Transaction cost in PPPs project: exploration of influence factors for both public and private sectors in different countries with whole life cycle

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Abstract: The transaction cost in Public-Private Partnerships (PPPs) project is an inevitable issue due to the long-term contract and complex interests. This research aims to explore the influence factors of transaction cost via public or/and private perspectives with developed and developing economics in the whole project life cycle. Literature review is adopted as the research method to study the transaction cost issue and provide a new perspective of transaction cost via distinguishing private and public sector in PPPs project. The research finds that the influence factors of transaction cost exist from preparation phase to operation phase, which include the following 11 dimensions: Improper allocation of risks; Lack of enough experience and knowledge for government staffs; Ex-post assessment; Lack of complete standards and regulations; Design flaw; PPPs’ inherent character; Government condition; Quality of project brief; Government’s serious investigation; Investment climate; Integrity and enforcement of contract. The research finds that, in different economics, the above 11 factors impact public and private sector in distinct way, and by understanding the factors how to influence the transaction cost will help PPPs participations manage and control the potential cost and risk better.

1. Introduction
When the private investment works efficiently with public infrastructure, it not only can improve the city environment but also promote economic growth (Estache, 2004) [1]. Hence, Public-Private Partnerships (PPPs) project is accepted by more and more countries, especially in many developing countries with the enormous demands of infrastructure construction. According to the definition provided by the World Bank (2017), PPP is a perennial contract involving government department and private sector, for offering a public asset or service, in which project risk and responsibility of management should be undertaken by private sector, and its reward is related to the performance [2]. The World Bank (2017) divides PPPs, by sector, to transport, water and waste, power and social infrastructure, which cover most basic necessities of life [2]. The research mainly focusses on transaction cost problem of the greenfield project, and mainly aims at Design-Build-Finance-Operate-Maintain (DBFOM) and Build-Operation-Transfer (BOT) contracts in PPPs.

The concept of transaction cost first appeared in 1937, from the paper “The Nature of the Firm” wrote by Ronald Coase (Williamson, 2010) [3]. Williamson (2010) states that once the idea of transaction cost is considered, it will be like opening Pandora’s box: the transaction cost existing in everywhere [3]. Although, the mode of PPPs project is different from the principle of vertical integration in firms, actually, the PPPs project, basing on the theory of Coase and Williamson, can be regarded as an outcome by considering the transaction cost from a new perspective. The government is like the firm
in the theory of Coase and the private sector can be considered as market. The governments adopt PPPs to reduce investment, which, in a certain extent, indirectly reduce the transaction cost by transfer risks. However, during the tendering phase, the transaction cost will be produced for all partners in each PPPs project, rather only for government (Sobiech-Grabka, 2018) [4]. Furthermore, in fact, PPPs project is not once-for-all deal because, in the whole life cycle of a PPPs project, there are many phases that may produce potential transaction cost. Hence, the transaction cost will run through the whole project life cycle for both public and private sectors. Some measures can reduce transaction cost and others, on the contrary, may lead to a raise.

Also, the transaction cost, in construction project, can be divided into pre-contract transaction cost and post-contract transaction cost (Li et al., 2014) [5]. In the following section, both of above classifications will be used for locating the phase that different influence factors may occur and understanding better. Many academics and organization have classified and named distinct phases during a PPPs project. For example, Demirel et al. (2016) discuss the flexibility in PPPs contract by pre-contract and post-contract [6], and Thomas et al. (2003) indicate that there are four crucial stages in PPPs project: development, construction, operation and project life cycle stage [7]. Also, the World Bank (2017) claims that there are five core functions in PPPs project: design, build or rehabilitate, finance, maintaining and operation phase [2]. However, to unify classification and easily locate transaction cost in different stage, this research divides the whole PPPs life cycle into four phases, which are preparation phase, negotiation (contract) phase, implementation (design and build) phase and operation phase. The preparation phase mainly includes work of project brief, feasibility investigation of PPPs and tender. Drafting contract, award of contract and all negotiations around this assemble the negotiation phase.

