

# ***Would Joint Ventures affect Market Competition?***

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## **Abstract**

### *Purpose*

The construction activities in Hong Kong are at un-precedent high level as the Hong Kong Government is rolling out major infrastructure projects. The tender values of these projects exceed budget substantially. With the rocketing tender value, major concerns have been raised over the market competitiveness. Contract packaging approach such as forming joint ventures may have effect on market concentration. This study aims to investigate the effects of using joint ventures on competition intensity with reference to the Ten Mega Projects programme in Hong Kong.

### *Methodology*

At the time of the study, there were 81 contractors involved in the Ten Mega Projects programme. Among them, 33 are in the form of Joint Venture. Based on the respective contract values, both four-firm concentration ratio (CR<sub>4</sub>) and Herfindahl-Hirschman Indices (HHI) are used to analyze. The effect of forming joint ventures is also analyzed in terms of the frequency of different contractors' winning contracts. The characteristics of "active contractors" and "inactive contractors" are compared.

### *Findings*

The study offers the following key findings. For the active contractors, due to the network of joint venturing among them, forming joint ventures did not reduce the number of competitors. In fact, when joint ventures are considered as separate and independent entities, the concentration level is lowered as a result. For contractors that have only one contract, forming joint venture increases the concentration level. For contracts that are less technically demanding or of lower value, segmenting sized projects into smaller separate contracts would enhance competition and lower concentration level.

## **Introduction**

After the 2008 global market tsunami that hit on many economies around the world, the Government of the Hong Kong Special Administrative Region (HKSAR) adopted a series of measures including rolling out Ten Mega Infrastructure Projects, to boost the local economy. Hong Kong's construction market has thereby been energized by this series of infrastructure projects. The gross value of construction works in 2014 has reached HK\$199.7 billion, increasing by year-on-year 13% compared with 2013 (HKTDC 2015). However, budget overrun has become a notable problem for many of these projects. The statistics from Civil Engineering and Development Department of HKSAR revealed that the construction cost index is rising markedly less than the tender price is, indicating that the cost increase cannot fully account for the surge of tender prices obtained for the construction mega projects. Insufficient competition in the market can be one of the key determinants for the soaring construction prices. A number of research studying the market competitiveness in the construction industry focus on the collusion behavior and bid rigging problems (Gupta, 2001, Dorée, 2004). Aside from these practices, joint ventures are also frequently practiced in the construction industry. However, there is relatively few research conducted on the impacts of contract packaging approaches such as joint venture bidding on the market competitiveness (Tong and Reuer, 2010). Researches studying construction joint ventures have been focused on risk assessment, managerial practices and economic efficiencies of joint ventures (Walker and Joannes 2003; Hong and Chan, 2014). The primary aim of this research is to investigate the effects on the use of horizontal joint ventures on market competitiveness with reference to the Ten Mega Projects programme in Hong Kong.

## **Literature Review**

### *Definition of joint venture*

Since a joint venture can be used to include all situations where more than one company unite their resources to achieve a common goal or shared interest (Pitofsky, 1969), the difficulty in defining joint ventures lies in the "lack of sharp definition that would distinguish joint ventures from other interfirm contractual agreements" (Brodley, 1982). To define the distinctive features of a joint venture, Kitch (1985) suggested that compared with a merger, a joint venture involves fewer restraints on competition but offers more efficiency gains than a cartel or a price fix. Bernstein (1965) suggests that the difference between mergers and joint ventures is that participants in mergers combine all of their assets while in joint ventures, participants only combine parts of their assets. However, Mead (1967) believed that the distinction between joint ventures and mergers proposed by Bernstein (1965) overemphasizes the form at the expense of substance, because joint ventures and mergers can share very similar characteristics. Another difference identified by Mead (1967) and Brodley (1982) is that a joint venture creates a business entity separate from its parents. Meanwhile, Werden (1998) distinguished a joint venture from a mere cartel by suggesting that true joint ventures should achieve efficiency-enhancing economic integration. Brodley (1982) provides that a joint venture is "an integration of operations between two or more separate firms and is characterized by : a) Parent firms jointly control the enterprise; b) A substantial contribution must be made by every parent firm; c) The venture firm is established as a new entity; and d) The joint venture creates significant new capability in terms of output capacity, technology and product advancement, or market expansion.

