

A Typology of Strategic Behaviour in PPPs for Expressways: Lessons from China and Implications for Europe

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In line with governance trends around the world, a growing number of expressways in the People's Republic of China are managed as Public-Private Partnerships (PPPs). The tremendous growth in demand for mobility in newly emerging economies has led to a gap between investment needs and available public funding. Using private funds is potentially helpful in closing this gap and accommodating the social and economic needs of motorization. By some, it is also hoped that contracting-out and involvement of the private sector will lead to higher transparency and accountability. However, in line with what has been found in various transport infrastructure modes, during uncertain and hazy transition periods that arise after infrastructure reforms, many forms of potentially pernicious strategic behaviour can pop up. Strategic behaviour emerges from information a-symmetry between private and public players, where the former act as agents and the latter as principals. In this article, China's evidence on various types of strategic behaviour in the management of expressways is found. Several PPP projects for expressways in China are investigated empirically. And conclusions are drawn as to what possible cures are effective countermeasures of strategic behaviour, and what are the implications for Europe.

Keywords: PPPs; strategic behaviour; agency theory; expressways; China

1. Introduction

In the past decade, public investments in expressway infrastructure in China have seen remarkable growth, but their actual percentage of total expressway-construction costs has

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declined (World Bank, 2007; China Statistics Bureau, 2007). The gap between the availability of public funding and actual project construction and to a lesser extent maintenance costs has been filled by raising growing sums of money from the private sector. Meanwhile, important responsibilities for the design, construction, maintenance and operation of expressways have been transferred to the private sector after signing contracts calling into life so-called Public-Private Partnerships (PPPs). PPPs, which originated in Anglo-Saxon countries and have subsequently spread around the world, are believed to offer the possibility of absorbing the strengths of the private sector, especially innovativeness and efficiency, without relinquishing public control and respecting public values (European Commission 2003; OECD 2001; OECD 2002; OECD and International Transport Forum 2008). Since the late 1990s, the growth in the number of PPPs for roads, especially for expressways programmed in the Chinese National Expressway Network Plan, has speeded up, from 0 to 122 PPP contracts at present (China Audit Office, 2008). The underlying reason for PPP's increased popularity is, apart from merits mentioned above, rising motorization and a concomitant requirement for road network extension and thus substantially higher funding needs.

However, as we know from various evaluation studies on the use of PPP around the world in various policy fields (World Bank and Public-Private Infrastructure Advisory Faculty 2004, 2005; Transparency International 2007; Chang et al 2005; Ministry of Foreign Affairs of Denmark 2006; German Institute of Urban Affairs 2006; European Parliament 2005, 2006; Price WaterHouse Coopers 2008; Andreas et al 2005; Levainen and Altes 2005; Andriani et al 2006; Ministry of Economy and Finance of Greece 2006; Engel et al 2003; Li et al 2005), the evidence on the merits of PPP is not exclusively positive. Often the explanation given for disappointments is that partnerships in which government contract activities out to private players can be characterized as principal-agent relations (Jensen and Meckling 1976, Jensen 2000, Buckley and Michie 1996, HM Treasury 2003, 2005; World Bank and Economic Commission for Africa, 2003). As a consequence, the asymmetric distribution of information evokes 'strategic behaviour' on the part of agents leading to higher costs and lower benefits than the preference function of the principal would justify (ten Heuvelhof et al 2009). For instance, contractors may tell only half-truths about their abilities when making bids. Alternatively, they refrain from making serious efforts to provide good service levels or otherwise refuse to behave in line with the interests of the public client if the chance of detection of shirking is low enough and/or sanctions absent or not serious enough to deter them from doing that. To put it in agency theory terms: adverse selection of contractors may occur during the tendering process, whereas moral hazard is likely to arise during the contracting period itself. The theory of strategic behaviour, which we will use here, has agency theory as its theoretical point of departure, but has been worked out to deal with the vagaries of actual actor behaviour in the world of the infrastructures, where self-interest can be made tangible by looking at aspects such as hard to pinpoint delaying tactics, playing with the ambiguity in the interpretation of legal concepts and spreading selective, biased, incomplete and overwhelming amounts of information, the evil intentions behind which are hard or impossible to demonstrate (ten Heuvelhof et al 2009). In short, strategic behaviour is hard to prove in terms of its explicitly bad intentions, normally not (yet) illegal, but morally doubtful and potentially harmful to the broader public interest (de Jong and Stout 2007).

And yet, as will appear below, these features can be found in PPP projects in China in various forms. Firstly, private enterprises show narrow self-interest in their focus on profit maximization, when they regularly harm consumer interests by embezzling public funds, delivering lower service quality than specified, charge more toll money than they are supposed to and cut back on maintenance expenses as long as they can get away with it. Secondly, utilizing the ambiguity in the way their conduct can be interpreted, agents argue that mistakes and omissions were not intentional or not necessarily harmful. Thirdly, when submitting bids for a tender and/or drafting a contract, public clients and private agents reflect on and anticipate each other's actions, make tactical choices and bargain and renegotiate cost estimates, quality standards, project

output specifications, project completion dates and financial risk allocations. Contracts are virtually always incomplete and both parties are unable to foresee all future contingencies at the moment of formulation and signing. During the implementation, contracts need further adjustment; this time aspect can be utilized to obtain extra gains, especially by agents whose involvement has become indispensable to project completion.

The purpose of this article is to explore different types of strategic behaviour in the management of expressways and propose corresponding countermeasures. We will answer the following questions. First, what is the empirical evidence regarding various forms of strategic behaviour in the management of expressways? And what can be possible cures? Second, to what extent can the agency theory, developed in a western style, be applied in the Chinese context? And third, since this type of research on expressways has not yet been conducted in Europe, we raise the question to what extent a similar map of strategic behaviour might also exist in Europe.

Collecting data on this subject is generally sensitive, and this is even more so in a country with a much shorter tradition of open communication between government and industry on the one hand and university researchers on the other (Zheng et al 2010). Only rarely are actors involved willing to lift the lid off what is seen as the suspicious side of politics and business. Remarkably, we were able, through personal and professional networks, to conduct face-to-face interviews with experts and professionals from organizations operating in this field. We have been lucky enough to obtain some non-official ('listed') reports and interview a number of officials willing to be open to us, in the office as well as over dinner. The names of the reports, which are obviously all in Mandarin, can be found under the references. The names of the interviewees are mentioned in appendix 1. In section 2, we present our theoretical assumptions, and produce a conceptual model with the various stages PPPs go through, which will enable us to pinpoint the various moments when strategic behaviour might emerge. One might say that these moments are ideal breeding grounds for tactical manoeuvring on the part of contractors. In subsequent section 3, which is based on national reports and experts and policy-makers at the national level, the different types of strategic behaviour as they can be found in road management by PPP in China are presented. Section 4 then tells the stories of three individual cases studies in three different provinces around China. It appears that both among public principals and among private agents strategic behaviour can be found. In section 5, suggestions for law-makers to install institutional incentives to mitigate the perversities resulting from strategic behaviour are offered. In the concluding section, we formulate our ideas on the implications of the Chinese findings for the European context. Do the same or similar forms of strategic behaviour also occur in Western PPP practice for road management, or is it 'cleaner' than Chinese decision-making on transport infrastructures?

2. Theory and method

Public-private partnership has been defined in many different ways (Flyvbjerg et al 2003; Koppenjan, 2008; Hodge and Greve, 2005; Grimsey and Lewis, 2002), but there is a general agreement that PPP projects involve private players in the design, construction, operation and maintenance of a public infrastructure on the basis of long-term contracts or arrangements. Some definitions focus mainly on the aspect of private finance, while others give it a more comprehensive interpretation in which the allocation, sharing and management of various tasks are included (Miller and Lessard, 2000; Li et al., 2005; Devapriya, 2006; Pakkala et al., 2007). Although there is no determinate and unified definition of PPP, on the one hand, we may say that PPP is a kind of contractual relationship between governments and private players, working together to finish a target project with their own objectives and interests. The delegation of some governmental responsibilities to the private sector, under their divergent goals, may raise our attention to how these tasks are subsequently dealt with. PPP as a general concept can be

subdivided into many different forms of procurement models. Usually, the sequence in phases on which typologies of procurement models are based are Design (D), Build (B), Maintain (M), Operate (O), Manage (also M) and Rehabilitate (R). Earlier approaches separated all of these phases in different contracts granted to different actors; today it is more common that they are merged into one contract. In addition, several aspects pertinent to contracting or construction that have not been covered under the above terms are sometimes incorporated in the wealth of procurement model acronyms. The main ones are Finance (F), Bid (also B), Develop (also D), Transfer (T), Lease (L), Upgrade (U), Purchase (P) and Own (also O). The rather traditional Design-Bid-Build would for instance be abbreviated to the simple acronym DBB, while a well-known more modern procurement model focusing on the entire infrastructure life cycle reads as Build-Operate-Transfer (BOT). An arrangement where ownership permanently remains with the private sector would be Build-Operate-Own (BOO), and if it is transferred back to the state after a number of years, it would be Build-Operate-Own-Transfer (BOOT). Figure 1 summarizes the different forms of PPP and their positions on the public-private spectrum. Not all of the above mentioned procurement models are currently being applied in China. The most commonly used forms in China are Build-Transfer (BT), Build-Operate-Transfer (BOT) and various forms of joint ventures.

