they decline when demand decreases. In result 2, the coefficient of the interaction among *lnrevbylagrev*, *DecDummy* and PPP is negative (significant level: 1%) indicating that PPP projects enhances the company participants' SG&A cost stickiness, as Hypothesis 1 predicts. The government endorsements from PPP enhance company participants' capability of settlements (such as payments for production material and labor) and capital financing, which in turn improve bargaining power against suppliers and cost control.

In a wide vision, the marginal stickiness due to PPP is with profound effect on social benefit. First, the stickiness features the priority of PPP in companies' development with a time frame from several years to decades.¹⁰ The quality of construction and resulting positive externality are promoted by ongoing commitments on investment signaled by the stickiness. Second, since many projects are still in the phase of construction due to the policy nudges brought forth since the year of 2015, the ongoing inputs of resources help to remain PPP in the right positions for the right moment. According to the mathematical derivation (Greco, 2015), PPP fits in if the quality of the service can be well specified in the initial contract, or there are good performance measures which can be used to reward or penalize the service provider, whereas the quality of the building cannot be. Correspondingly, the major of Chinese PPP projects concern hospitals,¹¹ pollution treatment facilities and recreational areas, which come up with clear measures of service quality but relatively ambiguous in constructions.¹² Therefore, in the current phase, the cost stockiness help to enhance the construction quality of these projects and take good advantage of PPP mode.

In Table 5, the marginal effect of different financial constrains on PPP function is illustrated. In the group of company participants with greater constraints (*constrain* = 1), the coefficient of the

Table 4. The Function of PPP on Companies' Cost Stickiness

	(1)	(2)
VARIABLES	Insgabygalag	Insgabygalag
Inrevbylagrev	0.519*** (69.35)	0.520*** (69.08)
Inrevbylagrev* DecDummy	-0.258*** (-17.88)	-0.255*** (-17.63)
Inrevbylagrev*PPP		-0.0415 (-0.67)
Inrevbylagrev* DecDummy*PPP		-0.425*** (-2.77)
PPP		0.0345 (1.36)
top1nature	-0.0345*** (-7.34)	-0.0339*** (-7.21)
Decminus1	-0.0657*** (-13.71)	-0.0656*** (-13.68)
Dmboth	0.0129*** (2.68)	0.0133*** (2.77)
AI	0.0009*** (2.77)	0.0010*** (2.85)
EI	0.153 (1.21)	0.161 (1.27)
FCF	-0.0067 (-0.81)	-0.0069 (-0.83)
toinsthold	0.0376 (1.13)	0.0350 (1.05)
pctIndep	-0.0338 (-0.93)	-0.0316 (-0.87)
year	control	control
industry	control	control
Constant	0.0807*** (3.57)	0.0776*** (3.43)
Observations	9,733	9,733
R-squared	0.404	0.406
Adj. R2	0.403	0.404

t-statistics in parentheses

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

interaction among Inrevbylagrev, DecDummy and PPP is negative (significant level: 1%) which indicates that PPP still works on SG&A cost stickiness, as hypothesis 2 predicts. However, the effect is not significant with respect to the group with sufficient capital (constrain = 0). According to the judgment on incentives (Xiaoli & Min, 2018), PPP invokes the efficiency consideration of cost adjustments, but barely triggers the behavior of managerial opportunism from owning ample cash. The reasons: (1) If company participants suffer from financing constraints, government endorsements from PPP have profound effects of improvement on indirect costs of financial distress. Mutual trust and reciprocity between participants and government will addresses stakeholders' concerns on impaired ability to conduct business, which helps to remain commitments on

