

R&D investments under uncertainty in China: The effect of political connections

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In the literature on R&D investments under uncertainty, the role of political connections has received scant attention. This is a serious omission given that political connections are well known to affect firm behaviour, especially in contexts of developing market-supporting institutions. We argue that political connections are a critical factor shaping firms’ R&D investments under conditions of environmental uncertainty. We further suggest that the effect of political connections can be different when firms have perceived the environmental uncertainty, compared with when they have not. The complex, state-controlled political-economy context of China provides a suitable setting for our research. We test our ideas on a sample of about 900 Chinese firms, selected from the data set of the Ninth National Private Enterprise Survey (NNPES) conducted in 2010 by the All-China Federation of Industry and Commerce in collaboration with a number of State bodies. In so doing we control for the effects of several firm and founder characteristics.

Keywords: Environmental uncertainty, R&D investments, Institutions, Political Connections, China.

1. Introduction

A large and growing stream of research has explored how uncertainty affects firms’ R&D investments. One line of literature suggests that when faced with uncertainty firms usually increase their R&D expenditures (e.g. Ahuja and Novelli, 2017; Atanassov et al., 2018; Chambers et al., 2002; Chan et al., 2001; Jiang et al., 2009; Pastor and Pietro, 2003; Stein and Stone, 2013; Vo, 2013; Vo and Le, 2017). However, another body of literature supports the opposite position, advocating negative effects of uncertainty on firms’ R&D investments (e.g. Czarnitzki and Toole, 2011, 2013; Minton and Schrand, 1999). These contradictory views exist because certain key features of uncertainty such as lack of information or high level of information asymmetries can be interpreted to lead to overinvestment in R&D (see for example Ahujia and Novelli, 2017), but also to underinvestment as well (see for example Holstrom, 1989; Christensen et al., 2008). In these regards, studies have emphasised the presence of different conditions that shape firms’ R&D investment decisions. Thus, a firm may increase its R&D expenditure in response to uncertainty under conditions such as strong competition (Vo & Le, 2017) or when uncertainty is political in nature (Atanassov et al., 2018).

On the other hand, in situations such as when markets are not competitive, uncertainty may have a negative effect on firms’ investments (e.g. Bulan, 2005; Leahy and Withed, 1996).

Despite the burgeoning research interest and the progress made in this area of research, we still do not have a clear understanding of critical factors shaping firms’ R&D investments in environments characterized by imperfect institutions. Institutions are long recognized to constrain or facilitate firms’ activities and hence affect their performance and that of the economies they are embedded in (North, 1990). Different institutional contexts may generate different behaviours, particularly in response to uncertainty, on the part of firms. In transitional economies, the relative weakness of market-supporting institutions and the rather complicated nature of state involvement in economic activities generate significant challenges for firms’ decision makers (Jia, 2014). In particular, this complex institutional environment may make it difficult for firms to ascertain the potential outcome of their investments (Haveman et al., 2017). This may have negative consequences because firms may adopt a more conservative innovation strategy (e.g. Zhao et al., 2016) with the associated reduction in formal R&D investments (Petti et al., 2017). In such contexts, where market supporting-institutions are absent or weak (Haveman et al., 2017), firm behaviors may be guided by whether or not they have developed relationships with important state bureaucrats (Pfeffer and Slancik, 1978; Burt, 1982; Haveman et al., 2017). It has been fairly well established that firms actively pursue political actions in locations where markets and market-supporting institutions are still developing (e.g., Henisz, 2000; Henisz and Zelner, 2003; Li, et al., 2006; Li and Zhang, 2007; Luo, 2003; Jia, 2014). In the Chinese context in particular, political connections have been demonstrated to play a significant role in influencing directly and indirectly firms’ behaviours and investment decisions (Haveman et al., 2017; Peng and Luo, 2000; Li et al., 2008) when facing uncertainty (e.g. Wang et al., 2016; Welman, 2016). A second issue that the literature has overlooked is a distinction between an actual occurrence of uncertainty, such as a macroeconomic shock, and firms’ perception of that uncertain environment. Firms differ in their perception of uncertainty (Boyd, Dess, & Rasheed, 1993; Dess & Beard, 1984) and therefore managers’ behaviors in relation to investment in innovation are likely to be different when their organizations are experiencing uncertainty compared with when they are not. However, prior literature has not paid attention to the consequence of differential perception of uncertainty by firms on the behavioral responses of managers in relation to innovation efforts.

Our paper aims to address these issues with a view to develop a fuller picture of innovation under uncertainty in environments with imperfect market-supporting institutions. In so doing, we make a distinction between environmental uncertainty and perceived environmental uncertainty (Boyd, Dess, & Rasheed, 1993; Dess & Beard, 1984; Packard et al 2017). The former can arise from a major external shock that raise concerns, for example, about conditions of the market and the

macroeconomic environment. However, the presence of a macroeconomic shock in itself may not elicit a reaction from firms. This is likely to be especially true if the external shock occurs in a distant geographic region such that some firms may not perceive any consequence of such a shock for their organizations. Actually prior literature suggests that ‘true’ uncertainty (Knight, 1921) has two components: the objective conditions of the environment, how these conditions interact with the entrepreneur’s perceptions and actions. This latter, forcibly vary among firms due to factors specific to the organization and their market environment. These factors contributes to managers’ perception of the combined complexity, instability and unpredictability in the organizational environment, i.e. perceived environmental uncertainty (Andrews, 2008). This is the kind of uncertainty that, when is high, forced managers to consider carefully the impact of their actions and decisions and elicit a reaction. As such, we suggest, an external shock may trigger different degrees of perceived environmental uncertainty, and that this may affect managers’ responses to external occurrences, more specifically in relation to innovation efforts.