Exactly, because of so many phases and in which there also includes a number of different stakeholders with distinct goals, such as the government, private investors, downstream suppliers, surrounding communities and future users, the issue of transaction cost is evitable for both public and private sectors to implement a PPPs project under such complex circumstance. In terms of the research on transaction cost and PPPs, there are many researchers trying to complete it. Gerstlberger and Schneider (2013) state that the transaction cost of PPPs project is far more than a traditional project, on the account of increase of procuring, monitoring and enforcing contract [8]. Sobiech-Grabka (2018) adopts conjoint analysis method to identify the factors in sunk cost prevent [4]. In addition, Carbonara et al. (2015) develop a decision model for government to minimize the transaction cost during the tendering stage [9]. Liu et al. (2016) study the critical factors that may influence the efficiency during bidding phase in PPPs by comparison of China and Australia [10]. Maktabi (2014) indicates that during implementation of PPPs project, poor governance and institutional capacity, and insufficient regulatory and legal framework are the key influence factors for successful completion [11]. However, few of published researches both focus on transaction cost for public as well as private sectors in terms of whole life cycle, and discuss the influence factors by countries or areas. To achieve sustainable development of infrastructure, the whole life cycle must be considered, which not only may save the cost but also can reduce the damage of natural environment. Each country has its special condition. Therefore, due to different economic level and regime, the cause and situation of transaction cost may be totally different, which should be discussed separately. It will help people understand how the PPPs project is affected by transaction cost and explore how to control the effect.

2. Influence factor of transaction cost from the prospective of public sector

2.1. Improper allocation of risks

Risk transfer is innate character of PPPs, which can be regarded as a right belonging to government. However, when public sectors exercise right, how much degree they allocate is a crucial problem for controlling transaction cost. Jin and Doloji (2007) states that more and more governments realized as cooperation partner in PPPs, they must retain a part of risks instead of undertaking nothing [12]. If the allocation of risks is unadvisable for each stakeholder, the transaction cost for public part may secretly increase, which mainly exists in the preparation and negotiation phase. In some developing
countries, the governments want to take all advantage of the bargain and transfer nearly all of risks to private sector, which looks more like plunder than trade. This behavior may seem like a gain for public sector, but in fact, it’s most possibly loss. Hayford (2006) indicates that the impertinent transfer of risk usually shows a fluctuation in the form of price [13]. Also, the cost for public may exceed the prospective price, which is caused by transferring overmuch risks from public to private part (Thomas et al., 2003) [7]. Even, the private sector may perpetrate a fraud on implementation phase. They may use secondary materials to replace the requested one, or install cheaper facilities, which will damage the interest of both government and end users. Furthermore, if the risk allocation is excessive for private participations during the negotiation phase, the negotiation duration will be longer than they otherwise would have, which results in indefinitely postponing of project and then rocketing the transaction cost. This issue is not obvious in developed countries, which may attribute to their mature PPPs market, such as thorough framework and integrated relevant law, and rich experience.

2.2. Lack of enough experience and knowledge for government staffs

Extensive work experience is important for successfully control the transaction cost, because implementation of PPPs project is a quite complex work. In addition, the project is professional and cross-disciplinary, which may involve civil engineering, finance and legislation, so that fund of knowledge is another required characteristic for PPPs personnel. This situation mainly occurs in developing countries. For example, countries like Mali and Togo have hardly any experience on PPPs project (World Bank, 2016) [14]. Hill and Collins (2004) describes that lack of professional training on financial and legal area is a serious issue for Indian government officers [15].

Especially in preparation phase, if the public personnel don’t have required background, the quality of project brief will be influenced, which may result in unclear requirement and then misunderstanding information. In the situation, the public sector has two choices. The first choice is that they can continue to use their incompetent officers, and hiring specialized corporation to fill the gap is another choice. However, either option will add transaction cost to public sector, and how they make decision on this selection can depend on transaction cost theory.

