International Journal of Environmental Science and Technology (2018) 15:2581–2594
https://doi.org/10.1007/s13762-018-2035-x

ORIGINAL PAPER

The contribution of leading firms in environmental sustainability: dampening the detrimental effect of political capital ties

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Received: 19 February 2018 / Revised: 24 June 2018 / Accepted: 24 September 2018 / Published online: 29 September 2018

Abstract

As a possible determinant of environmental sustainability, innovation management has grasped the attention of researchers. In the present research, we investigated the effect of political capital ties on firm's contribution to environmental sustainability. We also examined how observed government support, an indicator of the inherent dependencies among political capital ties, moderates the effects of changes on innovation performance which plays a mediating role in the relationship of political capital ties and firm's contribution in environmental sustainability. We got empirical data of 4807 listed firms of China (2010–2015) and diffused political capital ties to form a two-dimensional matrix on analysis of 36 interviews. Our study suggests that political capital dampens inputs for innovation resulting in a proliferation of innovation performance. This paper also guides that how moderation of enabling the effect of political capital ties is explained and measured through important dimensions of project initiation, high-tech accreditation and government subsidies in the context of government support.The present study also sheds light on new ways in which upper echelons theory, transaction cost and resource dependence theory can be integrated for more advanced research on political capital ties to evolve an optimal corporate strategy for environmental sustainability.

Keywords Water pollution · Air pollution · Innovation performance · Government subsidy · Government support

Introduction

Firm's progress is an indicator of many important determinants associated with business, operations and strategic concerns. With the inclination of power in the organization, the extent of dependency of firms on government entities also rises. Isolated operations of any firm without the influence of external factors, particularly without the interloping of governing body, are not likely in the real world. The interference of Government, if is taken in a positive connotation, can be helpful in firm's performance as well. Nowadays, using blue ocean strategy, many organizations are concentrating on innovation management to make competition irrelevant. Sustainability, being an important construct of innovation management (Feniser et al. 2017), is, therefore, on a high note in the recent era. Similarly, vice versa of this, especially in the context of environmental sustainability (ES), i.e., innovation as the determinant of ES, also needs due consideration.

Broader investigation in the field of innovation management provides specific areas of study among which one is innovation performance. Previous research shows that political activism and political capital have a significant relationship with firm innovation (Kim 2017; Ovtchinnikov et al. 2015). This is why, nowadays, studies of political capital ties are also gaining importance. In the perspectives of studies in humanities, social and management sciences, social capital has also been the area of interest for advanced countries like the USA (Liu et al. 2017). At the same time, previous research has also indicated that political capital ties are very common in the countries including the USA, Indonesia, Pakistan, Thailand, Malaysia and Brazil. Social capital and knowledge sharing have the key role in innovation performance (Zheng et al. 2017).

The innovations which occurred due to incremental improvements in products are different from radical innovations in terms of investment mass (Feniser et al. 2017), and

Editorial responsibility: Tanmoy Karak.

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this is why innovations are critical not only at organizational level but also at the national level. Countries are different in choosing institutional solutions. Technological innovation performance is topic of concern both for Chinese firms and Government. It is an important way for sustainable competitive advantage (Yang et al. 2015). Different countries have different extent, forms and scopes of government regulation in developed and emerging economies (Levi-Faur 2005) leading to an influential role in environmental sustainability.

In compliance with local and central regulation, maintaining the standards to prevent air pollution and water pollution in the environment is still the aim of operating firms which can be sustained to reflect good performance and continuous improvement. The main objective of this study is to find the various possible forms of political capital ties, to determine the exact direction of the relationship of political capital ties with firm innovation performance and how their impact can be routed in a firm's errand. In the context of the contribution of leading firms, this study is also aimed to find that whether there will be a direct relationship between political capital ties and firm's performance for ES or any mediating variable is required to be considered? Furthermore, moderating role of various determinants of government support has to be analyzed. In this paper, we highlight the important caution to support this claim for clarity of dimensions.

Definition of environmental sustainability is one among three main evolutions of the concept of sustainable development that is meant to maintain and improve the systems and parameters which can play an integral role in supporting earth's life (Moldan et al. 2012). Setting targets by stakeholders including operating firms in controlling air and water pollution due to production in the manufacturing industry is one of the assessment and measuring tools of environmental sustainability. Leading firms in industry and market also have a leading role in benchmarking this noble cause. This role becomes pervasive in the firms fully following the components of corporate social responsibility. These components include corporate citizenship, a way of running a business, environmental practice, involvement in the development of community and operating in an ethical manner (Tench et al. 2012); and according to recent research, social communication technology also has association with CSR (Hao et al. 2018). We have conducted this research with the clear aim to find the impact of political capital ties on their role in environmental sustainability through needful moderating and mediating connections.

Generally, political capital is defined as the goodwill and trust which a person has with others for influence. Political capital ties are a multitude of formal and informal personal and organizational relational ties at various levels. We can divide them into individual relationships and organizational associations, provided in both cases they are interlinked in political regime. As the local firms begin to gain important resources from non-governmental organizations such as business networks (Kim and Keister 2009), the government role is changing to be a facilitator (Shi et al. 2012).

Previous studies have pointed the dark side of corporate political ties. Guthrie (1998), for example, suggested that the value of political capital tie diminishes as China establishes better legal and regulatory system. A few researchers have found that political capital ties can cause negligible or even negative effects on firm value. Breznitz and Murphree (Barlow 2011) have suggested that political capital ties in China are in fact detrimental to progress. Research also derived that it can lead to miss-allocation of resources and can also make negative influence on firm performance because of over-investment after the firm getting government loans.