On the other hand, PPP is also a trust relationship between governments and private players (Parker and Hartley 2003; Walker et al 2006; Teegen 1999; Bstieler and Hemmert 2007). In this relationship, a trusted party is presumed to implement policies, ethical codes, laws and their previous promises. Governments and private players get together in a partnership since they have confidence that the behaviour of their partner(s) will be in conformity with predefined contractual terms. Government is trusted to draft project requirements and the private players are trusted to fulfil the responsibilities transferred to them as stipulated. In addition, PPP is also regarded as an avenue of sharing project risks between the partners and the risks should be allocated to the partners who can bear them best, implying that players deal with those types of risks they can deal with best. Lastly, it is argued that PPP to bring more “value for money” to projects. This surplus obtained from partnerships may at least be partly explained by the trust relation between governments and private players which diminishes transaction costs.

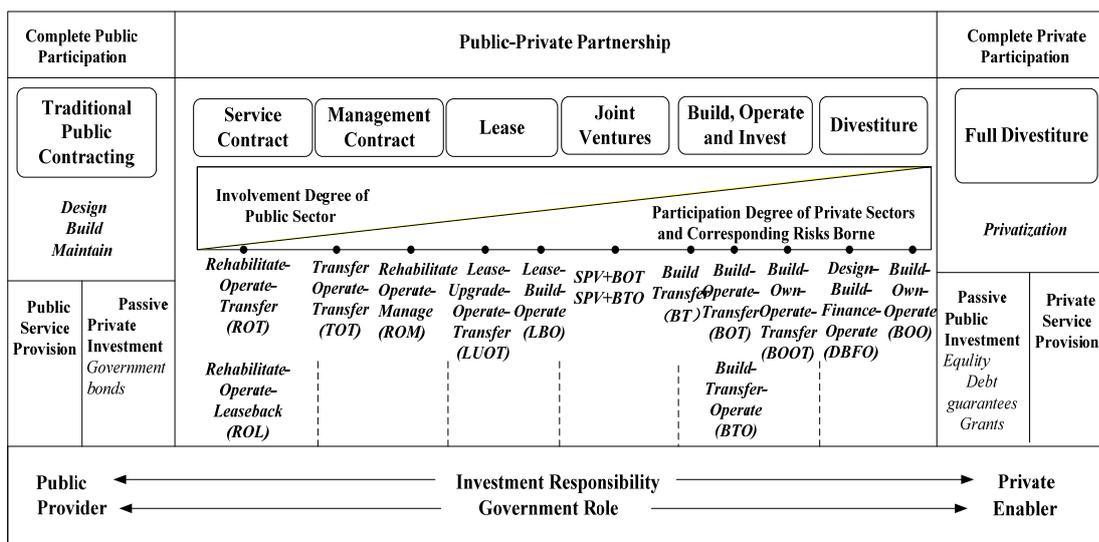


Figure 1. Forms of PPP and degrees of private involvement (De Jong et al. 2010)

According to Jensen (2000), agency theory involves the study where there is a contract in which a client or principal engages an agent or contractor to take actions on behalf of the principal that

involve the delegation of some decision-making authority to the agent. With its basic assumptions of asymmetric information and goal conflict (Caers et al, 2006), it is reasonable to believe that the agent will not always act in the best interests of the principal. At its core, this is the source of strategic behaviour. In *A Theory of Incentives in Procurement and Regulation* (1998), Laffont and Tirole define two main categories of strategic behaviour, adverse selection and moral hazard. Adverse selection emerges when agents possess more *exogenous* information than principals, such as technological options and actual project costs, which enables them to extract a rent from principals even if their bargaining power is poor. In effect, adverse selection is *ex ante-contractual* strategic behaviour, which usually takes place during the tendering process and induces principals to select sub-optimal contractors. Moral hazard is *ex post-contractual* strategic behaviour referring to *endogenous* variables of private agents, which cannot (easily) be observed by principals. Private agents take discretionary actions such as a reduction in service effort and artificially increasing project costs. In infrastructure projects, moral hazard usually occurs during project implementation. Consequently, adequate incentives and monitoring by public principals need to be strengthened, although this can be costly.

Agency theory has been a vital source of inspiration for the more recent publications on strategic behaviour (ten Heuvelhof et al, 2009) and can help to understand perversities arising in PPP projects. It is found that agency theory is able to manifest many types of strategic behaviour that the public sector faces when it attempts to contract out. Agency theory is also found to offer unique explanations for the public sector's choice and use of certain incentives and monitoring methods, low performance of the private players and even the failure of the PPP projects. However, agency theory also has notable weaknesses. The theory relies on narrow assumptions of human nature and motivation, and automatically attributes negative intentions to actors while overlooking how uncertainty, incompleteness of information and routine behaviour may cause failure by themselves. When reading our empirical accounts later on, this bias should therefore be borne in mind. Moreover, many applications of agency theory take inadequate account of the wider institutional environment in which contracting processes take place. Agency theory often cannot capture the existence and influence of multiple principals and other third parties outside the direct agency relationship. Being aware of the latter limitation (the former one is inherent to agency theory and cannot be 'fixed'), we attempt to mitigate this weakness through a complementary institutional framework. Williamson (2000) offers a useful multi-layer framework that allows analyzing and understanding different types of social and institutional arrangements in four integrated layers. In multi-layer systems, top-down and bottom-up causation interact: upper levels enable and impose constraints on lower levels and vice versa (Bauer 2009). Williamson's framework can enrich agency theory to build up a more comprehensive conceptual model (figure 2). This conceptual model can help us to obtain more detailed insights in how and where strategic behaviour can emerge in the management of expressways, and when it is observed in combination, it shows the breeding ground for and occurrence of strategic behaviour.

➤ Level 1: Wider cultural context

The first is the level of social-embeddedness, where the informal institutions (such as norms, customs, traditions, religions) and degree of trust are located. Since such informal institutions change slowly, they are taken as given. We put the informal institutions at the top level because they form the roots of human behaviours. Whether or not private players exhibit strategic behaviours in the third and fourth levels largely depends on the informal environment where they are socially embedded. In addition, we also put the degree of trust at this level for the reason that a nation's trust level will affect how policies should be made by governments in the second level when dealing with strategic behaviour. Therefore, we need to briefly clarify the trust levels in the Chinese context and we will return to them in the concluding section, when implications for Europe are discussed.

Definitions of trust abound, but the essence is one of a psychological state comprising the intention to accept vulnerability based upon positive expectations of the behaviour of other actors. In the context of a project, trust is a disposition of the willingness to rely on the actions of another party, under the circumstance of contractual and social obligations with the potential to collaboration (Smyth and Edkins, 2007). In China, the degree of trust is regarded as relatively low compared to countries such as Germany and Japan (Fukuyama 1995, Ragunathan 2007). The disadvantages of a nation with low trust levels include that agency costs (including the costs of providing incentives for the agents and executing monitoring methods on the agents) would be higher; reliance on institutions such as legislations and regulations would be lower; informal processes among mutually familiar individuals correspondingly higher.