More specifically, the purpose of this paper is to examine how political connections of a firm’s owner influences R&D investments when faced with the presence of ‘objective’ environmental uncertainty and when the environmental uncertainty has transformed into perceived uncertainty. We hypothesize that when facing only environmental uncertainty, operationalized through the context created by the 2008 global economic crisis, the participation of a firm’s owners as delegate in the National Chinese bodies may lead to a raise in R&D investments. On the other hand, when firms have perceived that the external shock has created environmental uncertainty, it may lead to a decrease in R&D investments. More importantly, this negative effect, we argue, is likely to be stronger for firms’ whose founders are delegates. We test our hypotheses on a sample of about 900 Chinese firms, selected from the data set of the Ninth National Private Enterprise Survey (NNPES) conducted in 2010 by the All-China Federation of Industry and Commerce in collaboration with a number of State bodies. The data pertains to the year 2009, for 4,614 private SMEs, which constitute between 0.1 to 0.2 percent of Chinese private enterprises (Lu and Tao 2009; Lu, Tao, and Wang 2010). The survey covers all Chinese provinces and 19 out of the 20 sectors classified by the Chinese National Economic Industrial Classification. In so doing, we controlled for the effects of several firm and founder characteristics. Our results suggest that political connections (i.e. being a delegate) do produce differential effects on firms’ R&D investments under conditions of environmental and perceived environmental uncertainty. More specifically, political connections produce positive effects when facing only environmental uncertainty, but negative ones when this uncertainty is experienced. In general, these findings seem to highlight a distortive effect of political connections and government influence on firms’ investment behaviours, on which we will comment.

The reminder of this paper is structured as follows. The following section elucidates the theoretical background and the conceptual framework from which we derived our hypotheses. Then we illustrate the method used to test the hypotheses. Thereafter, the findings obtained will be illustrated and discussed. The paper concludes with a summary of key contributions and limitation of the study.

2. Literature Background & Conceptual Framework

Innovation is inherently uncertain. According to Ahujia and Novelli (2017), investments in R&D face uncertainty of several different kinds. Environmental uncertainty about the competitive landscape being redrawn (Folta, 1998; Lee and Paruchuri, 2008). Endogenous or technical uncertainty about what outcomes R&D investments may generate (Folta, 1998; Maritan, 2001). Temporal uncertainty about when the returns from the investments will manifest themselves (McGrath, 1997; Scherer and Harhoff, 2000). In general, uncertainty is argued to increase the difficulty of evaluating R&D investment projects. However, the picture that emerges from relevant literature about the effects of uncertainty on R&D investments is mixed

For a number of organization specific factors, such as the overestimation of a new technology expected returns or its commercial potential (Ahujia and Novelli, 2017; Cassar, 2010) as well as external conditions, such as competition and government policies (Atanassov et al., 2018; Vo & Le, 2017), uncertainty has been argued and found to increase R&D investments. See for instance Jiang et al. (2009) and Stein and Stone (2013). Starting from the same general premises, uncertainty has also been argued and found to decrease of R&D investments. See for instance Minton and Schrand (1999) and Czarnitzki and Toole (2011). Innovation projects are in fact characterized by high idiosyncrasy, higher probability of failures and high level of information asymmetry (Holstrom, 1989). The influence of these characteristics on R&D investment evaluation have been found to lead more likely to under rather than excess R&D investments (see Christensen, Kaufman and Shi, 2008), for instance because a high ambiguity aversion (Cozzi and Giordani, 2011) or the adoption of a routinized behavior by firms (Amoroso et al, 2017).

In which that follow we suggest that two main explanations should be explored and can be hypothesised to account for such differences and develop a conceptual framework to test our arguments. More specifically, we discuss about the role of the institutional context in which the firm operates and whether the firm have actually perceived the environmental uncertainty or not.

The role of the institutional context and political connections

Institutions are the humanly devised constraints that structure political, economic, and social interaction. They consist of both formal rules, e.g. constitutions, laws, property rights, and informal constraints, e.g. sanctions, taboos, customs, traditions, and codes of conduct (North, 1990). Under an institutional perspective, firms undertake their activities in a peculiar institutional context, which exerts pressures to conformity that motivates them to seek legitimacy or approval for their actions (Oliver, 1997). As such, institutions affect the performance of economies and the performance of organizations within economies (North, 1990), constraining or facilitating firms’ activities and behaviours.

Especially in transitions environments, where market-supporting institutions are less developed, which is the case in many emerging economies, firms’ decision makers face significant uncertainty. They cannot predict what actions are possible or not, whether these actions are acceptable and effective, or what kind of actors are or are not acceptable and capable. In addition, these uncertainties may also reduce the ability of firms’ decision makers to take advantage of new opportunities created by the transition, making harder for firms to decide how to invest resources, and increase their likelihood of making mistakes (Haveman et al., 2017). For Haveman et al. Countries’ political institutions have a significant influence of in these regards and Atanassov et al. (2018) demonstrated the role of politics, and especially political uncertainty, in shaping a firm’s performance and related corporate decisions. In fact, most of the political decisions and public policies involving the redistribution of resources and wealth often represent “zero-sum” games in which allocating more resources to one firm can only be accomplished by decreasing the resources allocated to other firms (Jia, 2014). Innovation, which is the outcome of interactions across firms and organizations in the market, as well as in a wider range of the institutional set-up in the economy and society (Edquist, 2006), makes no exception.

Since economic action is “embedded and enmeshed in institutions, both economic and non-economic (Polanyi, 1957: p.250), there is the need to consider the impact of social factors, such as social networks that shape the allocation and valuation of resources (Polanyi, 1944, 1957; Granovetter, 1985). Social relations are believed to be especially important in transitional contexts, where market supporting-institutions are absent or weak (Haveman et al., 2017), as alternative mechanisms to build trust (Guseva and Rona-Tas, 2001).