## *Effects on Competition*

Joint ventures can be pro-competition by creating a new competitive force especially where a joint venture is formed by two smaller firms to enter the market without precluding the potential entry of the parent firms. Large amounts of capital can be accumulated through joint ventures so as to enable small firms to undertake projects that are too extensive for them to complete alone (Kitch, 1985, Pate, 1969, Mead, 1967, Pfeffer and Nowak, 1976). In addition, a joint venture can intensify competition because economies of scale can be achieved and transaction costs can be reduced thereby, e.g. information costs (Kitch, 1985, Pfeffer and Nowak, 1976, Werden, 1998, Pitofsky, 1969, Mead, 1967). Notwithstanding, Mead (1967) reminded that even though a joint venture may cause potential anticompetitive hazards, such interfirm link may still be preferred where the parents are too small to finance entry or undertake risks.

The anticompetitive hazards of horizontal joint ventures including potency of collusions and increasing entry barriers are widely recognized in many studies (Pfeffer and Nowak, 1976, Pitofsky, 1969). There have been great concerns over whether joint ventures are de facto mergers because joint ventures can have similar anticompetitive effects as mergers but can enjoy much relaxed regulations (Pfeffer and Nowak, 1976, Pate, 1969). Competition can be lessened or eliminated by horizontal joint ventures in the following three directions:

- a) Actual competition between parents (Bernstein, 1965, Pfeffer and Nowak, 1976).
- b) Actual or potential competition between either one of the parent firms and the joint venture enterprise (Bernstein, 1965, Pitofsky, 1969, Brodley, 1982, Pfeffer and Nowak, 1976).
- c) Potential competition by the entrances of the parent firms but for the existence of the joint venture (Pfeffer and Nowak, 1976, Mead, 1967, Pitofsky, 1969).

For a) and b), horizontal competition can be restrained due to the change of competitive incentives and/or collusions.

### The change of competitive incentive

Kitch (1985), Werden (1998), Pfeffer and Nowak (1976), Mead (1967), and Bresnahan and Salop (1986) have observed that joint venture partners are unlikely to compete at arm's length. Joint ventures connect the interests of actual or potential competitors, which inevitably affect the independent decision making and the competitive incentives of all the relevant parties (Werden, 1998, Mead, 1967, Bresnahan and Salop, 1986). In addition, it is found that firms bid significantly less against their former partners than against non-partners over a two-year interval and the impacts can even extend to matters outside of the joint venture (Mead, 1967, Pfeffer and Nowak, 1976), meaning that the change of competitive incentive that makes parent firms unwilling to compete vigorously with each other can last beyond the actual period of joint venture.

### Collusion

A joint venture may encourage or facilitate implicit or explicit collusion (Kitch, 1985, Pfeffer and Nowak, 1976, Mead, 1967, Werden, 1998, Brodley, 1982, Pitofsky, 1969). Information exchange and continuous cooperation are almost inevitable in every joint venture no matter how

small it is, and may lead to information spillover or provide great convenience to cartelization (Werden, 1998, Kitch, 1985, Brodley, 1982, Pfeffer and Nowak, 1976). Especially in the case where a joint venture is formed all by fully capable parent companies, the anticompetitive effects of eliminating potential bidders can be apparent and indifferent to explicit collusion (Mead, 1967).

For c), Potential competition can be lessened because it is possible that the establishment of a joint venture precludes the parent firms from being involved in the same competition (Pfeffer and Nowak, 1976, Mead, 1967, Pitofsky, 1969). The number of independent firms competing in the market can be reduced or left unchanged if one or more parent firms could have entered the market (Pitofsky, 1969). Such a preclusion of entry can be the desired or intended objective of forming a joint venture (Mead, 1967). Furthermore, a joint venture may even raise the entry threshold in terms of the financial and technical resources offered by the joint ventures (Pfeffer and Nowak, 1976, Pitofsky, 1969).

#### *Joint ventures and market structure*

In general, the potential of having anticompetitive behaviors is found to be positively related to the market concentration level (Berg and Friedman, 1981, Pfeffer and Nowak, 1976, Bresnahan and Salop, 1986, Mead, 1967, Tong and Reuer, 2010). Nonetheless, Pfeffer and Nowak (1976) found a negative correlation between the proportions of horizontal joint ventures over all types of joint ventures and the difference between the particular concentration level and the cross-industry median value, which means that the closer the market concentration level is to the cross-industry median concentration level, the higher the anticompetitive risks of joint ventures can be. The rationale behind is that with numerous competitors in the market, horizontal joint ventures only have very limited impacts on reducing the uncertainty associated with competitive interdependence, while with very few competitors in the market, other forms of interfirm links can be more efficient (Pfeffer and Nowak, 1976). Therefore the argument that the higher the market concentration level is, the more likely that joint ventures can lead to anticompetitive behaviors is true provided that the concentration level is still within the intermediate range of cross-industry concentration level.