Table 5. The function of PPP on cost stickiness of companies with financial constraints

	constrain = 1	constrain = 0
VARIABLES	lnsgabygalag	lnsgabygalag
lnrevbylagrev	0.402*** (33.90)	0.630*** (63.19)
lnrevbylagrev* DecDummy	-0.135*** (-7.18)	-0.469*** (-15.50)
lnrevbylagrev*PPP	0.205* (1.65)	0.0430 (0.52)
lnrevbylagrev* DecDummy*PPP	-0.702*** (-3.34)	-1.316 (-1.01)
PPP	-0.000509 (-0.01)	-0.0113 (-0.29)
top1nature	-0.0443*** (-6.29)	-0.0265*** (-4.30)
Decminus1	-0.0723*** (-10.26)	-0.0552*** (-8.47)
Dmboth	0.0101 (1.36)	0.0174*** (2.83)
AI	0.0007* (1.69)	0.0013** (2.29)
EI	0.0264 (0.15)	0.370** (2.02)
FCF	-0.0351* (-1.73)	-0.0240 (-1.22)
toinsthold	0.0378 (0.74)	0.0356 (0.81)
pctIndep	-0.0428 (-0.78)	0.0135 (0.29)
year	control	control
industry	control	control
Constant	0.0951*** (2.92)	0.0207 (0.67)
Observations	4,397	4,891
R-squared	0.323	0.514
Adj. R2	0.318	0.511

t-statistics in parentheses

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

investments and thus cost stickiness. (2) When it comes to the companies with less constraints or even ample cash, the low return due to profits control in public products¹³ may rank PPP projects behind other investment alternatives. Since most of the underlying processes for profit control are publicly informed, the limited return on PPP projects should be well understood by the companies' shareholders. If any over-investment on PPP is incurred for managers' self interests, it could be easily spotted and prevented.

Table 6. The Test Results of Mediation Effects on Cost Stickiness

VARIABLES	(1)lnsgabysgalag	(2)lnsgabysgalag
lnrevbylagrev	0.315** (2.79)	0.571*** (4.69)
lnrevbylagrev* DecDummy	-0.0733 (-0.15)	-0.714* (-2.07)
lnrevbylagrev*avePPPtoba	1.021*** (6.47)	
lnrevbylagrev* DecDummy* avePPPtoba	-2.057** (-2.72)	
avePPPtoba	-0.161** (-3.14)	
lnrevbylagrev* investtorev		0.0649*** (5.20)
lnrevbylagrev* DecDummy* investtorev		0.0434 (0.11)
investtorev		-0.0363*** (-5.11)
Decminus1	-0.0475 (-0.63)	-0.0397 (-0.46)
top1nature	-0.0723 (-1.55)	-0.0765** (-2.30)
Dmboth	-0.00113 (-0.04)	-0.0172 (-0.52)
AI	0.0297** (3.19)	0.0327*** (3.81)
EI	1.690 (0.61)	1.864 (0.90)
FCF	-0.0844* (-1.91)	-0.294** (-2.74)
toinsthold	0.173 (0.20)	0.0659 (0.09)
pctIndep	-0.282 (-1.33)	-0.247 (-1.60)
industry	control	control
update	control	control
Constant	0.0415 (0.45)	0.0149 (0.13)
Observations	466	466
R-squared	0.613	0.610
Adj. R2	0.506	0.498

Robust t-statistics in parentheses
 *** p < 0.01, ** p < 0.05, * p < 0.1

4.3. The test of mediation effects in Hypothesis 3

The previous section illustrates that PPP with government endorsements enhance the SG&A cost stickiness of company participant. By focusing on the PPP companies only in this section, the mediation effects outside and inside on the very government endorsements are examined.

In the result 1 of Table 6, avePPPtoba is the proxy for the external mediation of governments' trust. The coefficient of the interaction among lnrevbylagrev, DecDummy and avePPPtoba is negative (significant level: 5%) which indicates that greater amount of PPP investments in terms of local debt works on SG&A cost stickiness, as hypothesis 3 predicts. The reciprocity between governments and private sectors is derived from arrangements on debt financing between the two parties. Based on that, the greater the investments in PPP projects, the more explicit governmental debts could be turned into the implicit. It definitely will be a favor to local government administrations with performance KPI on debt control. As the payoffs, the governmental endorsements enhance companies' bargaining power against suppliers and creditors, holding up resources when setbacks in operation turn up.