However, this view is not unanimous. Literature has also shown the positive benefits of political capital ties because it serves to reduce environment uncertainties and secure external resources. Out of its numerous uses, it can bring in tax reduction, get government bailing out when it fails into a financial crisis (Faccio et al. 2006) and secure bank loans. It can exert positive pressure to private firm's performance in the long run. By successfully developing and exploiting the linkages to public authorities through ongoing business–government exchanges, corporations can obtain valuable outputs from political capital resources and that cannot be exactly imitated by competitors which don't have such connections. Political capital ties are useful not only in the reduction in environmental uncertainties but also help in development as in emerging economies (Faccio et al. 2006). Critical analysis about political capital has been made in past.

Theories and research suggest that the value of government support is not automatic but diverges directly with a different background. However, these designs of the contingent value of government support exist in the background of business–government connection. If desirability of improvement in innovation performance and the difficulty that firms encounter in realizing its benefits exist, the impact of political capital ties becomes the matter of debate. As per our argument, one way to resolve this issue is to defuse detrimental political capital ties and utilize the ties with positive impact. The next step is a classification of moderating role of government support and then examining the effects separately. High innovation performance takes to leading position in the industry and the extent to which how political capital ties affect firm innovation performance may be influenced by the government support with which the firm operates.

Chen and Wei (2015) put up the mechanism of government coordination and have given the idea of government

support. They delineated that Chinese government holds the large public resources and has the right to allocate it based on the basic institute of China with centralized political and economic decentralization. Government support policy is realized by Ministry of Finance of China through the allocation of certain fund for the specific enterprises gratuitously according to the political and economic policy made by the government. The aim of the government is to encourage the enterprise to promote its development through favored tax policy; government subsidies and government specific high-tech recognition policy.

We determine government support in dimensions of project initiation, high-tech enterprise accreditation and government subsidies by following the law and satisfying the form system. Furthermore, although certain political capital ties can put negative effects on firm innovation performance, the extent to which the negative effect of political capital ties to firm innovation performance is moderated by how efficiently the government support that firm utilizes. We focus on one important variable, government support and examine how it moderates the effect of political capital ties on innovation performance.

Government support, defined as strategic resources allocation and favorable policy support, through active project initiation, high-tech accreditation and government subsidies to exhibit its own rationality, is an important variable to measure whether the firm has optimized social resources allocation or not. For theoretical clarity and scope of the project, we consider only government support by controlling other variables like the support of non-profit organizations (NPO), industry collaboration and trade unions. We also test the hypothesis and theory on patent data from firms from the year 2010 to the year 2015.

We move to advance the theory on several fronts with this study. According to Pfeffer and Salancik (1978), firms try to manage interdependence between the firm and the government through politically connected senior executives. There is still pretty less research on the effects of various cooperative relations and political strategies on organizational outcomes. Past research lacks the consideration of conditions under which cooperative strategies could work efficiently. Hence, the need of theory's progress still suggests the focus on the benefits of cooperative strategies which can result in due consideration on conditions and segregations of variables.

Now, we shed new light on the integration of upper echelons theory, resource dependence theory and transaction cost theory. For a market leader, there is a positive relationship between firm's performance and firm's ability to influence the environmental sustainability. While the upper echelons theory describes that senior executives play an important role in firm's strategic decision making, it generally assumes that senior executive personal background effects firm performance. We, however, raise the question that how the senior executive gets the resources for firm performance. Since resource dependence logic stresses the outside environment exerts great influences for the firm to compete against the rivals, we build upon recent work on resource dependence to show that political capital ties may affect differently on firm's innovation performance which is further affected by the resources obtained from outsider-government.

We, therefore, prescribe a new opportunity for theoretical classification by explicating the mechanism through which political capital ties can play a different role for the arrangement of resources for firm innovation performance and ultimately for environmental sustainability. In manufacturing industries, innovative products may have an unusual effect on air and water pollution. How political capital ties can effect on setting the benchmark to control air and water pollution and to sustain the environment. There is a potential irony that the dark side of political capital ties can be leveraged by transaction cost and can be handled by effective utilization of appropriate forms (Lux et al. 2011).

China contains almost one-fifth population of the world and political ties are of continuing importance in China. One of the other reasons why we choose China for our empirical setting is that the political regime of China has been stable and the government has a profound influence in the business area. Due to industrial advancement and big population, the proportion of manufacturing and consumption is comparatively higher than any other country. It is pertinent to mention that the importance of innovation has been much stressed by the government. Meanwhile, the misappropriation of government support is being highlighted by media and pedagogical research. Hence, the salient value of political capital ties and the importance of firm innovation performance and government support make the Chinese corporate sector ideal context to find the potential bright side of political capital ties for firm's innovation performance.

Diffusion of political capital ties and innovation performance

The link between different parts of business and government is a multitude of formal and informal; personal and organizational relational ties to implement exchanges. Scholars have built-up political, strategic, theoretical and empirical analysis to define that firms begin to influence public policy in their own favor (Hillman et al. 2004). The political capital tie is the connection between micro-level of senior executives and the government that affects the macro-level of the

organization. One such tactic is having the CEO, Chairman or Director of Board, who has previously or currently served in some political capacity. It is also the logic thread that studies how the characteristic of senior executives affects the firm innovation performance.

Literature shows both bright and dark sides of the positive relationship of political capital for the firm. Thus, the further critical analysis is required to state about the impact of political capital ties on firm's ability to keep leading position. For this purpose, it is imperative to first segregate political capital ties into its broader forms. As political capital is termed as the goodwill, trust and influence which a person can have with others, this goodwill, trust and influence of an employee can be associated with another employee, client, customer, public administrator, supplier, competitor, Government official, authority or any other person or entity. The other person or entity may or may not be the stakeholder of the firm at any particular point of time. This yields two broader types: "Internal Ties" and "External Ties."