#### *Market Competitiveness*

There is limited reported research that investigates the market competitiveness of the construction industry. The most commonly recognized and widely observed anticompetitive behavior in the construction industry is collusion (Gupta 2001, Doree 2004). However, there is relatively few studies done to assess the competitive consequences of joint bidding in the construction contracting market. Drew and Skitmore (1997) argued that the competitiveness of every bidder is dependent on both the size and type of the contracts. In the construction contracting market, it is possible that the variation of contract size can change the competitiveness of firms of varying sizes and hence alter the overall competition level by the market.

#### **Methodology**

Concentration measures can be used to indirectly gauge competition level. Dimensions of market structure can be captured to indicate the competitiveness in an industry (Perloff et al., 2007). One of the most commonly used concentration measures adopted by the U.S. Bureau of Census and

the U.S. Government Accountability Office is the four-firm concentration ratio ( $CR_4$ ). Another measure that has been widely used is Herfindahl-Hirschman Index (“HHI”). Both the U.S. Department of Justice (DOJ) and Federal Trade Commission (FTC) use HHI as a quantitative indicator of market structure.

Four-firm concentration Ratio ( $CR_4$ ) is the sum of the market shares accounted for by the top four firms in the market (Perloff et al., 2007) and can be expressed as below:

$$CR_4 = S_1 + S_2 + S_3 + S_4 \quad ( 1 )$$

This index approaches zero where there is infinite number of firms in the market and equals one where four firms’ market shares have made up the entire industry (Bikker and Haaf, 2002).

Herfindahl-Hirschman Index (“HHI”) is the sum of the squared market shares of all the firms in the market. (Perloff et al., 2007)

$$HHI = \sum_{i=1}^n S_i^2 \quad ( 2 )$$

Where  $S_i$  is the market share of the  $i^{\text{th}}$  firm. HHI value ranges from 0 to 1, when HHI equals 1, the market structure will be considered a monopoly (Hirschman, 1964).

In this study, the results obtained from  $CR_4$  and HHI need to be compared with the standards used by the Department of Justice (DOJ) and the Government Accountability Office (GAO) in the United States. Where HHI is below 0.15 or  $CR_4$  is below 40%, the market is considered as un-concentrated. Where HHI is between 0.15 and 0.25 or  $CR_4$  is between 40% and 60%, the market is considered loosely concentrated. Where HHI is higher than 0.25 or  $CR_4$  is higher than 60%, the market is considered highly concentrated. In order to reflect the market structure in a more comprehensive way, the presence of major firms, the number of firms, and the inequality of market share distribution shall all be taken into account besides HHI in assessing market structure (Rhoades, 1995).

### **Data Analysis and Findings**

In this study, the contract value each firm obtained in the ten mega projects market in Hong Kong from 2010 to 2015 are used to represent their market shares. As the most important infrastructure development projects in Hong Kong, Ten Mega Projects have involved almost all the active contractors in Hong Kong. At the time of study, six of the Ten Mega Projects that have commenced were analyzed in this study. The contract values obtained by the firms may not be final, as all the projects are still in progress and many works haven’t been awarded. In total, there are 81 contractors involved, and 35 contracts have been awarded to construction joint ventures. There is only one joint venture which has repeatedly bid in three different projects while each of the remaining joint venture entities only obtained one contract. In addition, one third of the joint venture parent firms formed more than one joint ventures with different partners.

Two tests were conducted to analyze the effects of joint venture bidding. In Test I, joint venture entities are counted as contractors independent of their parents. There are in total 81 firms with the largest one having 14.76% market share. In Test II, each contract awarded to a joint venture entity is viewed as being split into several smaller contracts, of which each was awarded to one parent firm. There are altogether 86 firms with the largest two companies having market shares

of 13.28% and 11.07% respectively. It is suggested in both tests that instead of being dominated by one monopoly firm, the mega project market in Hong Kong is composed of several sized firms and a number of fringe firms. (see Table 1)

TEST I		TEST II	
<i>Market Share</i>	<i>No. of Firms</i>	<i>Market Share</i>	<i>No. of Firms</i>
10%-15%	1	0%-1%	2
5%-10%	5	5%-10%	4
1%-5%	14	1%-5%	12
0%-1%	61	0%-1%	68

Table 1: Firm Size Distribution

Prior studies suggest that joint venture can be an effective device to facilitate fringe firms to enter the market while greater convenience is provided to fully capable firms to reduce competition (Mead, 1967, Kitch, 1985, Pfeffer and Nowak, 1976). In this study, the effects of joint ventures will be analyzed separately for inactive firms and for active firms.