In the result 2 of Table 6, investtorev is the ratio of companys' PPP investments to sales revenues which is the proxy for the internal mediation of financial constraints. The coefficient of the interaction between lnrevbylagrev and investtorev is positive (significant level: 1%); the coefficient of the interaction among lnrevbylagrev, DecDummy and investtorev is positive, but not significant, as hypothesis 4 predicts. The incremental benefit of the external reciprocity could be compromised due to companies' internal pressures of commitments on PPP investments and profit-seeking. If the investments occupy a great amount of capital, in no doubt the companies would like to speed adjustments. Many PPP projects are featured by large initial cash outflows but long payback period with low rate of return. In the time of prosperity, shareholders and managements may stand the huge inputs, where the pros of government endorsements outweigh the cons of PPP projects; in the time of recession, however, the effect turns out to be neutralized.

4.4. The additional test on the effect of PPP on supply Chains

(a) Test design and variable measurement

In the test result of Hypothesis1, the PPP mode is positively associated with SG&A cost stickiness. With the endorsement of government, company participants are more likely to enjoy the benefit of tax, subsidies and high credit in fund raising, which improve bargaining power against suppliers and manufacturing cost control. All these above would help to hold up resources when setbacks in operations turn up. This section will provide additional evidence on the very "bargaining power": the test of PPP function on supply chain. If PPP projects can reduce relative changes between productions and demands in participants' companies, the proper match between the demand and the supply will be achieve, enhancing ongoing investments into productions. The equation of the pool regression is arranged as followed:

$$\begin{aligned} AR1/AR2 = & \beta 0 Constant + \beta 1 PPP_t + \beta 2 Ardayst + \beta 3 Apdays_t + \beta 4 Invdays_t + \beta 5 GM_t \\ & + \beta 6 ROA_t + \beta 7 LEV_t + \beta 8 Top1_t + \beta 9 SOEt + \beta 10 Inasset_t \\ & + \text{Industry Indicators} + \text{Year Indicators} + \epsilon \end{aligned} \quad (2)$$

With reference to Cachon et al. (2007), Shan et al. (2014), the following equation measures the degree of variation between changes in changes in production and changes in demands,

$$AR_{1 \text{ or } 2} = \frac{\sigma(\text{Production}_{it})}{\sigma(\text{Demand}_{it})} \quad (3)$$

In order to control the fixed effect of time series, the paper applies natural logarithm to dollar amount of production and demand for each quarter, and then make first difference

transformation. For example, given the dollar amount for a company each quarter is $\{X_{it}\}$, it will be transformed to $\{\ln(X_{it}) - \ln(X_{it-1})\}$. And then, the standard deviation for the series of transformed number in each year will be computed. Therefore, the equation (2) measures the relative change between the degree of variations for production and for demand. Sales revenues and cost of goods sold will be proxy for demands in AR_1 and AR_2 respectively. As for the production, it will be calculated as followed:

$$\text{Production}_n = \text{COGS}_n + \text{INV}_n - \text{INV}_{n-1} \quad (4)$$

In equation (4), COGS_n indicates cost of goods sold for a company each quarter; and $\text{INV}_n - \text{INV}_{n-1}$ represents the change in inventory for the quarter.

The following variables which may cause relative changes between production and demand to companies will be controlled in regressions: account receivables turnover in days (ArDays_{it}), account payables turnover in days (ApDays_{it}), inventory turnover in days (InvDays_{it}), gross margin rate (GM_{it}), ROA_{it} , debt ratio (LEV_{it}), total assets ($\ln \text{asset}_{it}$), the dummy variable for state-owned enterprises (SOE_{it}) and shareholding ratio for top1 shareholders (Top1_{it}). In addition, the fixed effect of sample years and industries will also be controlled in the regressions. Table 7 specifies the variables:

(b) Test Result

According to result (2) in Table 8, PPP shows a negative coefficient (-0.0705 , significant level: 5%) for AR_2 which accounts for elasticity of companies' production and demand. As for the denominator of AR_2 , the demand changes are easy to forecast due to rigid demand of public goods and