Among the above, relations between economic and political actors are believed to be especially important (Polanyi, 1957; Lie, 1991). In transitional contexts, where market failures usually coexist with government control of resources, firms are motivated to undertake political actions to acquire valuable resources from the government because underdeveloped markets do not supply these

resources in sufficient quantities (Jia, 2014). In such contexts, a firm owner can reduce uncertainty by developing relationship with State bureaucrats (Pfeffer and Slancik, 1978; Burt, 1982; Haveman et al., 2017). Firms have actually been found to more actively pursue political actions in locations where markets and market-supporting institutions are less developed (Henisz, 2000; Henisz and Zelner, 2003; Luo, 2003; Li, et al., 2006; Li and Zhang, 2007, Jie, 2014). This with a certain degree of effectiveness. In Indonesia for instance, business-government connections have been demonstrated to have a considerable effect on a firm’s market value (Fisman, 2001), whereas in Taiwan ties to political actors facilitated diversification (Chung et al. 2007). Faccio (2006) and Faccio et al. (2006) found that politically connected firms are more likely to be bailed out than similar no connected firms, not only in emerging and transitional economies (see for instance Ahujia and Yayavaram, 2001). These relationships of a firm’s owner with government bureaucrats, which we refer as to political connections, are argued to foster better knowledge and trust that helps to stabilize operations and help businesses making it easy to get access to State controlled resources, reduce regulatory burdens, lower fees and taxes and provide better regulatory oversight (Haveman et al., 2017). All of which are particularly helpful for innovation and R&D. Because of the imperfect market-supporting institutions and other key resources’ shortages and weaknesses, complimentary resources for learning and innovation are catered by means of managerial ties with governments and other businesses (Peng and Luo, 2000; Li et al., 2008). Up to recently, Zhao et al. (2016) found that political ties strengthen the relationships between exploitative learning and radical innovation, whereas they weaken the one with exploratory learning.

In general, political connections are perceived as a way to alleviate the hazards of economies’ transitional states (e.g., Henisz and Zelner, 2003; Li, et al., 2006; Li and Zhang, 2007). In China, the uncertainty generated by peculiar economic transition experienced and the complex role of the state in the economy (Haveman et al., 2017), made political connections an essential component of Chinese firms’ core strategies. In these regards there is a substantial literature (e.g., Bai et al., 2006; Chen and Dickson, 2010; Cull and Xu, 2005; Dickson, 2003; Kennedy, 2005; Li and Zhang, 2007; Luo, 2003; Peng and Luo, 2000). For instance, Chinese private entrepreneurs have been found to be active in using political capital to obtain bank loans because the heavy influence of the state on China’s financial markets (Cull and Xu, 2005; Bai et al., 2006).

The role of different types of uncertainties

Uncertainty concept itself and especially the fact that there is not a unique type and definition of uncertainty, further confounds the already complex R&D investments decision context. Uncertainty can be ontological (Bronk, 2001) or epistemological (Amoroso et al., 2017). Has been qualified as

political, related to policies, to the market or technical (Dobbelaere et al., 2008; Wang et al., 2016; Atanassov et al., 2018) and of several other kinds, so that is often being used interchangeably with risk (Alvarez and Busenitz, 2007) or conflated with ambiguity (Packard et al., 2017). Actually, Amoroso et al. (2017) observe as most of the literature on uncertainty and R&D focused on what they call measurable uncertainty, which is actually risk or volatility. On the other hand, very few studies dealt with the impact of real, Knightian uncertainty, among which the theoretical framework developed by Sutton (2006) is among the first.

As a consequence, the evidences of an association between high uncertain environments and higher returns from R&D investments (Chambers et al. 2002; Chan et al., 2001; Pastor and Pietro, 2003; Vo 2013) found, which may lead to support a view about the positive impact of uncertainty on R&D investment (precisely intensity), should be taken with caution. These results have actually been obtained in the context of an uncertainty characterized as measurable, and therefore more related to risk and volatility rather than to ‘true’ uncertainty. In addition, in the same realm, there are also other studies, for instance Czarnitzki and Toole (2011), which support the opposite view about a negative effect of (market) volatility on a firm’s R&D investments. The empirical attempt of Amoroso et al. (2017) itself, since it focuses ambiguity may not be considered fully in the realm of uncertainty.

According to Knight (1921), the difference between risk and ‘true’ uncertainty lies on whether the possible outcomes are known and probabilities “either through calculations *a priori* or from statistics of past experience” (Knight, 1921, p. 232) can be assigned or not. Ambiguity (Ellsberg, 1961) is something in between, since the events are known, but the probabilities about their occurrence are not, because the available information is incomplete and/or imperfect.

‘True’ uncertainty is ontological (Bronk, 2011), as it refers to a situation where the nature of an event and its associated probability to happen are both not known. This uncertainty particularly affects an innovation setting, where, especially radical innovations, confront the entrepreneur with the unlikeliness to envisage well-founded expectations of additional benefits of future-generation products, of which the nature is not yet known (Amoroso et al., 2017). Incremental innovation abounds of uncertainty too, though of a different kind. More specifically, about the means or options by which to attain a desired outcome, being a customer need or catch-up to a competitor move, which Packard et al. (2017) refer as creative uncertainty.