The other dimension of bifurcation is based on singularity or plurality which means political binding on one-to-one, one-to-many or many-to-one political networking. Hence, the political capital ties can be individual or group ties. We define individual political capital tie as a one-to-one tie between two individuals. Similarly, the definition of group political capital ties covers one-to-many or many-to-one relationships depending upon multi-dimensional situation prevailing in the firms. With this elaboration, we are happening to state that a matrix can be formed for political capital ties which can influence the firm's sustainability for market leadership with different impact factors. The proposed matrix is meant to define various combinations of two-dimensional sets and then to resolve perpetual hostilities regarding political capital ties which can have different levels of significance in relevance with innovation performance that is likely to play mediating role in firm's ability to sustain its market leadership.

Prior to a discussion about this role, there is an immense need to understand the concept of innovation and "innovation performance." There are four directions of innovation, i.e., product innovation, process innovation, marketing innovation and organizational innovation. Product innovation is an innovation of good or service (Feniser et al. 2017). For seeking the possibility of deterrence of dark side of political capital ties, we have to explore the relationships between different combinations of outputs of a two-dimensional matrix of political capital ties and the relationship of their aggregate with innovation directions. In order to control the scope of our study, we have concentrated on the aggregate of combinations. Our qualitative analysis is the base for giving names to these combinations.

Upper echelons theory describes that the characteristic of senior executives exerts significant influence on firm's strategic decision and organization performance. Thus, upper echelon theory can be used to understand the influence of political capital ties. All political capital ties affect firm performance based on psychological and behavioral characteristics of senior executives. The firm performance herein not only consists of economic performance and operational performance but also includes the important determinant of innovation performance. In the context of corporate political strategy, we propose that corporation's political capital can implement innovation activities by different ways of innovation funding.

Specifically, political capital is crucial to buffer the areas of legal rules and also of the equity market. Early political economy literature suggests that regulatory agency can be "captured" by interest groups that can dampen regulatory arrangements operated for their private interest. Moreover, corporations can employ their political capital to "flex their muscles" to regulators (Gordon and Hafer 2005). The relation between political capital ties and firm innovation performance is also affected by other factors, such as government support policy. Upper echelons theory alone does not explain how these other factors exist and how it affects the above relationship.

One of the developments of upper echelons theory is that it absorbs factors of resource dependence to make up the deficiency of its social background of senior executives' characteristics. Resource dependence theory highlights the dependency of organizational survival and growth on their ability of two things regarding external elements. First is to procure resources and second is to manage uncertainties (Sun et al. 2016). Government is one of the most difficult external dependencies to control it. According to Pfeffer and Salancik (1978), corporations build political power in the external environment, to be used at some future time for the organization's interests. The corporation works in the network with other organizational actors, such as competitors and regulators (Granovetter 1985).

For our specific objective, we identify the forms of political capital ties and mechanisms based on regulatory and market situation through which these ties can move the power balance for firm innovation performance. We focus on government support mechanism, consisting of project initiation, high-tech accreditation and government subsidies that influence the mechanisms through which political capital ties effect firm innovation performance. This is important because innovation performance vide leading position of firms witnesses the leading role of such firms in environmental sustainability.

The integration of upper echelons theory and resource dependence theory is not enough to explain how the effect of political capital ties on innovation performance can be turned favorable. The transaction cost can explain this phenomenon in the better way. Firstly, while enjoying the outside resources, the enterprise also faces the embedding risk, especially the embedding into the political network will lead to high social capital and cost. This social cost not only includes all kinds of over-expenditure to sustain the firm's political status but also includes government intervention for the firm's decision making. Hence, it bounds the innovation idea of the firm. It offers a high cost because the outside resource acquisition is an exchange behavior between the firm and the government.

Experience also shows that entrepreneurs have to pay the high political cost to obtain political position and have to pay to sustain the political capital ties. This indicates that control of these two variables may lead to the positive outcome of political capital. Secondly, since successful innovation and innovation performance are associated with firm's value in any contribution, hence, most important thing is to find the impact of political capital ties on firm's innovation performance. Based on the above, it may be hypothesized that the embedding of political capital ties can cause a favorable effect on innovation output subject to control on political exchange cost (transaction cost).

H1 Aggregate political capital ties have a positive effect on innovation performance.

Government support and possible ultimate effects

Government support can be defined as project initiation, high-tech accreditation and government subsidies. China has experienced complicated and diverse changes because of its own economic, political and environmental variations. China implements innovation policy to strengthen competitiveness for the change of economics and society. Innovation policy is made to raise the quantity and efficiency of innovative activities. And these activities can be national, regional and/or local. Our paper mainly talks about national level executed by the Chinese central government.

In the Chinese context, politically connected senior executives can be former officials of government and communist party and vice versa as executives of successful entrepreneurs may also enter in politics as members of China's legislative bodies (Sun et al. 2016). Zhu et al. (2013) found that political ties are playing an increasingly important role in China, together with the enhanced interaction between business owners and state officials in shaping economic policy.

Different government bodies and agencies execute a series of multilevel administration reforms in accordance with shifts in administrative power. Since 1998, the changed name body, Ministry of Science and Technology turned as a principal participant in China's technological endeavors. It is thought to be the body that has the high competence in designing and implementing innovation policy. It provides funds to basic and applied R&D and it serves enterprises especially SMEs (small medium enterprises) for innovation. Statistical data of Chinese Academy of Science (CAS), an important stakeholder in China innovation policy, show that, for Science and Technology, CAS remained the major beneficiary of China's government funds in last decade (Huang et al. 2006).