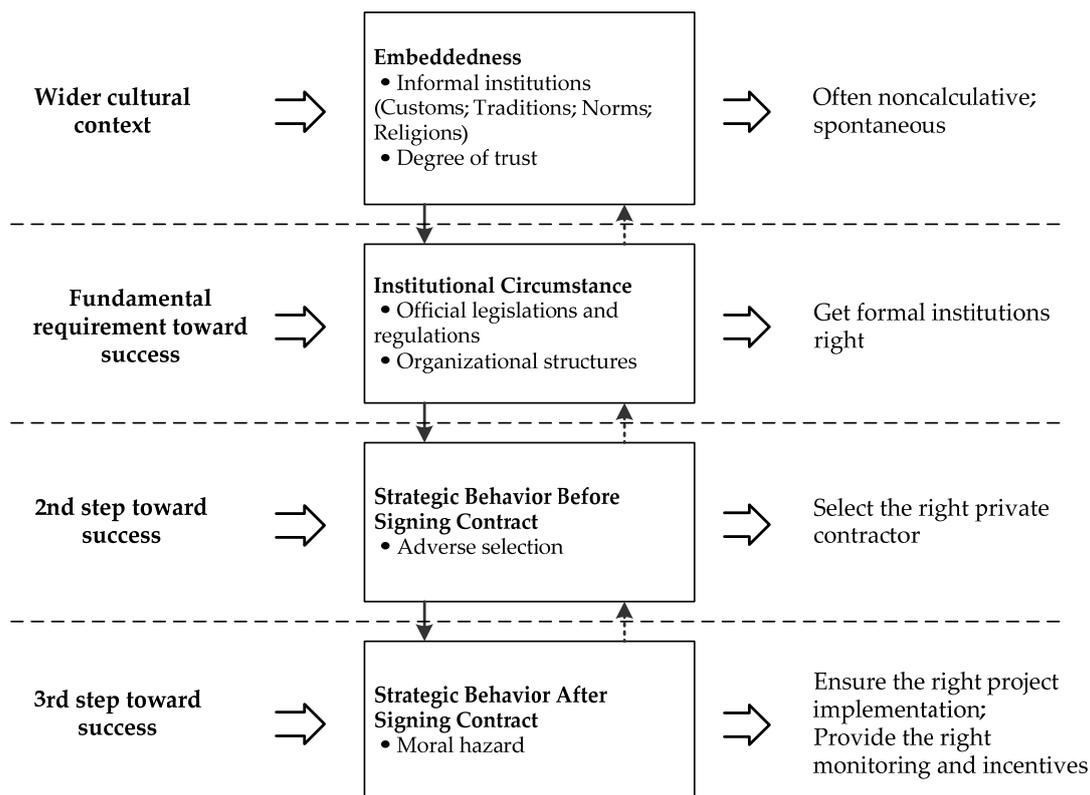


Figure 2. Multi-layered model of the PPP contracting process

➤ Level 2: Formal institutions

At the second level, the formal institutions, including official legislation and regulations and the organizational structures can be found. According to North (1990), these institutions are the formal rules of the game. Their major role in a society is to reduce uncertainty by establishing a stable (but not necessarily efficient) structure to human interaction. A well-developed and stable institutional environment is favourable for applying successful project management in general and PPP in particular, since it diminishes unnecessary ambiguity and potential for contention among players.

➤ Level 3: Strategic behaviour before signing contracts

Under the institutions, both formal and informal, the third level, tendering, is located as a beginning of PPP projects. During tendering processes, principals face big challenges in selecting the optimal contractor and thus avoiding adverse selection. More favourable conditions in levels 1 and 2 may improve the starting position here and make various forms of strategic behaviour more difficult or costly.

➤ Level 4: Strategic behaviour after signing contracts

Even if level 3 is favourably organized, prevention of ex post strategic behaviour, moral hazard, has not been ensured. When the contract has been awarded, during the phases of design, construction, operation and maintenance, the contractor can still use tactics inconsistent with the clauses defined in the contract, shirk from duties and display doubtful morality in performing its tasks.

This conceptual model is applied in our empirical research. This article does not aim at exploring problems at the social embeddedness level, so we take the Chinese socio-cultural environment, including its trust level as given. But, we must be aware that this environment plays a role in directing people's behaviour and thus may act as a breeding ground for strategic behaviour in PPP projects. As to the formal institutions at the second level, they also affect the emergence of strategic behaviour in PPP projects because an unfavourable institutional environment may provide involved actors with room for pernicious tactics. In the empirical work for this article, we have focused on the institutional levels 3 and 4, while formulating our policy recommendations in section 5 mainly in terms of possible legal improvement for level 2. In section 3, our general findings on the various forms of strategic behaviour as they exist all over China are presented. They are based on listed national reports and national experts and policy-makers, which have been analysed and systematised. Section 4 will then shift to the case studies of three projects in three different provinces, thus focusing more in details on the physical circumstances and outcomes of strategic behaviour.

3. General empirical findings

3.1 Strategic behavior before signing contracts

Strategic behaviour during the tendering process centres around collusion among bidders, which goes against the essential objective of tendering: fair competition. This will prevent principals from having accurate information on the bidders. Consequently, non-optimal contractors can be selected. First, *bidders can collude in submitting bid prices together*. Such collusion would force the government to choose a bidder from those whose bid prices are all high. In such cases, the government does not know the real price that each bidder can offer and is unable to make comparisons among them to select the optimal one since they are all at similarly (contrived) high levels. Fair competition is made impossible and transaction costs increase because of weak incentives to control project costs. In addition, *collusion could imply bids with prices substantially lower than the normal price in order to exclude other bidders who offer at a reasonable price from winning the bid*. Such collusion may sometimes trap the government into selecting a fallacious low-price bidder. This raises the risk of moral hazard emerging later on during the contract period, because the selected bidder will be subject to vast cost overruns and the probability that such agents can force off renegotiations is far higher. Therefore, transaction costs are also bound to rise. Such fallacious low prices generate a so-called "investment trap" for principals, because such contractors will inevitably ask for supplementary funding later. Furthermore, *bidders might collude with each other on winning the bid by turn*. Such collusion strategically provides bidders with an average opportunity of winning the contract even if the bidder is actually incapable of carrying out the project. Tendering in such cases is meaningless and competition is absent because the winner has been determined surreptitiously by the bidders. The principal is kept from selecting the best bidder and, as a consequence, moral hazard is likely to occur during the construction process (Qiao, 2008; Huang, 2007; Dang and Zu, 2006; Zu, 2005). Collusion among the bidders may provide them with a stronger position individually or jointly against the principal to either raise the bid price or win the contract. The asymmetric distribution of the information on the actual capabilities and capacities of the bidders also offers the bidders the motivation to collude.

3.2 Strategic behaviour after signing contracts

After contractor selection, strategic behaviour can take place during the construction period. Several forms of moral hazard that might impair project quality have been detected (Wei, 2001; Liu, 2000; Ouyang, 2007). Moral hazard may be caused by *technical jerry-builds*. Such strategic behaviour can be expected from contractors that are technically advanced and thus know with great accuracy to what extent and what elements of the construction can be built and equipped with low-quality materials (such as concrete) and fewer materials (such as lower-magnitude steel or reinforcement). Such technically specialized information is only in the hands of the contractor. The consequence can be that project quality cannot be ensured according to the quality specifications defined in the contract and expensive maintenance operations are likely to follow further down the road. A variant of the above are *experience-dependent jerry-builds*, usually from contractors with abundant experience in construction activities, but lacking in technical know-how. They might use lower-level materials or reduce the use of materials in order to save construction costs (and thus make excessive profits) fully relying on their experience obtained in past projects. During construction, information on the locations where the project is jerry-built is only available to the contractor. The consequences may be more serious than with technical jerry-builds because technical factors are not even taken into consideration. Safety and security issues may arise and maintenance might become even more difficult and costly. There are still *other kinds of jerry-build*. Contractors aiming for excessive profits and lacking expertise and experience may jerry-build relying on their arbitrary discretion alone, as long as they expect their deceit to remain undetected. Such strategic behaviour will probably cause the most serious project quality issues. In China, such projects are called “doufuzha” projects, which imply that construction is compared to “bean curd” which is not solid and easily destroyed.

The China Audit Office (2008) has concluded that jerry-build problems are usually caused through subcontracting with cheaper sub-constructors more likely to revert to strategic behaviour. Among a project sample in 34 provinces, 36% projects have been jerry-built for a total amount of 9.035 billion Yuan. For instance, the Xinjiang Road-Harbour Construction Enterprise won the contract for an expressway from Bengbu to Guangming. It signed sub-contracting contracts with 36 small construction firms that rarely qualified for their jobs and thus economized on its actual project costs from 84.97 to 65.51 million Yuan (19.46 in excess). Of course, the subcontractors used fewer and lower-quality materials. Even more dramatically, in Chongqing, the Chang-Wang expressway (from Changshou to Wanzhou) was transferred to sub-sub-sub constructors (four levels down), thus reducing the amount available for project construction by 69%.