The above leads to the main dimensions by which to recognize, classify and identify the impacts of the different types of uncertainty on an entrepreneur’s decision-making: 1) the extent to which a probability can be calculated, which in turns depends on 2) the knowledge of events or options or outcomes. In this framework, uncertainty is easily understood. Probability can be calculated only if both the options available and the set of related outcomes are known, and here lays risk. We may

have a situation in which in theory we can know that an event can occur and what its outcomes can be (e.g. an economic shock), but the estimation on whether it will, it is in the realm of possibilities rather than which of probabilities. That is ambiguity. Uncertainty and the different types and degree of uncertainty exist when one or both the options and outcomes set are unknown. Packard et al. (2017) for example distinguish among creative, environmental and absolute uncertainty according to whether one or both the set of options and the set of outcomes available are known. In the first two cases, decision-making is argued to proceed by retrieving and closing either the set of options or the set of outcomes, upon which to make a judgement based on the intuitive assessment the decision maker’s view of reality. In the latter case, in the attempt to resolve uncertainty as much as possible, the elimination of implausible options or undesirable outcomes are done at the same time, for instance by collecting and controlling information or maintaining contingency plans and flexible organizing (Packard et al., 2017).

These typologies and their effects on decision making in particular are understood as perceived as opposed to ‘true’ or, better, ‘actual’ uncertainty. Since most of the decisions are based on perceived uncertainty, therefore the nature of the options and outcomes set and the types of uncertainty they origin, are subjective and often tacit. ‘True’ uncertainty, on the other hand is based on the actual nature of the decision, i.e. the complete set of options and the constant shifts to which, human action and innovation, subject the basic structures on which decisions and actions are made (North, 2005). This leads to the two components of Knight’s (1921) ‘true’ uncertainty, on which our distinction between environmental and perceived environmental uncertainty is made. More in detail, the objective, i.e. the ‘actual’ conditions of the environment, which we intend as environmental uncertainty, against how these conditions interact with the entrepreneur’s perceptions, and therefore on their decisions and actions which we intend as perceived environmental uncertainty.

Conceptual Framework

Now, to summarize, individuals’ responses to uncertainty, read the different types of uncertainty, are shaped in large part by the institutional milieu they are embedded in (Hodgson, 1988; Dequech 2006).

In the above, we argued as political connections are among such responses.

In China, affiliation with the Communist Party and local officials has been noted as a key success factor, and state-owned enterprises routinely command favorable terms of trade (Peng and Luo, 2000). The Chinese government has maintained a central role in guiding the country’s economic transition (Luo, 2003) as it influences the allocation of strategic resources and has significant power to approve projects (Peng and Luo, 2000). Thus, ties with government officials can help firms obtain regulatory resources, such as policy and aggregate industrial information, land, bank loans, tax breaks, and

subsidies from the government (Hoskisson et al., 2000; Peng and Luo, 2000) when they would otherwise face serious problems because of the underdeveloped factor markets (Hoskisson et al, 2000; Luo, 2003; Li et al., 2011). These generic regulatory resources are not directly beneficial for the creation of new product innovation knowledge, but they increase capacity and scale

According to Li et al. (2006), in China, participation in the People’s Congress or the People’s Consultative Conference is of the utmost importance to private entrepreneurs. Jia (2014) demonstrates as the willingness to become member of People’s Congress or of the Consultative Conference is stronger in provinces that are less economically developed and in provinces that have greater opportunities for state redistribution of valuable economic resources. Therefore, political connections, via participation to the Country’s National bodies as delegate, represent an important institutional force in China.

These connections can also shape entrepreneurs’ cognition, by influencing the information they receive, and its interpretation. In general, entrepreneurs’ response to uncertainty is potentially shaped by the extent to which they feel insulated from the downside effects of either ‘choosing to act’ through increased investments or ‘choosing to wait’ through decreased investments. Since political connections may buffer organizations from environmental shocks, for instance by favouring bail out or access to credit (e.g. Ahujia and Yayavaram, 2001; Bai et al., 2006), they can therefore influence entrepreneurs tolerance for uncertainty and the extent to which they see uncertainties as opportunities or threats.

According to Haveman et al. (2016), in developmental states ties with state bureaucrats can reduce uncertainty by clarifying which are the most profitable investment opportunities, revealing how to gain access to state-controlled resources. Because of these ties, firms can more quickly invest in new projects and maximize returns from these investments, as well as to clarify regulations. Wellman (2017) examines whether firms that establish political connections gain differential access to relevant information over legislative developments, thereby mitigating the negative consequences of uncertainty and found that political connections, since reducing information asymmetry, help partially offset the negative relation between investments and political uncertainty, but not of general economic uncertainty.

In these regard, environmental uncertainty, in the form of an external macroeconomic shock for example the 2008 global economic crisis, may not discourage entrepreneurs with political connections to increase investments in R&D, following a growth option logic. In this logic, delaying investments could leave the investment opportunity to other competitors while “immediate action may discourage entrants and enhance market share and profits” (Kulatilaka and Perotti 1998), thus increasing competitive advantage in the future (Vo & Le, 2017). This is because their connections in

the government may give them the necessary cushion to grab potential spaces in the market left by competitors who, in the absence of similar institutional support, may, or in the case of the 2008 economic crisis were forced to adopt a conservative approach. This is particularly true in the Chinese context, where there is a political mandate to increase R&D investments and the government sheltered rapidly against the 2008 economic crisis contagion. Therefore:

H1. Firms whose founders are delegates increase their R&D investments following an environmental uncertainty, compared with firms whose founders are non-delegates.

On the other hand, political connections may have the opposite effect when entrepreneurs feel the potential downside effects of environmental uncertainty. In this situation, political connections may allow firms to mitigate the losses from missed potential opportunities because of ‘waiting’, following a real option logic (Abel and Eberly 1996; Abel et al. 1996; Dixit and Pindyck, 1994; Pindyck 1991). In this logic, an increase in uncertainty leads to a higher value in the firms’ option waiting rather than immediately undertaking irreversible and costly investments (Vo & Le, 2017). Wellman (2017) also found that the information advantage connected firms have, results in delaying investment in anticipation of future lucrative tax incentives.