Meanwhile, we need to do a critical analysis of effects of government support before proceeding further. With the development of constitutional environment, as the technology promotes and uncertainties aggravates, certain political capital ties apparently go ill with firm innovation performance. Secondly, generally, political capital ties may weaken firm's autonomy. As soon as the firm gets the support from the government, it also has to consider the requirement from the government. Even worse, the senior executives may give up their own decision making to get in return for government resources. This may weaken the executive's effort to improve firm's innovation. Thirdly, the exchange between the senior executives and the government may exacerbate the dependency of senior executives to the government and strengthen the ties which may restrain senior executive innovative thinking and diminish the motivation for innovation.

On the other hand, government technological support is an important policy instrument to promote firm's innovation development. In China, there are mainly three ways for the government to support the innovation performance of firms, namely technological project initiation, high-tech accreditation and government subsidies. We find that technical support is actualized by a scientific research task and research funding. There is room of research concerning about the effect of scientific project initiation to the firm's innovation and there is a U-shape relationship between scientific research project initiation and firms' patent (Zhang et al. 2017a, b).

Science project acquisition means the number of scientific research projects that the firm gets from the government. Gao et al. (2013) explored the effects of the types of institutional support and hold that the behavior firm applies scientific research project to the government and persuades the government to fund its scientific effort is an effort to influence the government policy making for its own favor. It belongs to firm political behavior. This behavior can

facilitate the firm to get recognition from the government and send a positive signal to the outside world. Thus, this will help the firm to get more bank loan and improve its innovation performance. But in the process of seeking government scientific resources support, the firm has to pay a high cost for the transaction and squeeze its R&D expenditure which should be used as innovation expenditure on human capital and product development. This may be so, critically detrimental for the firms' innovation performance. Moreover, government scientific project research normally has its own policy direction which may not totally match with firms' innovation needs. High-tech enterprise qualification recognition and measures are made by the Ministry of Science and Technology according to the policy of "national high-tech industrial development zone." There are mainly 11 high-tech categories of high-tech enterprises.

It is found that the firm twists its normal investing behavior to cater to government and it may miss a lot of innovation performance opportunity while over-involving itself in government scientific research project acquisition and increase cost. As technological diversification has a significant impact on firm's performance (Chen et al. 2016), government R&D funding exerts an opposite firm's R&D. After getting government funding, the firm lacks the motivation for scientific research seeking and this may not be beneficial for firms' innovation performance.

There are two types of government subsidies in China, indirect and direct. The indirect one refers to the government offering preferable tax policy for the firms to support its own. From the government aspect, in order to seek maximized gross domestic point (GDP) and tax revenue, local government intervention will be strengthened and it will lean toward large firms and key firms thus leading to over-investment and non-periodical excess capacity. In fact, medium-sized firms facing difficulties in financing and lacking capital are more in need of outside resource support for own innovation. This shows that positive effect of political capital ties can be moderated by three forms of government support. Hence, our second hypothesis is:

H2a Scientific project initiation strengthens the positive effect of political capital ties on innovation performance.

H2b High-tech qualification recognition strengthens the positive effect of political capital ties on innovation performance.

H2c Government subsidy strengthens the positive effect of political capital ties on innovation performance.

After getting the fund from the government, of course, the firms have much more financial resources to allocate and this may promote its patents outcome growth. With this element of innovation performance emerges. Internal and external capabilities of executives of market-leading firms have been widely discussed regarding innovation and vice versa is also needed to be explored which is supposed to have the same positive direction of the relationship. As soon as the innovation promotion is heightened, it may increase firm's ability to play a significant role in environmental sustainability. Relentless innovation is assumed as the strategy for being a contributor to environmental sustainability. That's why our next hypothesis is:

H3 Innovation performance has a positive relationship with firm's contribution to environmental sustainability.

Transparency as the basic parameter of corporate governance is already highlighted in top public firms. It is supposed that high transparency alleviates the inefficiencies; and strategy can be executed well to retain good performers and ultimately enhance overall organizational performance. Since organizational performance is necessary for a massive role in the environment, eventually, it is expected that transparency may have a positive relationship with the sustainability of the environment. This leads us to another hypothesis.

H4 Transparency has a positive effect on environmental sustainability.

Date and location of research: This study has been carried out in China (Zhejiang Gongshang University, Hangzhou) from 2016 to 2018. Research completed on January 18, 2018.

Materials and methods

Our population consists of all Chinese firms listed on Shenzhen Stock Exchange or Shanghai Stock Exchange from 2010 to 2015. We got secondary data of 4807 listed firms identified during the study period after excluding firms that are in the area of financing, real estate as well as those samples lacking data.

Independent, dependent and mediating variables

In China, public listed firms are required to disclose their senior executives' biographical outlines and profiles including their education, professional expertise and experience, career background and history and of course their current position. Professional experience was the concerned variable for us. We noted the political experience of 5586 individuals from these firms whose background or experience was

political as mentioned in annual reports. We manually coded the political experience of each individual of senior executives of these firms from the biological sketches. The coding was professionally performed by a team of three well-trained researchers.

We used CSMAR'S China Stock Market Financial Information Database to collect patents of firms. Website of State Intellectual Property Office of China was surfed for manual collection of the patents lacked in CSMAR. We also manually collected the information of government direct subsidies from annual reports. The information of high-tech firms' qualification was obtained from CSMAR and also matched with firms with 15% of income tax rate from Juchao Web site. We manually collected the data of firm's scientific project initiation from their annual reports.