Strategic behaviour during operation and maintenance, a second form of moral hazard in expressway management, refers to private agents obtaining excess profits from road users by extending the charging period, increasing the number of tollbooths and reducing expenditure on maintenance. They may *strategically extend the charging period*. Theoretically speaking, the charging period (i.e. the operating period) has been defined in PPP contracts, but operators still want to extend this period in order to earn additional sums at the expense of the public. They claim that the period should be extended due to unforeseen or uncontrollable factors and that normal profit could not be ensured (due to exceptional bad weather conditions or an initial overestimation of traffic demand). If an agent puts forward the extension requirement, extra workload is imposed on the principal to audit the operator's accounting sheets and set up renegotiations. As a result, transaction costs rise. Agents may also *strategically increase the number of tollbooths*. The number of tollbooths is normally determined in the contract, whereas relevant legislation (the Expressway Law and the Ordinance on the Administration on Toll Roads) stipulates the method of establish the location of tollbooths. However, operator can strategically increase toll income by shortening the distance between payment points. Excess numbers of tollbooths could be easily detected if principals took action. But in practice, this supervision

rarely is undertaken, since monitoring is expensive and time-consuming. Finally, it is common that private operators *strategically reduce maintenance spending*. Regulation on expressway maintenance in China is classified in four types: routine maintenance; periodic maintenance; special maintenance; and amelioration maintenance. Currently, according to officials of the Department of Communication in Liaoning Province, only amelioration maintenance can be safeguarded. This is because when amelioration maintenance is due, the government will join and provide technical and managerial support for private operators and monitor their work. But for routine and periodic maintenance, transaction costs of monitoring are deemed too high. Therefore, the operators then have more opportunities to behave strategically and to reduce the frequency of maintenance activities. As a consequence, the road condition tends to deteriorate.

The China Audit Office (2008) reveals many examples of moral hazard problems during project operation and maintenance. It writes that the most serious problem in China is the increase in the number of tollbooths. The investigation was conducted in 18 provinces, and 16 of them turned out to face these issues. The figures indicate that in these 16 provinces, 158 illegal tollbooths were detected (that is, without license permits) and until late 2005 the incurred user fees from them amounted to 14.9 billion Yuan. It was estimated that if these illegal tollbooths had not been cancelled, operators would have charged 19.5 billion Yuan extra until the expiry dates of their operating rights. And for some expressways the charging periods of which have not yet expired, still 66 illegal tollbooths are still operating.

These empirical findings were mainly found in listed reports and through face-to-face interviews with relevant experts and policy makers in China. They showed what types of strategic behaviour exist in the processes of tendering, construction, maintenance and operation for PPP expressways in China. In the next section, we will present three specific cases that supplement the empirical findings.

4. Case studies

In this section, we extend the empirical research by studying three Chinese expressway cases (figure 3). Theoretically speaking, methodologists are strict with the selection of cases in analytical and comparative research in terms of their critical and representative properties. But in reality it is to some extent hard to access ideal cases illustrating all the aspects of the preceding discussed theory. Here, the selection of cases is based on other grounds, including the availability of data and empirical materials; the practical feasibility of content analysis; and the accessibility to the interviewees. The selected cases are Shen-Da expressway in Liaoning; Citong bridge in Fujian; and He-Chao-Wu expressway in Anhui, in three different provinces all over the country.

4.1 *The Shen-Da expressway in Liaoning province*

The Shen-Da Expressway connecting Shenyang and Dalian (Shen and Da) is the first expressway in China that was planned in early 1980s and adopted the Build-Transfer (BT) model in its construction (figure 4). Its construction started in 1984 and was completed in 1990 with a total length of 375 km, including 27 interchanges, 148 bridges, 451 culverts, 7 rest areas and 7 control centres. It has political significance because it enhances regional economic development by connecting the two major cities in Liaoning with each other. It was designed with 4 lanes for both directions initially in 1980s, and after 10 years operation, in 2000, the traffic volume had reached 6739 cars per day with yearly traffic amount increase by 11.8%, and thus the traffic amount in 2000 has been already 20613 cars per day. Confronting such an increase in traffic volume, the expressway was widened into 8 lanes for bidirectional carriageways in 2002 after careful evaluations in terms of costs and benefits by Liaoning People's Government and Liaoning Department of Communication. After 3 years, the expressway opened again in 2005 with fully

new constructed lanes and supporting facilities such as new rest areas and computerized monitor systems.

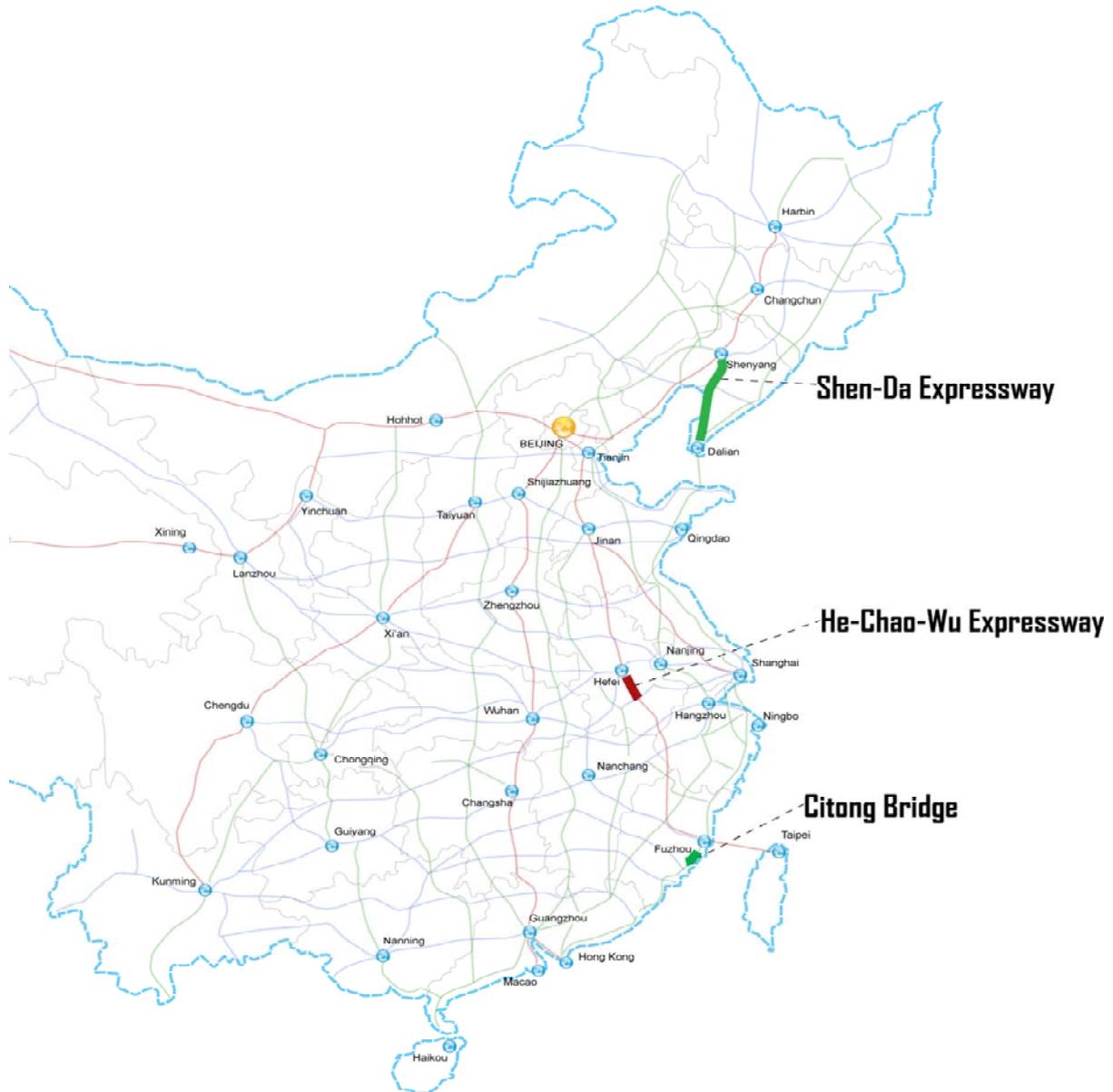


Figure 3. The Chinese plan for expressways and the selected cases



Figure 4. Shen-Da expressway

The Liaoning Department of Communication commissioned the Liaoning Transportation Plan and Design Institute to carry out an inspection of the project quality 10 years after the road opened in 1990. The inspection results showed that the minimum surface deformation value

along Shen-Da expressway was 40, which was much larger than the designed maximum value of 30. And over a stretch over 174 km of the expressway, a deformation value of around 70 was found, another 137km with a deformation between 70 and 120, and another 38km with a deformation higher than 120. Furthermore, after examination it appeared that the foundation layers of some parts of the expressway were thinner than the designed value and that the asphalt layer and the foundation layer had been separated from each other. Finally, 222 jerry-build locations were demonstrated where construction elements had not been built according to the technical terms defined in the contract.

