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A.J. CLARK SCHOOL OF ENGINEERING
Civil & Environmental Engineering Department



WOULD JOINT VENTURE AFFECT COMPETITION?

Lu SHEN and Sai On Cheung
2016 Project Management Symposium



Agenda

- Literature Review
- Methodology
- Data Analysis
- Discussions
- Concluding Remarks
- Q&A



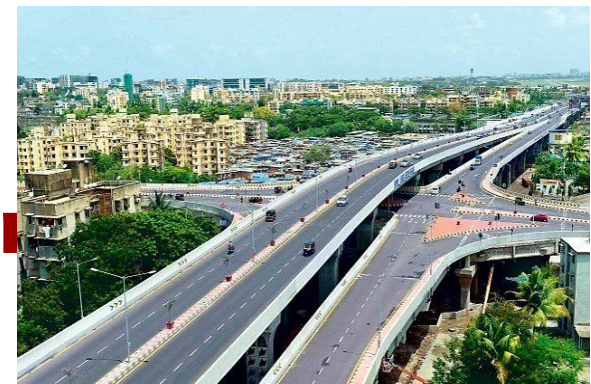
Ten Mega Projects

	TYPE	NAME
1	Transportation Infrastructure (railway projects)	West Island Line and South Island Line
2		Shatin to Central Link
3		Tuen Mun Western Bypass & Tuen Mun Chek Lap Kok Link
4	Cross-boundary Infrastructure	Guangzhou-Shenzhen-HK Express Rail Link
5		HK-Zhuhai-Macao Bridge
6		HK-Shenzhen Airport Cooperation
7		HK-Shenzhen Joint Development of Lok Ma Chau Loop
8	New Urban Development Area	Western Kowloon Cultural District
9		Lai Tak Development Plan
10		New Development Areas



Ten Mega Projects

- HK\$199.7 billion (2014)
- YoY 13% increase
 - HKTDC 2015
- Budget overrun
- Cost < Tender Price



→ **Insufficient Competition**



Market Competitiveness

- Collusion behaviors & bid riggings
 - (Gupta, 2001, Dorée, 2004)
- **Joint venture** (contract packaging)
 - Risk assessment, managerial practices, economic efficiencies, etc.
 - Tradeoff between scale & competition ?
 - Impacts on **competitiveness** ?



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Section I

LITERATURE REVIEW



Definition of Joint Venture

- “Parts OR all of the assets combined” (Bernstein 1965)
- “A separate entity” (Mead 1967; Brodley 1982)
- Compared with a merger
 - Fewer competitive restraints (Kitch 1985)
- Compared with a cartel
 - More efficiency gains (Kitch 1985)
- Characteristics
 - Joint control
 - Substantial contribution
 - A new entity
 - New significant capability (Brodley 1982)



Pro-competition ?

- A new competitive force
 - With no preclusion
- Small firms → extensive projects
- Economies of scale
- Reduce transaction costs
 - (Kitch, 1985, Pate, 1969, Mead, 1967, Pfeffer and Nowak, 1976)



Anti-competition ?

- **Lessen competition between**
 - Parent Firms
 - Either one of the parents and the JV
 - (Bernstein, 1965, Pitofsky, 1969, Brodley, 1982, Pfeffer and Nowak, 1976).
- **The change of competitive incentive**
 - Interests connected
- **Collusion**
 - Information exchange & cooperation
 - (Kitch, 1985, **Pfeffer and Nowak, 1976, Mead, 1967**, Werden, 1998, Brodley, 1982, Pitofsky, 1969)



Anti-competition ?

- Lessen potential competition
 - Preclusion of the parent firms
 - No. of competitors
 - Raise the entry threshold
 - Financial
 - Technical

(Pfeffer and Nowak, 1976, Mead, 1967, Pitofsky, 1969)



Market Structure

- **Market concentration level & potential of anticompetitive behaviors**
 - (Berg and Friedman, 1981, Pfeffer and Nowak, 1976, Bresnahan and Salop, 1986, Mead, 1967, Tong and Reuer, 2010)
- **Within intermediate range of cross-industry concentration level**
 - (Pfeffer and Nowak, 1976)



Market Competitiveness

- Depend on contract 'size' & 'type'
 - (Drew and Skitmore, 1997)
- Variation of contract size → bidder competitiveness