Zhao et al. (2016) sees as in fact negative the influence of the government on innovation activities of firms, with particular reference to radical/exploratory innovation. More specifically regulatory resources, such as land, bank loans, tax breaks, and subsidies obtained from the government (Sheng et al., 2011), are seldom associated with the combination and recombination of knowledge, which is needed to create new knowledge. Second, when firms can obtain more generic resources from the government, they prefer to use these resources to obtain current economic benefits and directly achieve higher performance (Li and Zhang, 2007; Peng and Luo, 2000). In such cases, even R&D funding can be used for such purposes (e.g. buying equipment or outsourcing) rather than for long-term technology development objectives. This has been shown to be particularly true for Chinese companies (Guan et al. 2006), and it could be more frequent in SMEs operating in contexts where there are difficulties in gathering enough funds to finance long-term expensive R&D, as is, again, the case in China. (Petti et al., 2017). Third, relying too much on government resources may impede a firm’s innovative culture, make it less innovative and tolerant of risk (Tan, 2001) and constrain its activities by government policies and preferences, which may favour certain economic growth rather than risk-taking activities (Zhao et al., 2006). Therefore:

H2. *Firms with perceived environmental uncertainty (a decline in overall investments prior to the current year) decrease their R&D investments.*

H3. *The negative effect of perceived environmental uncertainty on R&D investments is stronger for firms whose founders are delegates, compared with firms whose founders are non-delegates.*

3. Methods

Data and Sample

The data for the analysis were selected from the data set of the Ninth National Private Enterprise Survey (NNPES). The survey was undertaken in 2010 by the United Front Work Department of the CPC Central Committee, the All-China Federation of Industry and Commerce, the State Administration for Industry and Commerce and the Chinese public (private) Economy Research Association. The access to the data set has been provided in the framework of the collaboration of one of the authors with the Research Centre for Chinese Family businesses at Sun Yat-Sen University. The NNPES data set refers to 2009 and it includes data from 4,614 private SMEs, which involves between 0.1 to 0.2 percent of Chinese private enterprises (Lu and Tao 2009; Lu, Tao, and Wang 2010). The survey covers all Chinese provinces and 19 out of the 20 sectors classified by the Chinese National Economic Industrial Classification, with the exclusion of “International Organizations”. Data were collected by sending a questionnaire to the owner of such enterprises. The questionnaire included 39 questions covering many aspects of the entrepreneur and their family background, the firm’s basic and financial information (i.e., year of registration, typology, ownership, industry, number of employees, composition of capital and expenses breakdown), loans, recruitment and management, internationalization, and the evaluation of policy effects. In this last regard, covering all provinces, this data set generates enough variation in local institutional settings to make our analysis meaningful. The NNPES used a multi-stage stratified random sampling method to achieve a balanced representation of private enterprises across all Chinese provinces and industrial sectors. The analyses carried out in this work are based on a sample selected from the NNPES data set covering all Chinese provinces made of 897 enterprises.

Variables and Measures

We use *firms’ R&D investment in 2009* – the year following the financial crisis of 2008 as the dependent variable.

For *environmental uncertainty*, we make use of the uncertain market environment created by the 2008 financial crisis as the context for capturing environmental uncertainty. This external shock has the hallmarks of ‘actual’ uncertainty, i.e. the inherent complexity, due to the heterogeneity and dispersion of an organization’s domain (Dess and Beard, 1984) and dynamism, due to the rate of change and the unpredictability of that change (Terreberry, 1968). Together, these set the objective conditions of the environment in which decisions and actions may or may not be taken.

We measure *perceived environmental uncertainty* using a novel measure: the decline in overall investment in the year the crisis began compared with the previous year, which takes a value 1 for firms that experienced a decline in investment in 2008 compared with 2007, and 0 otherwise. A decline in investment following a macroeconomic crisis can be seen as a tangible expression of the interaction of objective environmental conditions with the entrepreneur’s perceptions, so to trigger a response. According to the degree of uncertainty perceived, the set of responses available may span from being able to deal with a selection of scenarios that can be envisaged through previous experience, knowledge and creative imagination, to protecting against undesirable outcomes before the judgement is made (Packard et al., 2017). For example maintaining contingency plans and flexible organizing (Galbraith, 1973; Milliken, 1987). Prudentially reducing investments may be interpreted in such a way and for such purposes.

We have hypothesised that the entrepreneurs’ response to these two kind of uncertainty is contingent upon their political connections. I.e. we use political connection as moderating variable. Upon Ang and Jia (2014), we define and measure *political connections* in terms of the founder being a delegate at People’s Congress or the People’s Consultative Conference – the variable takes a value 1 if founder is a delegate and 0 otherwise. Participation in the People’s Congress or the People’s Consultative Conference, has been recognized as a type of private political action that is of the utmost importance to private entrepreneurs in China (Li et al., 2006). In addition, is the one that is most common and practicable given that formal lobbying is rare and campaign contributions are forbidden (Li et al., 2006; Ma and Parish, 2006). According to Jia (2014), the choice of membership in formal political organizations for measuring political connections is due to two main reasons. First, the membership in the Congress or the Conference, constitute highly salient and observable examples of corporate political actions. Second, it is difficult to obtain accurate measures of informal political networks. It is therefore unsurprising that the surveys used in this study do not contain questions that directly asked about firms’ informal political connections.

A positive effect of the delegate variable, within the environmental uncertainty intrinsic into the temporal context of the analysis due to the 2008 financial crisis, will support hypothesis 1 about environmental uncertainty motivating a politically connected manager to increase investments in R&D. Within the same context, hypothesis 2 about the crippling effect of perceived environmental uncertainty on firms’ R&D investments will be supported by a negative effect. Finally, this latter effect is argued (hypothesis 3) to be more severe for firms which founders are politically connected. This is tested by an interaction variable between the investment decline and delegate variables, respectively for perceived environmental uncertainty and political connections – a negative effect for this variable will lend support to our hypothesis.