Logical analysis would show the following. First, adverse selection of the contractor may cause serious problems during project design, construction and operation. In this case, the constructors of the old expressway and the new one were the same state-owned road construction corporation and they were automatically appointed for the job. The selection process was not based on competitive tendering and consequently no comparisons were made by the government to choose the optimal constructor. Second, after the constructor selection, moral hazard problems must have taken place in the construction process. Because of the lack of good incentives and the absence of monitoring, 222 jerry build locations were found. During the construction of the old expressway, the state-owned enterprise lacked accountability for project quality, and although the consequences were not detected at project completion in 1990, they led to serious problems further down the road. During reconstruction and extension of the old road, this state-owned enterprise thus exerted greater efforts in dealing with the previously existing quality problems.

4.2 The Citong bridge in Fujian province

At 1503 meters, the Citong Bridge is one of the largest bridges in Fujian province with 6 lanes for both directions and the technical classification as expressways crossing the Jin River and is the first bridge that applied Build-Operate-Transfer (BOT) model in China (figure 5). The crossing is located approximately 10 kilometers downstream of the existing Quanzhou Bridge and traverses the Jin River at the point where the river is 22 meters wide. The bridge links the outside areas of the Quanzhou city with the inside areas. It currently lacks the connections with nearby national highways and expressways.



Figure 5. Citong bridge

The construction of the Citong Bridge was completed in late 1996 and then entered the operating stage. Just in the year 1997, the toll incomes had reached 0.1 billion Yuan and the profits in the future were very promising for the Mingliu Corporation, the private contractor selected for the construction and operation of this bridge. However, this good performance did not last long because of the Quanzhou Bridge which is operated by the Quanzhou local government. Competitions thus evolved between these two bridges for traffic flows. Facing the substantive amount of tolls, the Quanzhou local government wanted to set its monopolistic position over the traffic flows and thus make greater revenues from tolls. Therefore, due to the imperfect competition between the two bridges, the Citong Bridge has lost many of its users. Actually, the imperfect competition was caused by government protection of the Quanzhou Bridge with side-policies that systematically favoured Quanzhou bridge traffic at the expense of the Citong Bridge.

The case of Citong Bridge revealed several institutional weaknesses in China, as indicated at the second level in the conceptual model. First, the role of the government in PPP should be criticized because the government also provoked strategic behaviour. The government should provide enough space or opportunities for the private actor when the project enters the operating stage in order to ensure that the private actor will earn back its initial investment on the BOT basis, because it is disastrous for the private actor to complete the project without project demands. In addition, the procedures for making decisions of the government should be clear and transparent in order to ensure that unfair and strategic decisions are absent. And only in this way public interests can be ensured and private actors can be given more confidence when doing business with government. Third, there is an absence of the enforcement of the law against unfair competition. As a consequence, fair competition between the public and private players as is the case here can be impaired by side-policies.

4.3 The He-Chao-Wu expressway in Anhui province

The He-Chao-Wu expressway, located in Anhui province, is one of the infrastructure projects belonging to the nation's eighth five-year plan connecting the hinterland with more developed regions, such as Shanghai and Nanjing. Project construction started late 1992 and was completed in mid 2000. The road leads from Hefei, through Chaohu, and then to Wuhu (He-Chao-Wu) with a total length of 100 kilometer and a total investment of 3.2 billion Yuan. The He-Chao-Wu expressway is a typical project using the Transfer-Operate-Transfer (TOT) model, a variant of the BOT model. The government transfers the operating right within a certain time period to private actor at a lump sum price. After its completion in 2000, the Anhui government tried to operate the road by itself, but with the fiscal pressures for its maintenance and construction of other new roads, the government chose to transfer its operating rights to the private operator, Shanghai Eastern Holdings Limited (SEHL), with a lump sum payment in 2003.

In 2008, the National Audit Office of China reported the auditing results for China's toll roads and revealed problems in the He-Chao-Wu expressway. It reported that the operating right of this expressway was transferred in a strategic and nonstandard way, which led to potential operation problems and thus the failure of the corporation between the government and the private operator. According to the National Audit Office, the transfer of the operating right of the He-Chao-Wu expressway led to a more than one billion loss of state capital. In 2003, the operating right was transferred to SEHL at the price of 1.9 billion Yuan with an additional 0.6 billion for maintenance costs. However, after two years, the operating right was bought back by the Anhui Government at the price of 3.58 billion Yuan. The reason for repurchasing was that SEHL had gone bankrupt; the operating right could not be transferred to other third parties; and the government wanted to ensure the continuity of the service. The reason for the loss of state capital is that its asset price evaluation of this expressway was flawed and artificially low. And the false evaluation result was approved by the local government because one of the public officials had accepted bribery from SEHL. As a consequence, SEHL obtained the operating right of the He-Chao-Wu expressway at a very low price.

The evidence of this case shows that the actual use of PPP does not necessarily provide a positive contribution to infrastructures. In contrast, here it created opportunities for public officials for corruption. It indicates that a number of essential institutional preconditions have to be met before PPPs can be fruitfully put in place, according to the second level in the conceptual model. Especially in less developed provinces of a developing country like China, some of these preconditions are lacking. The preconditions, for instance, are the presence of secure private property legislation and solid anti-corruption law.

The above cases showed various forms of strategic behaviour of the private players and/or malpractice of governments, and they revealed a certain amount of institutional weaknesses. Agency theory only emphasizes strategic behaviour that could be evoked by agents because of

asymmetric information. However, apart from those strategic actions on the part of the private players, we also came across public principal malpractice. Therefore, strategic behaviours are not only applicable to private players but also is present among governments.

5. Institutional incentives/cures for strategic behaviour

Strategic tendering through collusion among bidders never happens in a vacuum. To a large extent, collusion reflects anticipation to reactions from the tendering environments. The friendlier the environment is to such actions, the more likely is the emergence of collusion. Therefore, an environment with adequate incentives penalizing collusive behaviour needs to be built up. We therefore now turn to level 2 of our multi-layered conceptual model and formulate some possible regulatory action which the Chinese law-makers can adopt.

First, we recommend a credible increase in the penalties for collusion attempts, proportional to the potential benefits from collusion. Since the motivation of collusive bidders is the potential benefit gained from their collusive actions, an increase in the venture costs of such behaviour relative to their potential benefits will discourage bidders from colluding because they will be subject to high risk of dramatic losses. The more costly such actions are, the less they will be attempted. Ways to raise venture costs may include setting up a disclosure system and awarding extremely heavy penalties. Bidders whose collusion is disclosed will suffer from high penalties involving not only economic punishment, but also administrative and legislative sanctions. Administrative and legislative sanctions may include the prohibition to attend future project tenders for a certain period of time (Feng, 2005; Song, 2005; Sun, 2007). In China, such a disclosure-penalty system has recently been set up, the Administration Ordinance on Strategic Behaviour in Tendering, which was enacted January 1st, 2009. The challenge, that is to prove collusion, is also mentioned in this Ordinance. It stipulates that the contractors, whose collusion has been proven, should be sent to provincial or national legal departments and charged with the crime of disrupting orderly tendering procedures and influencing the tendering results.