Table 7. Variables description in additional test

Titles	Description
AR_n	The relative change between the degree of variations for production and for demand on quarter basis. Sales revenues and cost of goods sold will be proxy for demands in AR_1 and AR_2 respectively.
PPP	equal to 1, if companies posted that PPP contracts had been approved and signed in sample years, otherwise zero.
Ardays	natural log of account receivables turnover in days
Apdays	natural log of account payables turnover in days
Invdays	natural log of inventory turnover in days
GM	gross profit /sales revenues $\times 100\%$
ROA	net profit/total assets
LEV	total liabilities/total assets
Top1	shareholding ratio for top1 shareholders
SOE	equal to 1, if the company is state-owned, otherwise zero.
cusinfor	1-(top 5 customers revenue divided by total revenue)
suppinfor	1- (purchase from top 5 suppliers divided by total purchase)
lnasset	natural log of total assets
Years	dummy variables for the sample periods in the pool regressions, from the year 2015 to the year 2019
Industries	dummy variables for industry classification set by China SEC. After eliminating financial institutions with code "J", there are 18 industries in the sample.

Table 8. The effect of PPP on the elasticity between production and demand

	(1)	(2)
VARIABLES	AR1	AR2
ppp	-0.0290 (-0.62)	-0.0705** (-2.16)
Ardays	-0.0589*** (-8.16)	-0.0419*** (-8.28)
Apdays	-0.0700*** (-6.05)	-0.0486*** (-6.03)
Invdays	0.0914*** (10.94)	0.0888*** (15.45)
GM	0.0043*** (7.56)	0.0009** (2.18)
ROA	-0.0047*** (-2.82)	-0.0005 (-0.39)
LEV	0.0011** (2.42)	0.0009*** (2.61)
top1	-1.33e-05 (-0.03)	-5.86e-05 (-0.18)
SOE	-0.0581*** (-3.57)	-0.0403*** (-3.53)
lnasset	0.0025 (0.35)	-0.0041 (-0.82)
update	control	control
lindustry	control	control
Constant	0.991*** (6.22)	1.000*** (9.00)
Observations	9733	9733
R-squared	0.044	0.033
Adj. R2	0.0422	0.0312

t-statistics in parentheses

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

government enforcement (such as wastewater treatment). As for the numerator, the change in production is smoothed by externality of government endorsement on PPP projects, facilitating PPP participants to raise capitals at lower cost and to retain bargaining power over supply chain. Therefore, the integrated effects of expected demand and cost efficiency from PPP stabilize the movements of production and demand. Moreover, specifically for AR₂ measuring demands in cost of goods sold (COGS), the effect is even enhanced by accommodating accounting practice in two-stages PPP mode. The participants assume duties for both construction stage (usually involves huge investment) and operation stage, and the going-concern of the second stage greatly hinge on timely payback from the first. By recording the stable relationship between production and demand with the accrual basis accounting practice, e.g., percentage of completion, PPP participants are confident in timely recognizing expense in the first stage of construction, cutting down deferrals¹⁴ of production cost (numerator) into cost of good sold (denominator) .

As for AR1, the coefficient of PPP is negative, but not at a significant level. Compared with cost of good sold (COGS) for AR2, demands are measured by sales revenue in the denominator of AR1. The

key differences between COGS and Revenues are profits, which are barely influenced by PPP function in the study: price and profit margin are regularly scrutinized by the government, thus little discretion is left to the market and PPP participants. Therefore, the insignificant effect on AR_1 does not significantly undermine the effect of PPP on supply chains.

4.5. The additional test on ppp projects' duration

In the test of last section, the external mediation effect of government trust and the internal mediation effect of financial constraints may work against each other in terms of remaining cost commitments. In other words, the positive effect of the external mediation on cost stickiness may be impaired by the internal one. This section also examines the conflicts between public trust and profit-seeking incentives, which could be intensified due to long duration of PPP projects.