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Section II

METHODOLOGY



Methodology

- Concentration measures → market structure & competitiveness
- Four-firm concentration ratio (CR_4)
 - U.S. Accountability Office
- Herfindahl-Hirschman Index (“HHI”)
 - U.S. Department of Justice
 - Federal Trade Commission



Methodology

$$CR_4 = S_1 + S_2 + S_3 + S_4$$

$$HHI = S_1^2 + S_2^2 + \dots + S_n^2$$

Market Structure	CR_4	HHI
Un-concentrated	< 40%	< 0.15
Loosely concentrated	40% - 60%	0.15 – 0.25
Highly Concentrated	> 60%	> 0.25



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Section III

DATA ANALYSIS & FINDINGS



Data Analysis

- Contract value → market shares
- 6 out of 10 commenced
- 81 contractors involved
- 35 JVs
- 1 JV bidding repeatedly



Data Analysis

- Test I: JV → individual enterprise
– 14.75% top
- Test II: split to parent firms
– 13.28% top

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	10%-15%	2
5%-10%	5	5%-10%	4
1%-5%	14	1%-5%	12
0%-1%	61	0%-1%	68



Data Analysis

- Fringe firms vs fully capable firms
 - (Mead, 1967, Kitch, 1985, Pfeffer and Nowak, 1976)
- Inactive firms vs active firms

Contract Awarded Frequencies	No. of Contractors
11	1
8	3
6	3
5	2
4	6
3	9
2	8
1	50



Data Analysis

- 7 or 9 active contractors (10%)
 - ≥ 6 contracts and/or ≥ 5 contracts
- 50 inactive contractors
 - 1 contract



Data Analysis

Contractor	Contract Value	%	% ²
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
SUM	84,761,921,249		
CR4	55.75%		
HHI	1056.89381		



Data Analysis

Contractor	Contract Value	%	%^2
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
SUM	84,761,921,249		
CR4	80.54%		
HHI	2004.854312		

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



Data Analysis

- 24 out of 50 inactive firms → JVs
- 6 out of 24 JVs → inactive firms
- 18 out of 24 JVs → one sizable firm

	Test I	Test II
CR ₄	42.45%	42.45%
HHI	740.6297	684.4039



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Section V

DISCUSSIONS



Discussions

- **ACTIVE**: CR_4 & HHI lowered in Test I
 - Construction JVs
 - project based
 - no dominant firm
 - 7 contractors & 6 additional JVs
- Little impact on competition



Discussions

- **INACTIVE:** HHI lowered in Test II
 - 24 out of 50 inactive firms → JVs
 - An effective way to enter the market
 - 18 out of 24 JVs → one sizable firm
 - Invisible value (Mohanram and Nanda, 1996)
 - Prior experience increases entry barriers (Hendricks and Porter, 1992)
- Contract fragmentation pro-competition effects
- JVs by inactive firms exclusively
 - JVs by inactive firms and active firms
(contingent on the needs of sizable firms)



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Work Nature	Infrequent	7 contractors	9 Contractors
Construction of tunnels and stations	9 (8 JV)	25	30
Construction and provisionings of bridges, carriageways, centers, pools, buildings, roads, linking sections	3 (1 JV)	9	12
Building services	2	9	9
Underground works (piles and site formation)	3	2	3
Trackside auxiliaries & sidings	0	4	4
Trackwork and overhead	4	2	2
Ground investigation works	0	1	1
Rolling stock and locomotives and wagons	6	0	0
Environmental control systems, Passenger Mobile Communications System, ticketing system, traffic and surveillance system, power supply systems, AFC systems, SAM systems, TETRA systems, radio systems, communication & telephone systems	15	0	0
Lifting devices	2	0	0
Supply of signs, doors and frames	2	0	0
Rail Grinding Unit	1	0	0
Barging Point Facilities	1	0	0
Dredging and reclamation	0	0	1
Average Contract Value	451,287,614	1,627,363,870	1,879,492,988

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Discussions

	Concentration Level	No. of firms	Average contract value	Technical Requirements
Active (Test II)	2004	7	1.6 billion	More demanding
Inactive (Test II)	684	50	451 million	Less demanding

- Contract fragmentation is only pro-competition
 - For less valuable & technically demanding contracts



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Section IV

CONCLUDING REMARKS



Concluding Remarks

- Data from Ten Mega Project
- Methodology: CR & HHI
- Construction JV → *temporary* agent
- Sizing down contracts of
 - high value & sophisticated technical demands
 - Little impact
 - low value & less technically complex
 - Effective



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Thank you !

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