There are altogether 7 contractors which obtained 6 or more contracts and 9 contractors which obtained at least 5 contracts. Among the total 81 firms, they represent the first ten percent of the most active players in the market. Meanwhile, there are in total 50 firms only getting one contract, representing the most inactive players in the market. Therefore Test I and Test II will be conducted again for most actively bidding firms and the fringe firms which can barely get awarded. Table 2 and Table 3 give the details of the market share distributions among 7 contractor market.

<b>Contractor</b>	<b>Contract Value</b>	<b>%</b>	<b>%<sup>2</sup></b>
Firm A	12,534,750,236	14.79%	218.6904335
Firm B	2,053,440,949	2.42%	5.868983012
Firm C	9,428,533,146	11.12%	123.733324
Firm D	4,249,549,964	5.01%	25.13531287
Firm E	13,500,369,140	15.93%	253.6820292
Firm F	4,904,890,611	5.79%	33.4855216
Firm G	2,887,054,080	3.41%	11.60134265
Firm A – Firm E Joint Venture	5,869,282,300	6.92%	47.94776998
Firm A – Firm B Joint Venture	8,400,000,000	9.91%	98.21028877
Firm A – Firm C Joint Venture	11,793,608,604	13.91%	193.5939751
Firm C – Firm D Joint Venture	3,368,442,219	3.97%	15.79270852
Firm D – Firm B Joint Venture	1,422,000,000	1.68%	2.814476383
Firm F – Firm E Joint Venture	4,350,000,000	5.13%	26.33764441
<b>SUM</b>	<b><u>84,761,921,249</u></b>		
<b>CR4</b>	<b>55.75%</b>		
<b>HHI</b>	<b>1056.89381</b>		

Table 2: Test I for 7 most active contractors

<b>Contractor</b>	<b>Contract Value</b>	<b>%</b>	<b>%^2</b>
Firm A	25,566,195,688	30.16%	909.7679507
Firm B	6,964,440,949	8.22%	67.51043971
Firm C	17,009,558,558	20.07%	402.7026628
Firm D	6,644,771,073	7.84%	61.45517535
Firm E	18,610,010,290	21.96%	482.0495063
Firm F	7,079,890,611	8.35%	69.76723494
Firm G	2,887,054,080	3.41%	11.60134265
<b>SUM</b>	<b>84,761,921,249</b>		
<b>CR4</b>	<b>80.54%</b>		
<b>HHI</b>	<b>2004.854312</b>		

Table 3: Test II for 7 most active contractors

For the market of 7 most active contractors and the market of 9 most active contractors, the numbers of market participants in Test I are higher than those in Test II, because the joint venture enterprises formed between each other are counted as new entrants.

	<b>Test I (7 firm)</b>	<b>Test II (7 firm)</b>	<b>Test I (9 firm)</b>	<b>Test II (9 firm)</b>
<b>CR4</b>	55.75%	80.54%	55.70%	75.72%
<b>HHI</b>	1056.89381	2004.854312	1116.355113	1616.725451

Table 4: Concentration Level Change for most active contractors

Comparing the results for both 7-firm and 9-firm market in Table 4 , the market concentration levels increase in both Test II, suggesting that with joint venture, the market appears to be more competitive than without joint ventures.

For the market of 50 most inactive contractors, contrary to the active player market, the number of competitors increases in Test II. Among 50 inactive market competitors, 24 of them get awarded with contracts in the form of joint ventures, but only six of the joint ventures are formed exclusively by the 50 inactive contractors. The remaining 18 joint ventures are formed by at least one sizable company and one inactive firm. Since the six joint ventures are all formed by small contractors, in Test II where the parent firms are counted as individual participants, the number of participants increases. Table 5 shows that the HHI decreases slightly in Test II while CR<sub>4</sub> remains the same, suggesting that the market appears to be less concentrated where the contract package is split into smaller parts for small firms.

	<b>Test I</b>	<b>Test II</b>
<b>CR4</b>	42.45%	42.45%
<b>HHI</b>	740.6297	684.4039

Table 5: Concentration Level Change for 50 most inactive contractors

### Discussions and Limitations

The findings suggest that the use of joint ventures in the ten Mega Projects has lowered the concentration level for active large firms. However, for inactive fringe firms, joint ventures are found to have the effect of lowering competition.

The following explanations are offered. First, instead of operating as independent firms entering the market, most joint ventures in the construction contracting market are only formed to bid for one particular contract and such joint ventures usually exit the market as the project ends. In this study, only one joint venture enterprise among the 33 joint ventures in total bidding for multiple contracts and it is found that contractors are used to forming joint ventures with various firms at the same time, meaning that such joint ventures are unlikely to lead to extremely close relationship or collusion. Walker and Johannes (2003, pp.41) suggested that forming joint ventures becomes “a means to temporarily merge strategic assets” so as to meet the requirements of the client, and such characteristic can influence the relationship between joint venture partners. Since these joint ventures are only project based, it is less likely that the parent firms can develop such a “close and continuous relationship”, as previous literature described. (Brodley, 1982, Werden, 1998, Kitch, 1985, Pfeffer and Nowak, 1976).