To verify this, with the same dependent and control variables as in Table 6 but with different independent variable of $\ln revbylagrev * DecDummy$ term, a pool regression test has been applied. The coefficient of the interaction variable is not significant.

However, the result above is not conclusive, which results from the issue of self-selection in the samples: if there is a group of PPP company participants with significant stronger incentives to assume social responsibility, the result will be biased. Specifically, if any PPP project of company participants had been assessed as "Paradigm for Practice" by China Ministry of Finance, the group are incentivized for public expectations.¹⁵ The two supporting arguments: (1) close attention and monitoring from the public are brought by the PPP projects entitled "Paradigm for Practice". If quality issues of projects due to contractions on investment are found, the indirect cost, such as opportunity costs of impaired ability to conduct business, are tremendous. (2) The prize to the winners in the competition for "Paradigm for Practice" includes: the allowances to projects' initial investments, ranging from 3 millions to 8 millions RMB; for the public projects in which the title are transferred to company participants, the allowances are 2% of debts previously assumed by the government to hold the projects being transferred.

In order to control this self-selection effect, a two stage model will be applied in the section. For probit regression in the first stage, the dependent variable is "notice", if any PPP project of company participants had been assessed as "Paradigm for Practice" by China Ministry of Finance, equals 1, otherwise 0. The instrument variable is "morethan1" which equals 1 if company participants acquire more than one PPP projects in an observation year, otherwise 0. The rationale is as follows: (1) In the first stage, companies with many PPP projects are literally experienced and qualified. Moreover, the mutual trust and reciprocity between the government and the companies could be developed on a continuous base resulted from a number of projects. These edges construct the casual link between "morethan1" and "notice". (2) In the second stage, the proxy "morethan1" could be reasonably ruled out, which provide required externality for the whole two-stage mode.¹⁶

According to the result of stage 1 in Table 9, the lambda coefficient is significant at 1% level. The samples entitled "Paradigm for Practice" make noise to the impact of project terms on cost stickiness. The two-stage model here is fitted to control this self-selection effect. In the result of first stage, as predicted, the coefficient of proxy "morethan1" is significantly positive at 5% level, indicating that better odds in the competition of "Paradigm for Practice" go for the companies with more projects.

In the result of stage 2, the coefficient of $\ln revbylagrev * term$ is significantly negative at 1% level, whereas the coefficient of $\ln revbylagrev * DecDummy * term$ is significantly positive at 5% level. Under the control of "Paradigm for Practice", the residual of company participants speed downward adjustments when sales decline, compared to upward adjustments in sales increase. PPP projects involve the whole cycle of construction and operation, leading to longer duration compared to non-PPP projects.¹⁷ According to the principle of cost adjustments presented by

Table 9. The effect of PPP project duration on cost stickiness

	Stage One	Stage Two
Independent Variables	notice	Insgabysgalag
lnrevbylagrev		1.3402***
		(4.65)
lnrevbylagrev* DecDummy		-2.5792
		(-1.59)
lnrevbylagrev*term		-0.0474***
		(-3.22)
lnrevbylagrev* DecDummy*term		0.1118**
		(2.18)
term		0.0092***
		(3.34)
Morethan1	0.6239**	
	(1.95)	
Decminus1	control	control
top1nature	control	control
Dmboth	control	control
AI	control	control
EI	control	control
FCF	control	control
toinstholdper100	control	control
pctlndep	control	control
Intersect	control	control
Number of Samples	466	466
Wald chi2	146.86	
lambda	0.1328***	
	(2.52)	

Robust z-statistics in parentheses

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

Banker et al. (2011), higher future values of present investments will enhance companies' commitments on inputs which generates cost stickiness. The critical premise here is that the investors reap the most of the future benefits. However, a fair part of benefits from PPP investments are returned to participants in forms of government endorsement based on reciprocity between governments and the private sectors, which are very uncertain in the long run. For the company participants without the prize (both explicit and implicit) as those entitled "Paradigm for Practice", the paybacks are not sufficient enough to compensate the cost of serving the public, or overflow of positive externality.