2.3. Ex-post assessment

Ex-post mains that the public sector executes a series of assessments and evaluations for the PPPs project in operation stage or after transfer. This measure may increase the cost for now but, in the future, the transaction costs of public sector may decline attributing to the assessment. Hence, the transaction cost mainly increases in the operation phase for existing projects but decreases in whole life cycle for unborn project. Furthermore, this measure usually be adopted by developed economics, such as UK and Australia.

Ex-post assessment can be regarded as a virtuous circle, which is like the David Kolb’s model (1970) [16]. This model is about learning cycle, and include four stages, which are concrete experience, observation and reflection on the experience, formation of concepts from reflection and new concept testing. In fact, the ex-post assessment does some work with the learning style. The public sector can summarize the reason of success or failure via assessment from projects, and then adjust their policy and strategy for future projects, which can constitute an advantageous cycle. UK government will implement an ex-post assessment for this PPP project after transfer or during the operation stage, which can acquire feedback, and help public sector analysis and summarize experience. For example, the Department for Transport in UK (2016), executes Post Opening Project Evaluations (POPE), which involves baseline data from pre-scheme, 1-year data after evaluation and 5 years after evaluation. Then, the ex-ante forecast will be compared with ex-post data on the areas of journey times, congestion environment and safety [17].

Also, the government can request the private participations to publish or hand in an annual outputs reporter, and it’s better to put this item in the contract, which can avoid transaction cost caused by negotiation. This measure can reduce the public cost and help future PPPs project decrease transaction cost.
2.4. Lack of complete standards and regulations

This factor means that the country where the project is located doesn’t possess complete and thorough regulations. However, rule of law and regulation quality are key influence factors for infrastructure PPPs projects (Moszoro et al., 2014) [18]. Because of standards and regulations can efficiently avoid unnecessary negotiations during negotiation phase, and then reduce potential transaction cost. Furthermore, according to the data from PPIAF, one standard deviation increase of regulation quality can result in 4% raise of investment (PPIAF, 2016) [14].

Usually, in a mature PPPs marketing, the relevant regulations are relatively well-developed. For example, the UK government published a series of guidance for PPPs project, such as the Project governance guidance, PFI/PPP finance guidance, Code of conduct for operational PFI/PPP contracts, just to name a few, which cover preparation and negotiation phase. Although, developed countries have long PPPs experience, the transaction cost caused by standard and regulation is still inevitable. According to House of Lords’ Review of PPPs, a preferred bidder may win the tender by deliberately price or absolute predominance of firm scale, and then during the negotiation phase, they utilize the remaining uncertainties in the preparation phase to ask increase on price (World Bank, 201) [2]. It leads to not only a direct increase on investment by requested price but an indirect raise of transaction cost via the number of negotiations skyrocketing. The hidden trouble is buried in the preparation phase and the transaction cost increase during the negotiation phase.

On the contrary, developing and underdeveloped countries may not have such integrated standard and regulation, which may attribute to little experience on PPPs and professional personnel (This can be regarded as an ill result caused by Section 1.2). According to a report of Lee et al. (2018), developing Asia accounts for 54.5% and Latin America represents 40.8% in all cancelled PPP projects of the world from 1991 to 2015 [19]. Also, Asian Development Bank (2008) indicates that the government transfer operational work to private participations while they should pay more attention on regulations [20]. Hence, complete regulation system is a key factor to reduce transaction cost for both developed and developing countries.

2.5. Design flaw

Contract design is a hot topic in academics. However, infrastructure design problem is usually neglected by public sector, especially for EPC (Engineering Procurement Construction) +OM (Operation and Maintenance) contract. During the design stage, if the general contractor choices a plan that is optimal only for construction stage and their operation duration, which may lead to potential transaction cost increase. For example, the materials used in project may be inexpensive for construction and short-time maintenance, but, as time goes on, the maintenance cost may increase. Then, the cost after transfer may rocket to an unacceptable price. This issue can be deemed to a product of lack of complete regulation, and the situation commonly takes place in design stage, but cost is produced in operation stage after transfer. Governments should attach importance to the above problem, or the transaction cost may stealthily increase.