We employ several *control variables* to take into account other important firm and founder related factors that might affect firms’ decisions about R&D investment.

Government support is a dummy variable that indicates whether the firm has received financial support from the government in 2009 for technological upgrading. Although there is no agreement on whether public subsidies for research have positive, absent, or substitution effects on firm’s R&D efforts, all these studies made in these regards (see Petti et al., 2017) are an evidence of the relevance and the need to consider these effects in relation to R&D investments.

Investment net of R&D investment for 2009 is aimed to insulate any potential effect of overall investment decisions on firms’ R&D.

Investing abroad as well as exporting may influence the uncertainty facing firms. Therefore, we include respectively a foreign investment variable that is measured as logarithm of the value of foreign investments and an export dummy variable that takes a value of 1 for exporting firms and 0 for others.

We include logarithm of sales to control for the potential effect of variations in firm size on R&D investments across firms. Larger firms have in fact been found to more likely have political ties, whereas smaller firms may be more likely to use them (Guthrie, 1999; Lin, 2001).

For capturing the effect of different types of ownership we include variables measuring the equity share of founder and her family, the equity share of foreign investors (none of which are majority shareholders in our sample of firms), and the equity share of state owned and collective organizations. Haveman et al. (2016) report a number of studies that support as in China controlling shareholders exercise considerable control over operations, that different types of controlling shareholders influence not only firm performance but also the use and the benefits of political connections, with particular reference to state-owned against non-state-owned firms.

Experience of firm and the founder can of course affect the perception about uncertainty, so we include the age of both firm and founder.

A dummy variable that takes a value 1 for founders with a graduate degree and 0 for others is expected to capture the effect of education on perceptions about uncertainty and R&D investments.

Finally, our sample consists of firms operating in a variety of industries. As industry and market characteristics are important in relation to the degree of uncertainty and the importance of R&D activities, we use sector dummies (dummies for 19 sectors with one sector being treated as the reference category).

4. Results

Table 1 presents the descriptive statistics. As to be expected, R&D investments, our dependent variable, display wide variations across firms. Just over a third of the firms were founded by delegates, while only a fifth of the firms experienced an investment decline between 2007 and 2008 (that is, perceived environmental uncertainty). As private enterprises are a relatively new type of organization in China, most firms are young with the average age being about eight years, with average age of the founders being around 45. The correlation matrix show no serious cases of high correlation.

Results of the regression analysis of our proposed model are reported in Table 2. As the dependent variable is continuous, we employed the ordinary least square estimator with cluster-robust standard errors (clustered by industry).

Model 1 estimates a controls-only specification with the hypotheses testing variables not included. We observe a significant positive effect of government financial support, exporting, firm size, firm age, and graduate degree. In other words, exporting firms, larger firms, and firms with founders with a relatively high human capital tend to see opportunities for increasing value through innovation efforts when there is environmental uncertainty. Government support also tend to stimulate R&D investment when firms are experiencing environmental uncertainty.

We next add the hypothesis testing variables in model 2. In support of hypothesis 1, the delegate variable has a significant and positive coefficient. The investment decline variable shows a negative effect, confirming hypothesis 2 and suggesting that firms that experienced perceived environmental uncertainty decreased their R&D investments in the following year compared with firms that did not experience such uncertainty to that extent.

Finally, the negative moderating effect, under hypothesis 3, of founder being a delegate on the effect of perceived environmental uncertainty is confirmed by the significantly negative coefficient for the interaction term (Investment decline x Delegate).

Table 1. Descriptive statistics and correlation matrix

NO	VARIABLES	MEAN	SD	MIN	MAX	1	2	3	4	5	6	7	8	9	10	11	12	13
1	R&D	34.05	196.34	0	4180													
2	Delegate dummy	0.36	0.48	0	1	0.13												
3	Investment decline dummy	0.21	0.41	0	1	-0.04	0											
4	Government support	16.48	111.34	0	1739	0.33	0.1	0										
5	Investment net of R&D investment	67.26	777.09	-4180	14900	-0.12	0.03	-0.02	0.05									
6	Foreign investment	8.80	180.94	0	5000	0.01	0.06	0.01	0.14	0								
7	Export dummy	0.09	0.29	0	1	0.24	0.1	0	0.22	-0.01	0.05							
8	Ln Sales	6.00	2.57	0	14.35741	0.23	0.36	-0.05	0.24	0.12	0.09	0.27						
9	Family equity	80.93	29.39	-106	100	-0.08	0.01	0.02	-0.09	0.03	0.03	0.03	-0.12					
10	SOE&Coll equity	0.65	6.39	0	100	0.04	0.03	-0.01	0.02	-0.01	0	0.05	0.07	-0.15				
11	Foreign equity	0.19	2.28	0	36	0.02	0.11	-0.04	0.04	0.08	0	0.16	0.12	-0.13	0.14			
12	Firm age	8.37	4.46	1	21	0.09	0.32	0.01	0.07	0.08	0.07	0.09	0.31	0.05	0.04	0.04		
13	Founder age	45.04	8.74	18	92	0.07	0.12	0.02	0.08	-0.02	0.05	0.04	0.2	-0.04	0.06	0.03	0.26	
14	Graduate	0.27	0.44	0	1	0.13	0.04	0.02	0.03	-0.03	0.01	0	0.03	-0.09	0.01	-0.05	-0.03	-0.16