5. Conclusion

PPP has been considered as the appropriate vehicle to load up projects of economic recovery under the COVID-19 pandemic and "New Infrastructure Construction". China will accelerate the construction of new infrastructure such as 5G networks and data centers. With political support, financial institutions step up innovation and improve financing services for infrastructure projects under the PPP framework.

In the case, enhanced government endorsement and ongoing commitments from private participants greatly influence corporate behavior of cost adjustment. The following arguments are verified in the paper:

(1) Due to the embedded government endorsements with PPP projects, companies participants are associated with greater SG&A cost stickiness, and it is even more prominent in companies with greater financial constraints. The government endorsements from PPP enhances company participants' capability of settlements (such as payments for production material and labor) and capital financing, which in turn improve bargaining power against suppliers and cost control. Typical PPP projects have great public interest that should be reinforced by high-quality construction and commitments on investments, thus the marginal stickiness due to PPP brings out incremental social benefit.

(2) SG&A cost stickiness is stronger in companies carrying PPP projects in provinces with a greater amount of PPP investment related to governmental debts, whereas SG&A cost stickiness is weaker in companies with a greater amount of PPP investment related to their own revenues. On one hand, the greater the total investment of PPP projects, the more explicit governmental debts could be deferred or even avoided. As the payoffs, the stronger governmental endorsement will be set forth. On the other hand, the fringe benefit of the external reciprocity could be compromised due to companies' internal pressures from commitments on PPP investments. When investments hold up a great amount of capital, companies will no doubt speed their adjustments. By this study, the joint effort of different stakeholders on the inputs in PPP projects is split up, and the volatility of different stakeholders' persistence in pursuing public interest is reasonably projected.

(3) The study shows that PPP projects are with reduced relative changes between productions and demands in participants' companies. The good match will enhance ongoing investments in production. The increasing stability due to predictable demand-supply pattern of public goods will help to control production cost and realize future benefit of current investment. It extends the list of critical success factors in PPP applications.

In the study, the overall actual performance of PPP projects in China is good. PPP generates incremental cost stickiness and ongoing commitments on huge inputs, implying critical success factors (such as the reciprocity between government and company participants) dominate in the applications.

In order to safeguard the public interest, policy makers are suggested to enhance the factors which alleviate the conflict between the public and the profit-seeking company participants. As mentioned above, Ministry of Finance of the People's Republic of China established a database of "Paradigm for Practice" in which company participants with paradigm projects are deemed to be with sound compliance with regulations and contracts, and excellent performance in financing, construction and operation. In return, the role models are in a good chances with government allowances and credits in fund raising, which compensate the cost of providing social benefit or "positive externality" and curb offsetting efforts from stakeholders. The race for "Paradigm for Practice" created a virtuous circle and enhance sound applications of PPPs, which should be strongly recommended in PPP development.

Although this research offers several theoretical and practical contributions, certain limitations exist. First, there is a lack of related study in scenarios of other nations, thus a cross reference on the function of PPP on cost adjustments is not put forward. Second, it is found that PPP can mitigate emergency issues like COVID-19 and make great contribution to economic recovery (Wan et. al, 2022). This will enhance the reciprocity between the government and the company participants, on which follow-up studies may provide additional evidence on the strong relation between PPP and SG&A.

Among the potential for future studies of PPP following on the present paper, the following disciplines are noteworthy: first, the PPP function on cost structure (the percentage of variable costs or fixed costs among total costs) of company participants could be meaningful, which may provide additional evidence on the role of PPP in cost stickiness. Second, critical success factors on PPP through surveys and case studies, such as the economic and legal environments, are in place for additional studies and verification of the efficacy.

Funding

The author received no direct funding for this research.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Citation information

Cite this article as: The role of public-private partnerships in selling, general, and administrative cost stickiness, Han Qing, *Cogent Economics & Finance* (2023), 11: 2174650.