3. Influence factor of transaction cost from the prospective of private sector

3.1. PPPs’ inherent character

The nature of PPPs includes risk transfer from public sector to private sector, which not only just reflects in financing stage but the whole life cycle. One of the greatest VFM drivers is risk transfer, which means appropriate risks can be transferred to the private sector, which is supposed to be capable of managing those risks better (Hayford, 2006) [13]. The private sector, therefore, will undertake more risks when the PPP mode is implemented, and both developed and developing countries will inevitably encounter this problem.

Fortunately, according to the data from the World Bank (2017), in the year of 2017, there were 135 governments offering supports to private participation during PPPs project, in which 90 governments provide direct help, and the rest of them provide indirect support, which increased 43.6% in comparison
with last year [21]. This phenomenon may indicate a trend that public sector starts to realize PPPs project cannot be successfully completed without their support. Therefore, this measure not only can increase profits in operation stage but also may give a visible reduction on the transaction cost of private participation, which will attract more private investment into infrastructures.

3.2. Government condition

Government condition involve the institutional condition and political stability, which can greatly affect transaction cost to private participations, and it therefore is crucial factor for private investors. Xu et al. (2010) via fuzzy assessment claim that in PPPs highway project, the most important risk is political risk for success [22].

At the government institutional level, the influence of transaction cost mainly depends on the political system in different countries. In developed countries, such as UK and Australia, the parliamentary system of constitutional monarchy may lead to some issues that will increase transaction cost. For example, both the protest of nearby residents and strike of relevant workers will result in extension of time and unplanned cost in whole four phases. Even, during the negotiation phase, the internal government activities can lead to project delays, such as the political debate and re-election. However, there is no political system can avoid transaction cost in PPPs from the level of government structure. In terms of developing countries, such as China, centralization may lower the work efficiency due to the need of approval at all levels and complicated approval process. Nevertheless, centralization can improve the work efficiency attributing to its strong mobilization ability.

In terms of international PPPs project, political stability is a key influence factor. Reasonable policies and stable environment to support and reduce the uncertainties are crucial features in international PPPs project, especially for developing countries (Reside and Mendoza 2010) [23]. However, in many developing economics, social stability is a primary problem. Also, the Fund For Peace develops the Fragile States Index to show national stability for each countries. According to the newest Fragile States Index (2018), all the top 10 countries are developing countries, in which seven countries come from Africa and three countries come from Middle-East [24]. In those counties with political upheaval, a coup may occur during the project. Hence, when the private participations invest such countries, the transaction cost will be much more and unpredictable.

The unstable environment may lead to indefinite postponement of the project and personnel safety problem due to the sudden warfare. The uncertainty influence will impact the transaction cost for private sector in the whole project life cycle.

4. Influence factor of transaction cost from the perspective of both of public and private

4.1. Quality of project brief

During the preparation phase, government will make a project brief for willing private participations to proceed tendering smoothly. The project brief mainly includes the basic requirement of the infrastructure, bidding rules and possible contract model. Liu et al. (2016) states that in PPPs project a good quality brief is a crucial factor to make tendering successful for both developed and developing countries [10].

In some developing countries, for reducing workload and saving cost, government may use few time and cost to make a project brief, and even usage previous project brief with a few modifications, which saves cost superficially. However, in the fact, this action may increase transaction cost for both public and private sector, because if the brief doesn’t exactly express the real demand of the infrastructure, the chosen private participation may misunderstand some requirements. Then, during the negotiation phase, even construction and operation phase, the numbers of negotiation will rise perpendicularly, and meanwhile the transaction cost must rocket with this situation.

Also, developed economics cannot avoid this problem, but it comes from other perspective. Sometime, project brief of a developed country may be too comprehensive, and there is no any flexibility and variability. However, modification and variation are inevitable for a practical project during negotiation and construction phases (Hwang and Low, 2012) [25]. Hence, too much limits also can result
in increase of transaction cost with negotiation raise.