Although difficult to quantify, but fortunately, previous studies in the Chinese context have developed and used the measurement scale of innovation performance. As for the number of patent applications, we collect data from the People's Republic of China State Intellectual Property Right Office published every year to make up those lacking information from CSMAR. There are three types of innovation in China's Intellectual Property Office: invention patents, designing patent and the use of new patents. The weak point is that China does not have the citation of patents using two indexes to test the innovation performance from the aspect of innovation R&D expenditure and the patents aspect of innovation outcome. Among four forms of innovations, we focused on product innovation performance because this sort of innovation is likely to have a substantial effect on environmental sustainability. Having efficacy and efficiency as two dimensions, we considered the measurement scale developed on the basis of recommendations given by (Churchill 1979) and Shannon (1993). Given the previous study, we used the index of RD calculated as the ratio of the annual R&D expenditure to the initial total assets. We used the index of LNPAT1 calculated as the measure of the natural logarithm of a total number of invention patents, utility invention and design patents plus 1. We also used the index of LNPAT2 calculated measure as the natural logarithm of total application of weighting of three types of patents plus 1.

We performed the study at two levels to measure associated variables. The first level used collected patents for calculations. In the second level, we used the weighted average method to calculate the strength of political capital ties of 548 firms out of which 288 were the market leader at the end of FY 2015 using the formula mentioned in Eq. 1.

$$\text{Pol\_Aff} = \sum_{i=1}^{n} i\text{th}\ (R+Y * \text{SUM(TS)}) \tag{1}$$

where "*R*" denotes the rank of the individual as he or she has a certain rank with "1" for director and "2" for Chairman or CEO. "*Y*" shows number of years of political background or experience. "TS" is type strength, assigned 1 to personal connection, 2 to task force category, 3 to independent entity nexus, 4 to robust activity constellation and "*n*" is the number of executives who have or had political affiliation in a particular firm. This measure is explained in detail in the next portion of this paper.

We need to explain our concept for this study that the market leaders are those firms which were pioneer in a particular product in a certain market or those which have the greatest equity in the industry at a particular point of time. For simplicity, we specify the point of time as standard as the end of each financial year. All other firms in the same industry, we call as market laggards or followers in this study. Vision and mission statements are founding proclamations of any firm. Comparison of the contribution of market leaders and laggards in environmental sustainability, we used the data of vision and mission statements of firms wherein environmental sustainability has been targeted to what extent.

Two samples were taken: one from the market leaders and other from the laggards, and we performed Kolmogorov–Smirnov one-sample test on samples to find that is it reasonable to believe that the samples have been drawn from specified populations. We further performed the Mann–Whitney *U* test on both samples to confirm that both samples have been taken from the same population.

In our model, the innovation performance takes to the simple number of innovative products launched in a year multiplied by 10 plus innovative initiatives during the year plus a number of R&D running programs. Transparency in a firm in this study means the regular publication of the financial statements on the website of the company. 1 was assigned to those firms which regularly publish their financial statements and 0 to those which missed any publication at the certain time. For contribution in environmental sustainability, 1 into 10 was assigned to the firms which mentioned their intention into help environment in any statement, 2 into 10 to those which focused on environmental improvement in any statement, 3 into 10 to those which has explained the need of improvement in more detail in any statement and 4 into 10 to those which focused this need in both important statements.

Two-dimensional matrix of political capital ties

Our research is cross-sectional but has three-tier data collection for analysis. At first, we collected secondary data for

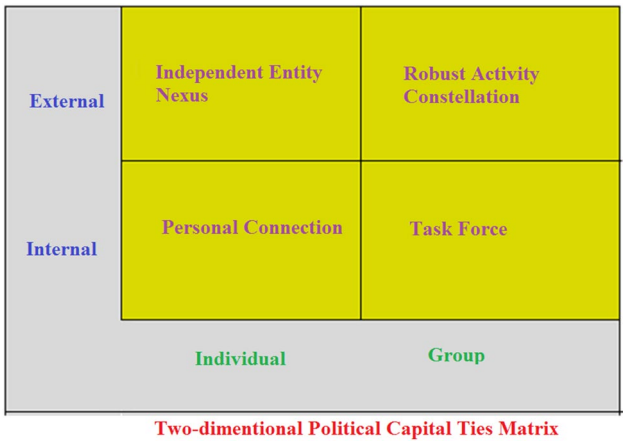

Fig. 1 Two-dimensional political captial ties matrix

finding political capital ties, market leadership positions of firms and government subsidy obtained by the firms. After scrutiny and basic analysis of secondary data, we conducted the interviews of 36 executives. The sample was selected from 288 market-leading firms listed in two stock exchanges on the basis of having previous related experience reflecting their political affiliations. The interview was about the types of political relations and associations in the context of firm's business and analysis of interviews helped us to design a two-dimensional matrix of political capital ties. As from theoretical level, the political capital connection is defined as having the privilege of personal interactions with government authorities; we rationalize the politically connected firm owners as former officials and delegates. The English version of names we adopted from the theme and sub-themes after interview analysis. Four derived types of capital ties are "personal connection," "task force," "independent entity nexus" and "robust activity constellation." Matrix is shown in Fig. 1. The firm's owner is the delegate of the people's congress or the people's consultative conference. The congress drafts and approves laws, whereas the conference contributes an opinion to policy making. Former officials as for if firm owners previously worked as a government official.

At the final level of data collection, we consulted 36 executives of market leaders and 78 executives of market laggards having any political capital tie. We coded 1 for an executive with former political experience and falling in the category of personal connection, 2 for task force category, 3 for independent entity nexus and 4 for robust activity constellation.

For further questions about environmental friendliness, we approached executives of same sample. In addition to this, a short survey of 120 community members was conducted through WeChat to get their opinion through convenient sampling technique.