Table 2. Effect of Political connections & Uncertainty on R&D investment

VARIABLES	(1) R&D	(2) R&D	(3) R&D
MAIN VARIABLES			
DELEGATE DUMMY		17.2729**	32.5887**
		(7.7247)	(11.8204)
INVESTMENT DECLINE DUMMY		-18.1631*	6.9897
		(9.8056)	(6.1285)
INVESTMENT DECLINE X DELEGATE			-69.3441***
			(21.3112)
CONTROL VARIABLES			
GOVERNMENT SUPPORT	0.4821***	0.4812***	0.4694***
	(0.1237)	(0.1270)	(0.1255)
INVESTMENT NET OF R&D INVESTMENT	-0.0348	-0.0346	-0.0346
	(0.0412)	(0.0411)	(0.0410)
FOREIGN INVESTMENT	-0.0546**	-0.0541**	-0.0518**
	(0.0256)	(0.0247)	(0.0220)
EXPORT DUMMY	97.6686***	98.6001***	101.2897***
	(22.7363)	(21.9292)	(21.3142)
LN SALES	10.4310**	9.3676**	9.5110**
	(4.0383)	(3.6007)	(3.6539)
FAMILY EQUITY	-0.1841	-0.1968	-0.2274*
	(0.1132)	(0.1253)	(0.1214)
SOE&COLL EQUITY	0.3090	0.3080	0.2066
	(0.6417)	(0.6104)	(0.6058)
FOREIGN EQUITY	-1.6083	-1.9775*	-2.3594**
	(1.0014)	(0.9676)	(0.9523)
FIRM AGE	1.2134***	0.8340**	0.7250*
	(0.3241)	(0.3655)	(0.3881)
FOUNDER AGE	0.5679	0.6032	0.6508
	(0.5008)	(0.5136)	(0.5456)
GRADUATE	46.8759*	46.1235*	47.8426*
	(25.7230)	(25.8545)	(26.3384)
SECTOR DUMMIES	yes	yes	yes
CONSTANT	-86.3119	-82.9022	-88.8553*
	(49.9083)	(48.0493)	(51.2217)
OBSERVATIONS	897	897	897
R-SQUARED	0.1950	0.1978	0.2024
ADJUSTED R-SQUARED	0.168	0.169	0.173

Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

The effect of political connection under environmental uncertainty and perceived environmental uncertainty may be more easily understood with the help of a graph. Figure 1 below shows the effect on R&D investment under environmental uncertainty (value 0 on the horizontal axis) and perceived (value 1 on the horizontal axis) environmental uncertainty for firms with and without political connections.

Our prediction in hypothesis 1 that delegates may seek to capitalize on the upside effects of environmental uncertainty by ‘acting’ on the opportunity can be seen validated by the higher magnitude of R&D investments for firms whose founders are delegates (when investment decline takes the value 0). A downward sloping regression line for delegates and an upward sloping line for non-delegates provide a visual confirmation of our moderating hypothesis, hypothesis 3 – for firms that experienced perceived environmental uncertainty (decline in overall investment prior to the current year), those whose founders are delegates experienced a decline in R&D investment. Interestingly, though not hypothesized, firms whose founders are not delegates increased their R&D investment when they experienced perceived environmental uncertainty. This finding is in line with our suggestion that the downside effects of not ‘acting’ may be an important consideration in the decision making process when firms are faced with uncertainty.

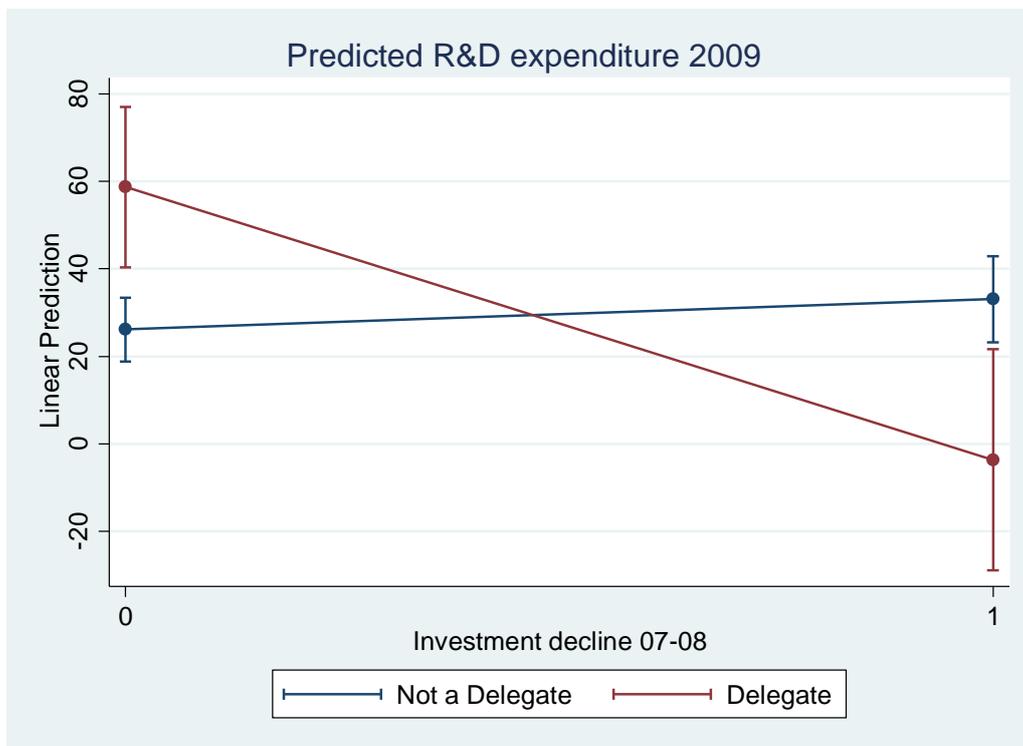


Figure 1. Magnitude of effect of investment decline on R&D for delegates and non-delegates

5. Discussion and conclusions

Findings of this paper unveil the combined effects of peculiar institutional settings and different types of uncertainty in trying to provide an explanation to the contradictory views and findings about the effects of uncertainty on firm’s R&D investments.

More specifically our arguments highlight as different institutional contexts generate different degrees and, to some extent, different types of uncertainty. These differences lead to different mechanisms by which uncertainty is dealt with by firms, decisions are taken and, eventually in the consequent behaviours.