Both unlimited and totally restricted project brief may increase transaction cost for public and private sector. Therefore, the problem has shifted from whether to how much. The balance of limitation in project brief is the most important influence factor for its quality, which also impact the transaction cost.

4.2. Government’s serious investigation

Generally, governments will execute a serious investigation before the PPPs project is implemented, which includes the project whether is suitable for PPPs and the forecast of volume as well as profits. However, if the government only takes preliminary investigation instead of an overall investigation, the transaction cost for public sector may be much more than the situation with a serious investigation.

In terms of private sector, this measure, in whole life cycle excepting preparation phase, may decline the times of negotiation and unexpected compensation, and may reduce potential transaction cost prevailingly. For example, on a project of roll roads and airport built in the 1990s, the Government of Colombia paid $2 billion to private participation under a purchase agreement by 2005, because practical situation was lower expected demand (World Bank, 2017) [2]. Coincidentally, in the 1990s, the South Korean government implemented an airport expressway between Incheon Airport and Seoul downtown, but the actual profit was less than the half the expect, so that the government had to pay dollars in tens each year (World Bank, 2017) [2]. Hence, comprehensive investigation can efficiently reduce huge transaction cost for public, although the serious investigation will spend some capital during the preparation phase. Both developed countries and developing countries may meet this problem, but it is more common in the emerging economics, which usually lack such detailed investigation before launch a PPPs project.

The more investigation can avoid more unexpected cost. However, it should be taken together both parts of increase and reduce. Therefore, the different projects should be discussed separately according to their characters.

4.3. Investment climate

In PPPs project, especially for international project, investment climate is a key influence factor, which includes macro economy environment, infrastructure condition and transparency.

The research collects the top5 countries with the highest number of PPPs project in the last five year from World Bank (2018), which are China, Brazil, India, Mexico and Turkey [26]. All the top5 economics are developing countries, and their Human Development Index (HDI) collected from UNDP (2015) are all around 0.7, which ranks above average [27]. This phenomenon is very interesting. The five countries have some common ground, which may explain why they have so many PPPs projects. In those countries, there are lots of private capital, which is different with most underdevelopment countries, such as Zimbabwe and Honduras, although they need infrastructure more than the above countries due to the booming economy. On the contrary, developed countries have more fund but their infrastructure is gradually saturated and updates slowly. Also, as a key factor of macro economy, Foreign Exchange Reserve (FER) can influence the transaction cost for private sector, especially in international project. For instance, if an international private investor requests settlement in international currency instead of local currency, the government perhaps cannot offer enough required currency or delay the payment due to the lack of foreign currency. This situation usually occurs in countries with insufficient foreign exchange reserves and countries with high inflation, which may drastically increase the risk of transaction cost raise. In addition, in some developing countries, such as China, they implement foreign exchange control, which also influences the free flow of capital for international investors. All the transaction cost that is caused by above issues mainly be produced in the later period of construction, and operation phase.

Furthermore, existing infrastructure condition also can impact transaction cost for private sector. Infrastructure construction usually needs vast materials and mechanical equipment, which need the support of existing transportation, or the potential cost will endlessly increase. Particularly, in some underdevelopment countries, contractors must transport many large-scale mechanical equipment and
even workforce from their countries to the project site. Then, the transaction cost of private sector will go up in the construction and operation phase with this situation.

As an important factor for investment climate, transparency will strongly influence the transaction cost. Lee et al. (2018) indicate that project’s risk ratio can be declined efficiently by less corruption and more transparency in PPPs project [19]. According to the organization of Transparency International (2017), the performance of the five countries is similar with their grades in HDI, and all of them are listed in middle of 180 countries [28]. However, the developed countries generally locate at front rank. In terms of public information, it’s common in centralized countries, such as China and Pakistan, and they seldom publish whole information that is important for private investor in PPPs project to the public. This situation mainly affects the transaction cost for private sector during the preparation phase. In addition, bribery is another crucial issue of transparency. Bribery only bring benefit to the unruly private sector, and other private competitors will be impacted. Even the public sector may be influenced. For instance, the private sector wants to save labor-hour or materials, and then bribe the public supervisor to achieve their aim, which usually results in a potential safety danger. Furthermore, if the public sector cannot disclose enough information to the private partners, the transaction cost of private sector will be more than working with an open and transparent government. This phenomenon may occur in all phases, which go through the whole project life cycle.