Another effective countermeasure is to insist on a broad range of bidders, and if possible, to cover a larger territory. Tendering under a small group of bidders will increase the possibility of collusion because it creates an easy environment for bidders to communicate with each other. The information obtained through such strategic communication gives bidders an advantage over the government during the tendering process, making collusion more likely. Having a broad range of bidders makes this much more complicated. In addition, bidders in other regions where the project is not located need to be invited because in some regions bidders know each other too well. Strategic communication and exchange of information can evolve almost naturally. One shortcoming of this method is that it will increase transaction costs of the tendering process because of an increase in the number of submitted documents (Song, 2005; Sun, 2007; Li et al 2007).

We also recommend the use of 'semi-transparency policy' which entails that the government knows all the bidders, while each single bidder does not know who the other bidders are. One effective measure to avoid strategic behaviour is to reduce information advantages of the agents. Thus the bidders are insulated from each other and operate back-to-back. Here, "semi-" does not mean that the tendering procedures and selection criteria are opaque to the government, but means that information between the government and bidders is one-way and favours the principal. In China, few project tenders have adopted this insulated manner to select a contractor, but we hope its popularity will grow (Li et al, 2007).

The fourth recommendation is to adopt a multi-dimensional evaluation method to determine the optimal contractor, which depends on multiple aspects of the various bids. The advantage behind this approach is to establish whether the bidder is cheating or not. Here, evaluation is done not only by means

of comparisons among bidders (horizontal dimension), but also by intra-bid comparisons (vertical dimension). The function of intra-bid comparisons is to examine whether the bid price submitted is consistent with the bidder's technological and management capabilities. If there is a substantial gap between the bidding price and the actual price according to the bidder's capacities, then likelihood of cheating is overwhelming. Currently in China, vertical evaluation of bidders is rare (Song, 2005).

Moral hazard during the construction phase is a key problem, since it delivers lower infrastructure quality and requires higher spending on maintenance. Not least, it affects safety negatively. Below, we propose some suggestions for more adequate incentives on this aspect.

First, we propose fixed-price contracts with periodical payments by the government. In China, fixed-price contracts are applied in most provinces, offering the formula of 0/100 (principal/agent) in the case of a fixed-price incentive contract. Therefore, incentives for cost-saving are not a problem, but when the constructor realizes that it is unable to make profits from a project as a result of bad cost management, it may unilaterally give up the project. And because of information asymmetry regarding actual project costs, the government may not be able to retrieve the initial investment. Therefore, we recommend using a short-term periodical payment system, in which the government pays the constructor for its work monthly after evaluating project quality and schedule. In this way, the constructor will not strategically terminate the contract because it may only obtain the amount of payment according to the work done. Even if the constructor terminates the contract, the government might continue the project by contracting with others. Also, *incentives to jerry-build can be reduced through employing a construction monitoring group to ensure project quality.* Construction monitoring may be effective in supervising project quality and provide technical support for the constructor. In China, expressway construction has been regulated in that construction cannot start until the monitoring group is ready. A construction monitoring group that has advanced expertise in building techniques and technologies is able to prevent jerry-build by the constructor. However, a new problem may appear. The relation between the government and the monitoring group can also be seen as a principal-agent relation and thus the government may be subject to moral hazard by the monitoring group as well. There is even the possibility that the constructor and the monitoring group collude with each other. Therefore, a complementary measure can be suggested, known as *the policy of personal lifetime project liability*. It aims at making individuals carry lifetime liability for what they have done in projects. Such a method can be a strong incentive for them to be accountable during their construction and monitoring activities. For instance, if a project suffers from quality issues during the later operation phase, and jerry-builds have been proven, both the company and the responsible individual can be prosecuted.

Because of the long duration of operation contracts, principals face a hard time monitoring operators' performance. Under such conditions, relational contracting and reputation policies can provide the right incentives for operators to behave accountably. In addition, we recommend public hearings either as an independent solution for motivating operators to face user feedback. Firstly, through the adoption of *"reputation policies" and "relational contracting"* (Williamson, 1996a, 1996b, 1998, 2000, 2008), a reputation credit mechanism is built up, which shows a record of the agent's reputation linked to its past performance. Such an account may indicate to what extent each private contractor can be trusted for future projects. And the private contractor linked to a reputation account can be assumed to act more cautiously because morally hazardous behaviour will reduce its standing and influence its involvement in future projects. Therefore, reputation policies are more probable to make the contractor think twice and take a long-term view. In relational contracting, continuity in mutual relations is emphasized hopefully leading to higher trust levels between the partners and better understanding among both sides of relevant issues during contract implementation. Secondly, we recommend *a system for public hearings*, because the public is the direct beneficiary of road infrastructures and directly feels the effects of the agent's

service quality. It is unusual to hear the public voice in China, since no institutional facility exists through which road users can express their opinions. However, road users are quite likely to be the best monitoring organ and could effectively relay messages on poor service or doubtful road quality to the principal reduce its transaction costs and induce corrective action.

6. Implications for Europe

Strategic behaviour is rife in institutional environments that are undergoing transition and/or where rules of the game have been formulated in ambiguous and contradictory fashions (Künneke and Groenewege 2005; Künneke, Groenewegen and Auger 2009; ten Heuvelhof e.a. 2009). Moreover, when trust levels are low, confidence in fruitful collaboration between players and faith in the other side not abusing one's own foibles are below certain thresholds, making constructive common enterprises far harder. To cut a long story short, such conditions prevail in expressway management in the People's Republic of China. Culturally speaking, trust must be considered rather low in the Chinese context (level 1 in figure 2). The regulatory framework is undergoing rapid improvement, but still showing omissions and contradictions (level 2 in figure 2). Consequently, when it comes to the processes of tendering, construction, operation and maintenance for expressway infrastructures (levels 3 and 4 in figure 2, which we have focused on), strategic behaviour is bound to arise, as seen in sections 3 and 4. Finally, in section 5 we have given suggestions for law-makers to forestall or mitigate them at level 2.

Apparently, necessary legal safeguards are not yet in place in China, although they are underway (Mu 2008). Most European countries rank higher on the Transparency International list than the PRC and can therefore safely assume that some gross examples of misconduct and corruption will not exist here. But although the existence and morphology of strategic behaviour in road management has not been mapped to the same extent as it has been done here for China, previous publications (OECD 2005, 2007; Transparency International 2005; Independent Evaluation Group of World Bank 2006; World Bank 2005) already indicate that strategic behaviours in construction project contracting are not a unique problem for poor countries; industrialized nations from United States to European member states have also faced such problems in their infrastructure sectors. Unsurprisingly, competition for government contracts can be fierce, which drives healthy economic activities forward. On the other hand, it also makes public procurement a hotbed for serious bribery and collusion. Global efforts, therefore, have been made to fight against strategic behaviours and promoting the performance of public projects. Furthermore, previous research shows that even in countries as spotless as Sweden, severe cases of constructor collusion have been found and confirmed (De Jong 2005). Public tendering for infrastructure construction in the Netherlands has undergone serious scrutiny in recent years when parliamentary investigation committees conducted studies on fraud scandals and staggering cost overruns in the construction of various mega-projects (Priemus et al, 2008). Since the above two countries enjoy high positions on the TI list and are considered to have high trust levels, it must be feared that countries with less favourable reputations in Europe in this regard, such as Italy and Bulgaria, will encounter phenomena not far removed from what we saw before in the Chinese context. We therefore recommend a replication of the above empirical study for a set of European countries. We expect that at levels 1 and 2, cross-national variation will be found, where some nations enjoy higher trust levels (level 1) and more sophisticated institutional frameworks against constructor malpractices (level 2) than others. At levels 3 and 4, they expect largely the same types of strategic behaviour, but these may take different shapes and different degrees of harmfulness depending on what levels 1 and 2 look like for each country.

Strategic behaviour as we have observed it in this article is persistent, often pernicious and complicated to weed out. Eventually, the road user and tax-payer suffer the consequences. Devising legislation allowing for more transparency and consistency and filling contracts with

clever incentives are important steps towards enhancing the quality of decision-making and project management. We hope that our map of types of strategic behaviour can help devise such intelligent institutions and contracts, by indicating where corrective actions are needed to curb excesses of information symmetry and target costly monitoring efforts where they are most needed.