We have in fact seen that as in an emerging market environment, the uncertainties generated in transitions and developing market-supporting institutions differ in degree (usually higher) and in nature (usually more complex, unstable and unpredictable). These add to the inherent uncertainties of innovative activities, mirrored by the lack of clear prescriptions in literature about what firms do or should do about their R&D investments in conditions of uncertainty. In such contexts, political connections are an important mechanism to deal with the heightened uncertainty and proved to have magnifying effects on R&D investments. However, whether these effects take the positive or negative slope, depends on the type of uncertainty faced, which is the main second argument of this paper. More in detail, the mere existence of uncertainty does not forcibly entail a change, i.e. a decision, an action or a re-action from the part of the firm. This happens only when it ‘interacts’, i.e. become perceived by the firm as likely to produce effects on its business, so to stimulate a response.

In the sample of Chinese firms analysed, when faced with an ‘objective’ external macro-economic shock, this has shown to not affect the several ‘pushes’ of relationships with the government on R&D investments, so the effect of political connections are positive (as found for hypothesis 1). However, when this macro-economic shock become felt as likely to produce effects, so as to trigger protective actions, i.e. a decrease of overall investments, then the negative side of government connections prevail (i.e. as found for hypothesis 3) and produce a magnifying effect on the tendency of firms to shelter from the environmental uncertainty perceived (as found for hypothesis 2). Therefore, the effect of political connections becomes negative.

Accordingly, the theoretical contributions of the paper are twofold. On one side provides preliminary empirical evidence about the relationships between uncertainty and R&D investments in transition environments characterized by imperfect, developing market institutions. This not only contributes to improved understanding on the critical factors shaping R&D investments in such environments. Also, demonstrate as the study of institutional context of emerging economies, provide an excellent opportunity to advance new conceptual frameworks and incorporate different theoretical perspectives as we attempted in this study, with particular reference to the studies about corporate political actions (Hoskisson et al., 2000). In general, this is a stimulus that stream of research which call for more research, especially more contingency studies in emerging economies settings.

Second, we contribute to the literature about uncertainty: by distinguishing the effects of uncertainty types on R&D investments, by providing evidence on how the different types of uncertainty work in a real setting (many of the frameworks and studies are still theoretical) and, in these last regards, by contrasting the two main components of ‘actual’ against ‘perceived’ uncertainty.

Overall, we combined the two perspectives on the study of the effects of political connections, within the overall topic of corporate political actions in an innovation setting.

This lead to highlight a first practical contribution of our findings, which is the evidence of distortive effects of political connections and in general government influence, on firm’s investment behaviour and R&D in particular. With specific reference to the negative effects produced by political connections on R&D investments. The distortive effects are, in our opinion, supported by examining the controls in our model, more specifically to the strongly positive coefficient of the export dummy, education and down below firm’s size, experience and government support. We interpret these findings as demonstrating entrepreneurs would act as the characteristics and needs of their firms would require (to maintain exports), their education prescribes (many theories points to a need to increase R&D instead of decrease it under uncertainty) and allow (i.e. size, age experience), which is to increase R&D following a growth option logic. However relational and influence rents considerations (Ahujia and Yayavaram, 2011) by which they are indirectly affected, push exactly in the opposite direction of what, curiously, in the specific Chinese context analysed, are supposed to push them (i.e. increasing R&D investments). It is in fact well known as there is a long-term strong political mandate on innovation in China, starting from the 2006 SciTech Guidelines, the three latest five-year plans and more recently the widely debated Made in China 2025 program. These are not only signals or directions, but also real instruments endowed with resources and incentives, at the point to have even raised concerns and criticism outside China for their magnitude and reach. Furthermore, by looking at government support in particular, which refer to government subsidies one can see as it plays the expected and accepted anti-cyclical function that government intervention is supposed to perform in times of crisis, i.e. to increase investment. However, the fact that the negative effects produced by political connections are much higher and significant than the positive one provided by government subsidies, further reinforce the impression about the distortive effects of government influence on Chinese firms investment behaviours, against other more common forms of public interventions and government-business relationships.

The considerations are deemed to be particularly relevant as they may apply not only to the Chinese context, but also to other emerging economies and even wider, at least as far as the reach of strong government role and involvement, imperfect market institutions and corporate political actions.

On the other hand, looking at the specific Chinese context, the negative coefficient of foreign equity is easily explained, as it reflects the evidence of common practices in that context. Foreign firms in China, usually and especially at the time of the survey, did product development and adaptation to market (e.g. Schwaag-Serger, 2006; von Zedtwitz et al., 2007), so invest quantitatively and qualitatively less in the Chinese market. Therefore, a marked reduction of investments in their Chinese subsidiaries may be motivated by directing scarce resources home or into other markets where innovation was seen as more significant (see for instance Pollio et al., 2016).

Finally, concerning family share it is not surprising as family firms, which are generally considered to have a centralized management, lower professional and authorization levels (Damanpour, 1991) and a number of other characteristics hindering innovation (e.g. Carnes and Ireland, 2013), may be conservative in their R&D investments, especially in times of recession (Llach et al., 2012). Open remains the role of the Chinese institutional setting.

These findings and their implications should be taken in the perspective of the limitations of the study undertaken. The main, are related to the data and measure used. First, the data used are cross-sectional. This limits the causal relationship with respect to panel data. Second, our proxy-based approach to measure uncertainty. To some authors (e.g. Andrews, 2008) perceptual measures are argued to be more accurate in tapping the linkages between uncertainty and managerial choices. Nonetheless, there is not a widespread agreement in literature about this issue. However, by having used secondary data and a novel measure, we could not make any comparison in these regards. Both limitations, especially this latter, can be taken on in further studies.

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