In the active contractor market, with only 7 contractors, there are already 6 joint ventures formed among them. In other words, the additional six joint ventures are only formed to overcome their “competitive interdependence” and reduce the competition among them rather than to create new competitive force. Meanwhile in Test I, due to the presence of the additional six joint ventures, the market is comprised of 13 firms while in Test II, there are only seven companies, which contributes to the higher HHI and CR<sub>4</sub> value in Test II. However, this finding cannot be interpreted as proving that contract fragmentation increases market concentration for active contractors because these joint ventures are not in fact competitors in the market. It is suggested that construction joint venture is unlikely to have pro-competition effects by introducing new competitive force to the market. On the other hand, construction joint venture can hardly have significant anti-competition effects as well when there is no dominant firm in the market. Because where the large contracts are split into smaller ones. Instead, sizable contractors which choose to form joint ventures to bid for larger contracts can always bid solo.

As for inactive contractor market, 24 out of 50 contractors obtained contracts by forming joint ventures, suggesting that it is an effective approach for many smaller firms to enter the market. Meanwhile, 18 of the joint ventures are formed by at least one sizable company and one fringe firm. Hendricks and Porter (1992) reported similar observations in the oil leasing auction market that fringe firms participate, through joint bidding with large firms rather than with each other. Mohanram and Nanda (1996) explained that a joint venture with a large firm signals the invisible value of the small firm. Another reason could be that the prior experience large contractors acquired in previous sizable projects seem to increase the barriers to entry to such a height that prevent small firms to bid alone or exclusively with each other (Hendricks and Porter, 1992). Since the sizable firms that many fringe firms form joint ventures with are not in the inactive contractor market, data from these 18 joint ventures are not included in this study. For the remaining contracts awarded to joint venture entities formed exclusively by small contractors, it is found that contract fragmentation has pro-competition effects, demonstrated by the decline in HHI value in Test II. Because when these contracts are divided into smaller packages so as to allow small contractors to bid solo, the number of bidders inherently increases and the market competitiveness can be enhanced. Moreover, it can be inferred that contract fragmentation has the same pro-competition effects for joint ventures formed by fringe firms and sizable firms, because where the contracts are so extensive that small firms have to form joint ventures with

larger companies, their entrances are contingent on the needs of sizable firms. In contrast, when contracts are sized down to smaller ones which can be bid by joint ventures formed by small firms or even by solo effort, much more bidders are then available.

In order to understand different features of active and inactive contractor market, the work natures of the contracts in both markets are studied. It is found that most jobs bid by larger and more active contractors are more technically demanding, such as tunneling and construction of bridges, roads and buildings. As for inactive contractor market, only nine contracts are for tunneling and among them, 8 are undertaken by joint venture enterprises, which mostly involve at least one sizable contractor. Generally speaking, the technical requirements of the jobs bid in the inactive contractor market are lower.

The HHI of the inactive contractor market is only 684 and hence, the inactive contractor market is considered highly competitive while the HHI value of the active contractor market reaches 2004 and the market is considered moderately concentrated. In total there are 50 contracts awarded to inactive contractors while there are 52 contracts awarded to 7 most active contractors, which means that the active contractors get awarded 7 to 8 times as many as the inactive contractors do. The average contract value in the active contractor market reaches 1.6 billion while the average value in the inactive contractor market is only 451 million. Nonetheless, the technical requirements of the contracts bid in the active contractor market are more demanding than in the inactive contractor market.

### **Concluding Remarks**

This study uses the data of the Hong Kong Ten Mega Projects to illustrate the effect of forming joint ventures on market competition. Concentration Ratios ( $CR_4$ ) and Herfindahl-Hershamann indice (HHI) are used to assess concentration. It is found that a joint venture in construction is more like a temporary agent synergizing the resources from multiple parties rather than creating a new entity or new entrant. Projects of high value and sophisticated technical requirements are usually bid by joint ventures formed by two or more large contractors already active in the market, and thus sizing down these contracts into smaller ones may not have significant impact on the market competitiveness. Moreover, the joint venture activities by the inactive contractors raise the market concentration. It is therefore suggested that sizable contracts of smaller contract value and less technically complex can be further split into smaller contracts so as to allow more fringe contractors to bid solo.

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