Appendix 1 Interviewees

1) The Ministry of Communication, Beijing, China

Hua Li - Vice Head of Road Transportation Department

2) China's Research Institute of Road Transportation Development, Beijing

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3) Liaoning Department of Communication, Shenyang, Liaoning Province

Jian Shi - Head of Road Design Section, Tel: +86 13804998028

4) Liaoning Institute of Road Design and Plan, Shenyang, Liaoning Province

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Chao Wang - Associate Engineer of Road Design, Tel: +86(0)24 88110718

5) Expressway Project Tendering Committee, Shenyang, Liaoning Province

Hui Wang - Head of Tendering Department

6) Communication Bank of China, Liaoning Branch

Shuguang Tan - Head of the Lending Department

7) Agriculture Bank of China, Liaoning Branch

Wenqi Han - Head of the Lending Department, Mobile phone: +86 13804995209

8) Liaoning Lijie Consultancy Firm, Dalian, Liaoning Province

Li Liu - Chairman Board, E-mail: liuli@cnpmi.com

Yushan Liu - Standing Director, E-mail: lyslndl@163.com

References

Andreas, B., Thorsten, B., Maria, H., and von Hirschhausen, C. (2005). Public-Private Partnership in new EU member countries of central and Eastern Europe. An economic analysis with case studies from the highway sector. *Public sector management and regulation working papers*, Vol. 10, No. 2. pp. 82-112.

Andriani, B., Lignieres, P. and Ratledge, S. (2006). PPP in France. Linklaters Publishing, Paris. Available online: www.linklaters.com/pdfs/publications/projects/pppfranceoct06.pdf (last accessed January 2010)

Bauer, J. M, and Herder, P. M. (2009). Designing social-technical systems. In: Gabbay D. M., Thagard P., and Woods J. (eds). *Handbook of the philosophy of science*. Elsevier, UK.

Buckley, P.J. and Michie, J. (1996) *Firms, organizations and contracts: A reader in industrial organizations*. Oxford University Press, Oxford, UK.

Bstieler, L. and Hemmert, M. (2007). Developing trust in vertical product development partnerships: A comparison of South Korea and Australia. *Journal of World Business*, Vol.43, No.1, pp. 35-46.

Caers, R., Boi, C., Jegers, M., et al (2006). Principal-agent relationships on the stewardship-agency axis. *Journal of non-profit management and leadership*, Vol.17, No.1, pp.25-47.

Chang, M., Frankel, B. and Choi, J.Y. (2005). Public-Private Partnerships: lessons learnt. Presentation given for PPP Centrum, Prague, Czech Republic. Available online: <http://www.pppcentrum.cz/res/data/000091.pdf> (last accessed January 2010)

China Audit Office (2008). Audit report on the Chinese toll roads (in Chinese). National Audit Report No. 26. China Audit Office Publishing. Beijing. China. Available online: www.audit.gov.cn/n1057/index.html (last accessed January 2010)

China Statistic Bureau (2007). Year book of China transportation and communications, 2007. China Statistics Press. Beijing. China. Available online: www.stats.gov.cn/tjsj/ndsj/2005/indexch.htm (last accessed January 2010)

Dang, S. and Zu, Y. (2006). Qualification of the bidders during the tendering process (Chinese with English title and abstract). *Journal of Coastal Enterprises and Science and Technology*, Vol. 74, No. 4, pp. 122-123.

De Jong, M. (2005). Van spreektelegraaf naar beeldradio; De rol van de overheid bij technologische transitities in infrastructuurgebonden sectoren, Lemma, Utrecht.

De Jong, M. and Stout, H. (2007). Dutch legal culture and technological transitions; the impact of Dutch government interventions. in: Gessner, Volkmar and David, Nelken (eds). *European ways of law; Towards a European sociology of law*, Hart Publishers, Oxford and Portland Oregon, pp. 327-347.

De Jong, M., Mu, R., Dominic, S., Ma, Y. and Xi, B. (2010). Introducing public-private partnerships for metropolitan subways in China: what is the evidence? *Journal of Transport Geography*, Vol. 18, No. 2, pp. 301-313.

Devapriya, K.A.K. (2006). Governance issues in financing public-private partnership organisations in network infrastructure industries. *International Journal of Project Management*. Vol.24, No.7, pp. 557-565.

Engel, E., Fischer, R. and Galetovic, A. (2003). Privatizing highways in Latin America: is it possible to fix what went wrong? Working paper series No. 866. Economic Growth Centre, Yale University. New Haven CT. USA. Available online: www.econ.yale.edu/growth_pdf/cdp866.pdf (last accessed January 2010)

European Commission (2003). Guidelines for successful public-private partnerships. European Commission, Directorate-general regional policy, Brussels. Available online: http://europa.eu.int/comm/regional_policy/sources/docgener/guides/PPPguide.htm (last accessed January 2010)

European Parliament (2005). Public-Private Partnerships: models and trends in the European Union. Internal Policy Department. European Parliament Publishing. Available online: www.europarl.europa.eu/comparl/imco/studies/0602_ppp_briefingnote_en.pdf (last accessed January 2010)

European Parliament (2006). Public-Private Partnerships: National experience in the European Union. Internal Policy Department. European Parliament Publishing. Available online: www.europarl.europa.eu/comparl/imco/studies/0602_ppp02_briefingnote_en.pdf (last accessed January 2010)

Feng, P. (2005). A preliminary research into bad behavior of construction project bid and countermeasure of preventing and curing (Chinese with English title and abstract). *Journal of Zhejiang Wanli University*, Vol.18, No.4, pp. 89-91.

Flyvbjerg, B., Bruzelius, N. and Rothengatter, W. (2003). *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge, Cambridge University Press.

Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Prosperity*. Free Press, New York, USA.

German Institute of Urban Affairs (2006). Public-Private Projects in Germany. A survey of current project at federal level and municipal level. Research paper commissioned by PPP task force at the federal Ministry of Transport, Building and Housing. German Institute of Urban Affairs Publishing, Berlin. Available online: www.difu.de/english/occasional/06ppp.pdf (last accessed January 2010)

Grimsey, D. and Lewis, M. (2002). Evaluating the risks of public private partnerships for infrastructure projects. *International Journal of Project Management*, Vol.20, No.2, pp. 107-118.

HM Treasury (2003). Public services: meeting the productivity challenge. A discussion paper for HM Treasury. HM Treasury Public Enquiry Unit, London, UK. Available online: www.hm-treasury.gov.uk/d/adpubserv304kb03.pdf (last accessed January 2010)

HM Treasury (2005). Managing risks with delivering partners. A guide for those working together to deliver better public service. Research paper of HM Treasury for improving government's risk handling. Office of Government Commerce. HM Treasury, London, UK. Available online: www.hm-treasury.gov.uk/d/managingrisks_deliverypartners.pdf (last accessed January 2010)

Hodge, G. and Greve, C. (2005). *The Challenge of Public Private Partnerships. Learning from International Experience*. Edward Elgar, Cheltenham.

Huang, Y. (2007). Problems in and countermeasures for tendering and bidding management of construction engineering project in China (Chinese with English title and abstract). *Journal of Building Construction*, Vol.29, No.5, pp. 378-379.

Independent Evaluation Group of World Bank (2006). Governance and anti-corruption. Ways to enhance the World Bank's Impact. Evaluation Brief 2. Knowledge & Evaluation Capacity Development. World Bank Publishing. Washington DC. USA. Available online: siteresources.worldbank.org/INTOED/Resources/governance_anticorruption.pdf (last accessed January 2010)

Jensen, M.C. (2000). *A theory of the firm: Governance, residual claims, and organizational forms*. Harvard University Press, Massachusetts, USA.

Jensen, M.C. and Meckling, W.H. (1976). Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, Vol.3, No.4, pp. 305-360.

Koppenjan, J.F.M. (2008). Public-private partnerships and mega-projects. In: Priemus, H., Flyvbjerg, B., van Wee, B. (Eds.). *Decision-making on Megaprojects: Cost-Benefit Analysis, Planning and Innovation*. Edward Elgar Publishers, Cheltenham.

Künneke, R.W. and Groenewegen, J. (2005). Process and Outcomes of the Infrastructure Reform: An Evolutionary Perspective. In R.W. Kunneke, A.F. Correlje, J.M.P. Groenewegen (Eds.). *Institutioneel Reform, Regulation and Privatization*. Edward Elgar Publishing, Cheltenham.

Künneke, R.W., Groenewegen, J. and Auger, J. (2009). *The governance of network industries: Institutions, technology and policy in reregulated infrastructures*. Edward Elgar, UK.