Moderator

All in all, China's current S&T programs are listed as Key R&D Program, State Key Laboratories Program, Spark Program, National Natural Science Foundation of China, High Technology R&D Program, National New Product Program, Torch Program, Key Basic Science R&D Program, Key Basic Science R&D Program, and Innovation Fund for Small Technology-Based Firms. Spark program, Key technology R&D program and regarded as three chief funding programs led by Ministry of Science and Technology (MOST). There are Science park and incubator and high-tech development zones. They are created by the government to support its political policy. China High-tech Fair (CHTF) is held each year, a concerning area of productivity promotion centers is also very important fact to consider government innovation supporting.

We clasify these projects into three categories, noted as national, provincial and municipal projects and we weigh them separately as 3, 2 and 1, respectively, to measure the scientific project initiation as PROJ.

Then we obtained the data for high-tech enterprise qualification recognition from CSMAR as well as from a national website renowned as high-tech enterprise qualification recognized website (http://www.innocom.gov.cn).

Because this type of firm enjoys a preferential tax rate of 15%, we used all the list of companies enjoying 15% tax rate. Then, we acquired our final data after matching. We coded 1 if a firm is a high-tech qualification recognized company and 0 otherwise to define high-tech qualification recognition.

Based on previous studies, firm's government subsidy is measured by the effective tax rate (ETR), which is actual income tax rate that the firm bears. We used the index of ETR to measure government subsidies. Inline with former studies, we also took the latest portion of tax measured by tax expenses and we subtracted deferred tax expenses as the numerator of the ETR. Similarly, Chinese income tax policy considers the adjusted taxable income for the denominator. In financial statements, firm's taxable income is an important parameter (Hanlon 2003) for such studies.

We included size, financial leverage, roa, growth, market index, average share price and initial capital as our control variables. SIZE, the natural log of total assets, is used in our model to control for economies of scale and the size effect. Effect of other variables has been checked on contribution to environmental sustainability with and without inclusion of these control variables, i.e., initial capital, average share price (mean value of share price for each year), financial leverage (LEV, total debts/total assets), growth opportunity

Table 1 Descriptive statistics

	N	Mean	SD	SE mean
One-sample statistics				
Political CT	548	7.85	1.143	.049
Transparency	548	.81	.394	.017
Innovation performance	548	16.68	2.978	.127
Scientific project initiation	548	5.42	.494	.021
High-tech qualification recognition	548	4.04	.684	.029
Government subsidy	548	170.01	36.101	1.542
Environmental sustainability	548	33.27	8.051	.344
Share price	548	34.4094	27.19130	1.16155
Initial capital	548	5.89	2.020	.086

(GROW, sales growth rate) and marketing index (DAT, based on Fangang calculation). Comparison witnessed the need to keeping them as control variables.

Results and discussion

Descriptive statistics

In phase 1, we collected and scrutinized the secondary data of 4807 firms. Subsequent to the formulation of the two-dimensional political capital matrix on basis of interviews, values were calculated and data analysis was done through SPSS. Descriptive statistics are shown in Tables 1 and 2.

From the perspective of environmental sustainability outcome, it can be seen that the average value is 33.27 with standard deviation of 8.05. This means that there is a significant difference in behavior of firm for environmental sustainability. In later analysis, one-sample *t* test shows 32.59 lower and 34.94 upper value for environmental sustainability at 95% confidence interval of the difference. From the aspect of government support, the standard deviation of government subsidy is 36.10 which shows a significant difference in government subsidy availed by different firms.

Survey about environmental friendliness showed interesting results. The survey with 36 executives of market-leading companies and 78 market laggards revealed that 92% executives of market-leading companies are environmentally friendly because they supported prioritized environmental sustainability in the list of eight choices given to them. On the other hand, only 48% executives of market laggards chose environmental sustainability as their first choice. This shows the difference of primacies of market leaders and laggards. The survey for opinion of the public showed that 87.4% of community members are of the opinion that large companies are environmentally friendly. This reflects closeness to the mass of opinion of executives of market leaders.

Hypotheses testing

Hypothesis1 predicts a positive relationship between firm political capital ties and firm innovation performance. Correlations analysis is presented above, and Table 3 demonstrates a significant positive correlation (.93) between political affiliation and innovation performance. The correlation between political affiliation and scientific project initiation (−.152) is negatively significant at $P < .001$ level (2-tailed).

The correlation between transparency and contribution in environmental sustainability is positive .007 and not

Table 2 One-sample test of political capital ties, environmental sustainability and other variables

	Test value = 0					
	T	*Df*	Sig. (2-tailed)	Mean difference	95% Confidence interval of the difference	
					Lower	Upper
One-sample test						
Political CT	160.773	547	.000	7.852	7.76	7.95
Transparency	48.040	547	.000	.808	.78	.84
Innovation performance	131.141	547	.000	16.682	16.43	16.93
Scientific project initiation	256.846	547	.000	5.420	5.38	5.46
High-tech qualification recognition	138.302	547	.000	4.042	3.98	4.10
Government subsidy	110.246	547	.000	170.015	166.99	173.04
Environmental sustainability	96.730	547	.000	33.266	32.59	33.94
Share price	29.624	547	.000	34.40936	32.1277	36.6910
Initial capital	68.204	547	.000	5.885	5.72	6.05

Results presented in Table 3 show a positive correlation of .930 between political CT and innovation performance significant at .01 level (2 tailed)

Table 3 Correlation analysis of political capital ties, innovation performance and determinants of Government support