4.4. Integrity and enforcement of contract

Transaction cost not only is simply influenced by objective environment but is impacted by contract spirit. The spirit of contract mainly focuses on whether the participations comply with the contractual obligations, which include unilateral breach and bilateral breach, even multiple default in complex PPPs project.

Nose (2014) states that one most important issue, recently, during a PPPs project is breach of contract, which directly leads to a cancelation in most cases [29]. During long-term contract, changes are inevitable although the contract is signed under a quite healthy economy condition, which usually contributes to contract renegotiations and cancellations. According to Guasch et al. (2014), there were 68% PPPs projects that were renegotiated from 1990 to 2003 in Latin America [30]. Coincidentally, Ahmad et al. (2014) state that in some developing countries, the renegotiations are caused by breaking contract of private or public participations [31].

Breaking a contract will bring irreversible damage to the partnership, especially for the private sector. For example, a government leader who charges the project may be transferred, and the new leader may deny the previous contract and work. Then, the project may be affected by this behavior. Hence, the above point will greatly impact the potential transaction cost for private sector. At times, a renegotiation occurs because the government wants the concessionaire to undertake additional work not required by the original contract (Irwin et al., 2010) [32]. The above situation also can lead to transaction cost increase for private sector which may run through whole life cycle. In contrast, sometimes, cost may also raise for government when private sector breaks a contract, which may occur not only in developing but developed economics. For example, due to unreached forecast demand, the private sector may tend to force renegotiation with government to avoid loss. Then, the government may adjust tariff or share the unexpected cost with private parts. This behavior results in a transaction cost raise for public sector during operation phase. Hence, to reduce transaction cost for both side, contract management should be considered, especially for contract monitoring.

5. Conclusion

Although, the gross of PPPs project fluctuated in recent 20 years, the marketing is still big. The resulting transaction cost is an element that all participations cannot ignore in infrastructure and associate service. This research aims to explore the influence factors of transaction cost for different participants in the four phases via studying developed and developing economics. In preparation phase, the improper allocation of risk, lack of experience and knowledge and lack of complete regulation will impact public transaction cost. However, in terms of construction phase, the transaction cost of private sector is
affected more than public, which mainly occurs in developing countries with issue of brief quality and investment climate. Negotiation phase is the most susceptible phase to transaction cost, because, expecting design problem and investment climate, almost all mentioned factors will lead to an impact on transaction cost for public and private sector, even both. As well as, operation phase may bring poor design problem to public, and payment issue to private participations may fluctuate the transaction cost. Also, the problem that may increase transaction cost, in fact, exists not only in developing countries, but also lurks in developed countries, such as the institutional issue and even lack of relevant regulations. Finally, the quality of project brief, in fact, is not as comprehensive as possible, which is trade-off strategy instead of simply choosing.

Furthermore, with the development, the headmost developing countries, such as the mentioned top5 economies, may continue to be active in PPPs marketing as the main investors instead of the countries where the project is located, because the infrastructure will gradually satisfy the society requirement in those countries. Meanwhile, the low-ranking countries in HDI may take on the role of implementing PPPs project with global economic trends.

Also, PPPs can be regarded as a revolution in public infrastructure area, which, from the perspective of enterprise, is like a development from sole proprietorship to diversification of the investment sources. The right of infrastructure construction and operation belonged to government before the concept of PPPs invented. Hence, in the further study, if PPPs project is deemed as a property right that can be traded freely, the market can impel stakeholders to make optimal decisions during whole life cycle according to transaction cost. However, due to the high transaction cost of the trade, how to reduce the transaction cost via blockchain in property right transaction is a potential area.

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