Laffont J. and Tirole J. (1998). *A theory of incentives in procurement and regulation*. MIT Press, Cambridge, USA.

Levainen, K. and Altes, W.K. (2005). Public-Private Partnership in land development contracts-a comparative study in Finland and in the Netherlands. *Nordic Journal of Surveying and Real Estate Research*, Vol.2, No.1, pp.137-148.

Li, B., Akintoye, A., Edwards, P.J. and Hardcastle, C. (2005). Critical success factors for PPP/PFI projects in the UK construction industry. *Construction Management and Economics*. Vol.23, No.5, pp. 459-471.

- Li, J., Li, W. and Xiong, Q. (2007). Strategies for increasing competitiveness of the public tendering (Chinese with English title and abstract). *Journal of Sichuan Building Science*, Vol.33, No.2, pp. 179-181.
- Liu, J. (2000). Discussion on “jerry-build” problems in project construction (Chinese with English title and abstract). *Journal of Southern China Highways*, Vol.25, No.4, pp. 68-72.
- Miller, R. and Lessard, D. (2000). *The strategic management of large engineering projects. Shaping Institutions, Risks and Governance*. MIT Press, Cambridge, USA.
- Ministry of Economy and Finance of Greece (2006). Guide for the implementation of public-private partnership in Greece. Ministry of Economy and Finance of Greece Publishing. Athens. Available online: www.sdit.mnec.gr/export/sites/sdit/en/infopoint/implementation/ppp_guide_en_final.pdf (last accessed January 2010)
- Ministry of Foreign Affairs of Denmark (2006). Corporate social responsibility: support facilities in the public-private partnership programme. Ministry of Foreign Affairs of Denmark Publishing. Copenhagen, Denmark. Available online: www.amg.um.dk/NR/rdonlyres/7C67FB92-9F8F-476B-8867-A5216E6434A1/0/PublicPrivatePartnershipProgramme.pdf (last accessed January 2010)
- Mu, R. (2008). *Public-private partnerships and the management of expressways in China: An agency theory approach*. Master Dissertation. Delft University of Technology, Delft, The Netherlands.
- North, D.C. (1990). *Institutions, institutional change and economic performance*. Cambridge University Press, New York. USA.
- OECD (2001). Private initiatives for corporate responsibility: An analysis. Directorate for Financing, Fiscal and Enterprise Affairs. Working Paper on International Investment. OECD Publishing, Paris. Available online: www.oecd.org/dataoecd/46/42/2074991.pdf (last accessed January 2010)
- OECD (2002). Competition and efficiency in publicly funded services. OECD Economic Studies No.35. OECD Publishing. Paris. Available online: www.oecd.org/dataoecd/42/36/22027701.pdf (last accessed January 2010)
- OECD (2005). Fighting corruption and promoting integrity in public procurement. OECD Publishing, Paris.
- OECD (2007). Bribery in public procurement. Methods, actors and counter-measures. OECD Publishing, Paris.
- OECD and International Transport Forum (2008). *Transport Infrastructure Investment. Options for efficiency*. OECD Publishing, Paris. Available online: www.oecdbookshop.org/oecd/display.asp?K=5KZRCZ5C919Q&CID=oecd&LANG=EN (last accessed January 2010)
- Ouyang, X. (2007). Enhancement on quality management during project construction (Chinese with English title and abstract). *Journal of Coastal Enterprises and Science and Technology*, Vol.88, No.9, pp. 167-168.
- Pakkala, P., De Jong, M. and Aijo, J. (2007). International overview of innovative contracting practices for roads. Tiehallinto/TU-Delft/Ramboll, Helsinki/Delft.
- Parker, D. and Hartley, K. (2003). Transaction costs, relational contracting and public private partnerships: a case study of UK defence. *Journal of Purchasing and Supply Management*. Vol.9, No.3, pp. 97-108.
- Price WaterHouse Coopers (2008). Building new Europe’s infrastructure: Public private partnerships in Central and Eastern Europe. Engineering & Construction. Price WaterHouse Coopers, Publishing. Available online: www.pwc.com/en_GX/gx/engineering-construction/assets/building-new-europe-infrastructure.pdf (last accessed January 2010)

Priemus, H., Flyvbjerg, B. and van Wee, B. (2008). *Decision-making on Mega-projects: Cost-benefit Analysis, Planning and Innovation (Transport Economics, Management and Policy Series)*. Elgar Edward, UK.

Qiao, L. (2008). Influence of asymmetric information on tendering for construction projects (in Chinese with English title and abstract). *Journal of Liaoning Administration College*, Vol.10, No.2. pp. 77-78.

Ragunthan, V. (2007). *Games Indians Play – Why we are the way we are*. Penguin Books Publishing, UK.

Smyth, H. and Edkins, A. (2007). Relationship management in the management of PFI/PPP projects in the UK. *International Journal of Project Management*, Vol.25, No.3, pp. 232-240.

Song, Y. (2005). Analysis of surround-bidding and accompanying-bidding in construction project bidding (Chinese with English title and abstract). *Journal of construction management modernization*, Vol.85, No.6, pp. 43-46.

Sun, H. (2007). Strategic behaviors and countermeasures in project tendering (Chinese with English title and abstract). *Journal of China Municipal Engineering*, Vol.128, No.4, pp. 69-70.

Teegen, H. (1998). Authority and trust in cross border partnership: Mexican firm perspectives. *Journal of International Management*, Vol.4, No.3, pp. 223-239.

ten Heuvelhof, E. F. (2009). *Strategic behaviour in network industries*. Edward Elgar, UK.

Transparency International (2005). *Global corruption report 2005*. Pluto Press Publishing, London. UK.

Transparency International (2007). *Why study PPP (Public-Private Partnership) with caution? PPP projects in the Czech Republic: implementations and risks*. Transparency International Publishing, Prague, Czech Republic.

Walker, R. et al (2007). Managing risk: Risk perception, trust and control in a Primary Case Partnership. *Social Science and Medicine*. Vol.64, No.4, pp. 911-923.

Wei, X. (2001). "Bean curd" projects and their quality examination (Chinese with English title and abstract). *Journal of Architecture*, Vol.11, No.1, pp. 16-17.

Williamson, O. E. (1996a). *The mechanisms of the governance*. Oxford University Press, New York, USA.

Williamson, O. E. (1996b). *Transaction-cost economics: The governance of contractual relations. Firms, organizations and contracts*. Edward Elgar, USA.

Williamson, O. E. (1998). Transaction cost economics: How it works; Where it is headed. *De Economist*, Vol.146, No.1, pp. 23-58.

Williamson, O. E. (2000). Public and private bureaucracies: A transaction cost economics perspective. *Journal of Law, Economics and Organization*, Vol.5, No.1, pp. 306-342.

Williamson, O. E. (2008). Outsourcing: Transaction cost economics and supply chain management. *Journal of supply chain management*, Vol.44, No.2, 5-16.

World Bank (2005). *Public service delivery. Public sector governance and accountability series*. World Bank Publishing, Washington DC, USA.

World Bank (2007). An Overview of China's Transport Sector. Eastern Working Paper No.15. Transport, Energy and Mining Sector Unit, Sustainable Development Department, East Asia and Pacific Region. World Bank Publishing. Washington D.C. USA. Available online: www.worldbank.org/eaptransport (last accessed January 2010)

World Bank and Economic Commission for Africa (2003). Public sector management reforms in Africa: Lessons learnt. Research paper of the Development Policy Management Division, Economic Commission for Africa. Economic Commission of Africa Publishing, Addis Ababa, Ethiopia. Available online: www.uneca.org/publications/dpmd/public_sector_mangt.pdf (last accessed February 2010)

World Bank and Public-Private Infrastructure Advisory Faculty (2004). *A country framework report: Private solutions for infrastructure in Lesotho*. World Bank Publishing, Washington DC, USA.

World Bank and Public-Private Infrastructure Advisory Faculty (2005). *A country framework report: Private solutions for infrastructure in Angola*. World Bank Publishing, Washington DC, USA.

Zheng, H., De Jong, M., Koppenjan, J. and Qi Z. (2010). Applying policy network theory to policy-making in China: The case of the urban health insurance reform, to appear in: *Journal of Public Administration*. (in press)

Zu, L. (2005). Problems in and countermeasures for the pre-qualification in tendering process (Chinese with English title and abstract). *Journal of Optimization of Capital Construction*, Vol.26, No.5, pp. 44-45.