	Political CT	Innovation performance	Scientific project initiation	High-tech qualification recognition	Government subsidy
Correlations (IV-Med-Mod)					
Political CT					
Pearson correlation	1	.930**	−.152**	.882**	.930**
Sig. (2-tailed)		.000	.000	.000	.000
N	548	548	548	548	548
Innovation performance					
Pearson correlation	.930**	1	−.189**	.890**	.967**
Sig. (2-tailed)	.000		.000	.000	.000
N	548	548	548	548	548
Scientific project initiation					
Pearson correlation	−.152**	−.189**	1	−.198**	−.302**
Sig. (2-tailed)	.000	.000		.000	.000
N	548	548	548	548	548
High-tech qualification recognition					
Pearson correlation	.882**	.890**	−.198**	1	.877**
Sig. (2-tailed)	.000	.000	.000		.000
N	548	548	548	548	548
Government subsidy					
Pearson correlation	.930**	.967**	−.302**	.877**	1
Sig. (2-tailed)	.000	.000	.000	.000	
N	548	548	548	548	548

**Correlation is significant at the .01 level (2-tailed)

Similarly, we can see the positive correlation between innovation performance and environmental sustainability in Table 4. The value .945 is significant at .01 level. On the other hand, correlation between transparency and environmental sustainability is slightly weak with value .011 having negative direction

significant which shows that there is an insignificant relationship between these two variables. Results show that variables pertaining to share price and initial capital have to be considerably controlled for the model fit.

With dependency of innovation performance, results show that relationship of political capital ties (Pol_Aff, b = .187) is not significant (p = .014). Hence, the moderation to strengthen the positive relationship between political capital ties and mediator innovation performance is needed. Results further show that scientific project initiation (b = .562, p = .000), high-tech qualification recognition (b = .598, p = .000) and government subsidy (b = .067, p = .000) strengthen the effect of political capital ties on innovation performance. The moderating effects of these variables accept our H2 a, b and c.

Regression analysis of mediator innovation performance and dependent variable environmental sustainability indicates significant effect Inn_Per (b = 2.557, p = .000). This shows that mediation of innovation performance is necessary for the establishment of the significant impact of political capital ties on their contribution in environmental sustainability. This also accepts our hypothesis H1.

A positive correlation between innovation performance and firm's contribution to environmental sustainability and regression analysis gives the model good fit, accepting the H3. The basic correlation between transparency and environmental sustainability is weak as well as negative. This rejects our hypothesis H4. However, it does not mean that there is no relationship between transparency in a firm and its environmental sustainability, but this indicates that there may be indirect relationship between transparency and firm's contribution in environmental sustainability and it is further hypothesized that there is need of a suitable mediator to develop a new model for separate study.

Before the year 2007, the uniform version corporate income tax law was enacted by China, with the salient of 33% highest tax. The central government has offered a variety of preferential tax policies which are implemented in certain regions and industries to eliminate the development gap among regions and to optimize the national industrial structure. In the absence of a unified law to regulate venture capital development, only local regulations made by local-level ShenZhen, ChongQing to protect and promote venture capital development are implemented. Chinese stock market

Table 4 Correlation analysis of innovation performance, transparency and environmental sustainability

	Innovation performance	Environmental sustainability	Transparency
Correlations (Med-DV)			
Innovation performance			
Pearson correlation	1	.945**	− .011
Sig. (2-tailed)		.000	.789
N	548	548	548
Environmental sustainability			
Pearson correlation	.945**	1	.007
Sig. (2-tailed)	.000		.861
N	548	548	548
Transparency			
Pearson correlation	− .011	.007	1
Sig. (2-tailed)	.789	.861	
N	548	548	548

**Correlation is significant at the .01 level (2-tailed)

Prior to declaring certain determinants in terms of control variables, it is necessary to analyze them and to perform basic tests to check their possible effects on the model. Results in Table 5 show that our defined control variables are of the dire need to be controlled for a precise description of the model

Table 5 Correlation analysis of environmental sustainability, initial capital and share price

	Environmental sustainability	Share price	Initial capital
Correlations (CVs and DVs)			
Environmental sustainability			
Pearson correlation	1	.302**	.104*
Sig. (2-tailed)		.000	.015
N	548	548	548

**Correlation is significant at the .01 level (2-tailed)

*Correlation is significant at the .05 level (2-tailed)

For this analysis of firms, environmental sustainability simply means the contribution of the firm in such sustainability. Multiple regression analysis was performed, and coefficients of determinations have been obtained in Table 6 to form the equation for independent, mediating and moderating effects

is supporting high-technology companies listed on the market. Data analysis for these variables was necessary to check the firm's contribution to environmental sustainability.

The direct subsidies define that the government directly offers funds to firms to better support government policy implementation. There is no exact law and regulation for the details of government subsidies target, standard and exact amount. Normally, the central government makes the macro-policy and offers the guidelines for automatic implementation by the local government. As there are deficiencies at policy-making level and lack of explicit monitoring system, the local government has much deciding space for allocation of financial resources. Due to the pursuit of GDP, income tax revenue increase as well as local officers' promotion, the local government is willing to fund the firms to support government policy, especially to large-scale firms.

Having political capital ties through senior executives is a crucial corporate strategy. Our empirical findings support the arguments and show that there is positive effect of political capital ties to firms' innovation performance. The facilitating effect is found more salient in firms with much more science technological projects initiation. The high-tech qualification recognition and government subsidies further strengthen the positive role of political capital ties on firm's innovation performance and eliminate the chances of any detrimental effect of political capital ties in the model. Similarly, scientific project initiation also strengthens this relationship.