Notes

- On 4 March 2020, the Meeting of the Standing Committee of the Political Bureau of the CPC Central Committee stressed that the country will accelerate the construction of new infrastructure such as 5 G networks.
- BRI Data (2021). Annual Report of China's PPP Market in 2020 from www.bridata.com, Accessed 6 April 2021.
- PPP projects "ready for launch" indicate that feasibility tests for cost and benefit have been applied, and positive results are assured by the Ministry of Finance and local governments. "Initial intentions for review" clarifies that different parties in projects intend to adopt the PPP mode, pending for further tests and approvals.
- Greco (2015) provided a first contribution to analyze how agency problems within the private consortium affect the performance of PPPs. When both public-private and private-private contracts are incomplete, the profit-sharing rules are key to regulating private partners' incentives. If the role of imperfect bundling is not considered, the scope of PPPs may be overrated if the social benefits of infrastructure quality are large as compared to the social cost of operation efficiency.
- Special vehicles controlled by municipal governments incurred "implicit liabilities" from PPP contracts. In some cases, it could be difficult for the central government to "pierce the veil" and engage in effective supervision.
- The calculation for KZ: (1) For companies in each observation year, define operation cash flows t /total assets $t-1$ as KZ_1 , cash dividends t /total assets $t-1$ as KZ_2 , cash/total assets $t-1$ as KZ_3 , debt ratio as KZ_4 and Tobin's Q as KZ_5 . In terms of KZ_1 , KZ_2 and KZ_3 , if the value is below the industry median, then it is replaced by one; otherwise, it is replaced by zero. In terms of KZ_4 and KZ_5 , if the value is above the industry median, then it is replaced by one; otherwise, it is replaced by zero. (2) $KZ = KZ_1 + KZ_2 + KZ_3 + KZ_4 + KZ_5$. (3) The ordered probit model is applied to the equation in step 2 to work out the regression coefficients of KZ_1 to KZ_5 . (4) After the coefficients are multiplied by the sample value of KZ_1 to KZ_5 , the predicted value of KZ for the company year observation is computed.
- CSMAR, short for China Stock Market & Accounting Research Database, is a comprehensive research-oriented database focusing on China Finance and Economy.
- Financial institutions provide financing for PPP projects. However, they are not involved in the process of constructions and operations, from which cost stickiness due to PPP could be derived.
- The market leader in China's financial information services industry. In China, Wind serves more than 90% of financial institutions. Overseas, Wind serves 70% of qualified foreign institutional investors (QFIIs).
- In the sample companies, the median is 35% in terms of the ratio of PPP investments stipulated in contracts to total assets stated at the end of the year when signing contract. For the samples of PPP projects, the median of duration is 18 years.
- Chinese authorities are facilitating a bigger role for the private sector in the nation's basic health insurance system. In the future, once the new reform is implemented, the business model of health insurance could take the form of PPPs which would mark a departure from the current ecosystem and structure of the insurance sector, according to a blue book published by the National Institution for Finance and Development, a think tank under the Chinese Academy of Social Sciences.
- It is noticed that the measurement or quantification of service quality is never simple. However, compared with others, there are clearer rules of thumb in terms of hospitals service or things alike, such as the cure rate and the number of patients visit.
- For example, the fare of subway and the charges of medical service are checked by the government regularly. High markups are not allowed for the concern of public interests.
- According to matching principle in accounting, no product cost will be recognized as cost of good sold or expenses until the obligations of providing product and service have been fulfilled. Therefore, for products with unstable demand, a long time may have pass before the product costs are expensed.
- From the year 2016 to the year 2018, there are four rounds of appraisal and screening organized by China Ministry of Finance for this "Paradigm for Practice" of PPP projects.
- In the pool regressions with $\ln \text{sgabysgalag}$ as dependent variable, the coefficient of interaction among $\ln \text{revbylagrev}$, DecDummy and morethan1 is not significant. The critical features, other than the number of PPP projects assumed by companies, generate marginal effect on commitments on investments. For companies per se, investments on a huge and long-going term project could be much greater than those on several smaller ones.
- For the samples of PPP projects in the paper, the median of duration is 18 years.

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