Regarding firm innovation performance implications, a straightforward application of resource dependence theory would likely predict a strong positive performance effect of political capital ties. However, our integration between resource dependence and transaction costs shows how and why the dark side of political capital ties can be negated. As an important contribution to extant studies, we obtained a direct measure of political affiliation and other variables to provide the evidence of how aggravation of political capital ties can be handled for gaining good innovation performance and ultimately achieving environmental sustainability through leading firms.

Theoretical implications

Both upper echelons theory and resource dependence theory are primary perspectives to understand the functioning of senior executives, though neither of them portrays a complete picture of how senior executives work in reality. Despite the conceptual work by many researchers, only a small number of ensuing empirical studies have integrated the two perspectives in the context of political capital ties and innovation performance regarding firm's contribution in environmental sustainability which makes innovation performance as a more crucial variable.

We identified the need of bifurcation of broader possible forms of political capital ties. Secondly, we conducted 36 interviews of general managers of different manufacturing firms regarding political capital ties, and on basis of interview analysis, we deduced two-dimensional matrix of political capital ties. Our paper implies another direction for this theoretical integration by highlighting the potential

Table 6 Coefficients of determination political capital ties, innovation performance and determinants of government support

Model	Unstandardized coefficients		Standardized coefficients	*T*	Sig.
	B	SE	Beta		
(IV-Med-Mod) coefficients[a]					
1					
(Constant)	−1.582	.391		−4.049	.000
Political CT	.187	.076	.072	2.460	.014
High-tech qualification recognition	.598	.091	.137	6.565	.000
Government subsidy	.067	.002	.808	27.327	.000
Scientific project initiation	.562	.063	.093	8.879	.000

[a]Dependent variable: innovation performance

Finally, the coefficients of determination for mediating and dependent variables are given in Table 7 which truly expose the relationship of important variables of our study

transaction costs between political capital tied companies and firm innovation performances; hence, control needs are to be clearly explained for amplification of the theory.

Our study advances resource dependence theory by improving our understanding of the "strange omission" raised by Pfeffer and Salancik (1978). Both resource dependence and transaction cost theories can be treated as theories of firm innovation performance. While addressing the question of "resource provision for whom" from the transaction costs view may be a productive way to supplement resource dependence theory.

In addition to this, our research further contributes to corporate political strategy literature. Previous studies hold that political strategies generally enhance firm performance, including innovation performance. However, transaction costs generated by firm political capital ties disappeared under all previous occasions.

Our analysis shows the possibility of how multi-theoretic integration for crafting corporate political strategies to guide future research. Theories, resource dependence and transaction costs can be integrated to better understand which dark side of a certain political strategy may manifest.

Table 7 Coefficients of determination environmental sustainability, transparency and innovation

Model	Unstandardized coefficients		Standardized coefficients	*T*	Sig.
	B	SE	Beta		
(Med-DV): coefficients[a]					
1					
(Constant)	−9.685	.681		−14.221	.000
Transparency	.374	.285	.018	1.313	.190
Innovation performance	2.557	.038	.946	67.862	.000

[a]Dependent variable: environmental sustainability

Practical and policy implications

Our research findings pose a delicate question to the executives, who normally value all political capitals equally. Our study shows how certain forms of political capital have a potential of destroying firm value by transaction costs and how should they ponder the supposed benefits alongside the latent costs? The present research also shows that how potential political capital ties can enhance the innovation performance and ultimately the probability contributing more to environmental sustainability. Through this study, we have provided clear directions of relationships among different factors which seldom are not paid due notice for policy formulations. Secondly, our research is standard for the majority of manufacturing and production concerns.

Furthermore, this research is a guideline for corporate executives. If policy reforms can reduce the roles of political actors in monitoring the efficiency of projects initiation given by the government, political capital ties may be channeled toward more value creation activities for environmental sustainability.

Conclusion

This research has shown that detrimental effect of political capital ties can be handled and these effects are turned positive for substantial contribution in environmental sustainability through the mediation of innovation performance and moderation of Government support. This is an empirical study of over 4807 firms which has proved that scientific project initiation, high-tech qualification recognition and government subsidy all strengthen the positive relationship between political capital ties and firm's innovation

performance. Our research implies the probability of significant role of transaction cost in the impact of political capital ties in firm's innovation performance and ultimately in environmental sustainability.

Generalizability, limitations and directions for future research

Although China is the most populated country in the world, but still a cross-cultural element in nowadays' research of business sciences is important. Our research findings are based on an empirical analysis of listed companies of two stock exchanges of China and it was conducted only in Chinese cultures and in perspective of Chinese laws.

On the empirical front, the paper has limitations too. Our theory is based on aggregation of all forms of political capital ties. Different forms may have different impacts. It will be useful if the future study can focus on the two-dimensional matrix of political capital ties and finds the variety of impacts of different forms of political capital ties on environmental sustainability instead of the aggregate impact of these ties.

Listed firms can use this research as a guideline and in order to get practical benefit at optimal level from this study, we recommend all the competing firms to conduct separate intra-organizational analysis of firm's political capital interactions with various government organizations for covering the gaps in firm innovation performance to contribute to environmental sustainability through innovative initiatives. Future study may also develop the new model for the relationship between transparency and environmental sustainability with the mediation of essential variables.

Acknowledgements In our previous publications, our focus was on important aspects of Business Ethics and CSR communication. For the present study, we realized the need to conduct research on detrimental effects of political capital ties and probabilities to alleviate them for environmental sustainability. We completed our empirical research which is the outcome of our consistent efforts moderated by the assistance of our research friends and fellows. We are thankful to our friends and supporters who encouraged us to write on this important aspect. We are also thankful to the executives of firms who spared their time for interview activities. The reviewers who critically checked the quality of our writing and research deserve special thanks.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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