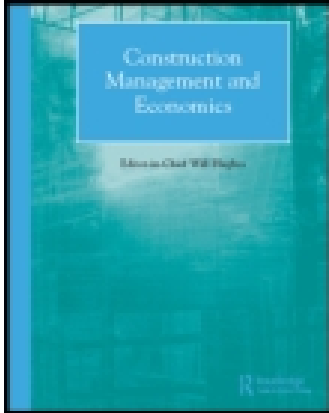


This article was downloaded by: [University College London]

On: 10 August 2015, At: 07:23

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: 5 Howick Place, London, SW1P 1WG



Construction Management and Economics

Publication details, including instructions for authors and subscription information:
<http://www.tandfonline.com/loi/rcme20>

A festschrift for Graham Ive

Chen-Yu Chang^a

^a Bartlett School of Construction and Project Management, University College London
London UK

Published online: 21 May 2015.



[Click for updates](#)

To cite this article: Chen-Yu Chang (2015) A festschrift for Graham Ive, *Construction Management and Economics*, 33:2, 91-105, DOI: [10.1080/01446193.2015.1039044](https://doi.org/10.1080/01446193.2015.1039044)

To link to this article: <http://dx.doi.org/10.1080/01446193.2015.1039044>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Versions of published Taylor & Francis and Routledge Open articles and Taylor & Francis and Routledge Open Select articles posted to institutional or subject repositories or any other third-party website are without warranty from Taylor & Francis of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. Any opinions and views expressed in this article are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor & Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

It is essential that you check the license status of any given Open and Open Select article to confirm conditions of access and use.

EDITORIAL

A festschrift for Graham Ive

CHEN-YU CHANG*

Bartlett School of Construction and Project Management, University College London London UK

Received 2 April 2015; accepted 2 April 2015

Writing this editorial is a sentimental moment for me. As a former PhD student and colleague of Mr Graham Ive, I feel honoured to have this opportunity to gather together key thinkers in the field to pay tribute to his achievements in advancing our understanding of economic behaviour in construction. In his 40 years of service to University College London (UCL), he has been a great educator, inspirational scholar and venerated gentleman. His persistent involvement in *Construction Management and Economics* over the past 20-plus years as editorial board member, reviewer and author makes this journal an ideal venue to commemorate his intellectual contributions. Apart from the traditional purpose of a festschrift (e.g., those for Dr Patricia Hillebrandt in 1994 and Professor Ranko Bon in 2007), this special issue is also intended to reflect on the development of ‘construction economics’ as a field. In the current academic environment where funding records are better valued than research publications,¹ few built environment scholars could have held this issue consistently in mind amid the hectic and sometimes opportunistic search for fundable topics. Nevertheless, since construction researchers preach to others continual improvement as the key to improve efficiency, it is essential for us to apply the same mentality and examine where we stand periodically. This special issue also provides a forum for the discourse of some fundamental issues that are difficult to find room for in regular issues but remain critical to the long-term development of the discipline. Apart from the five thought-provoking papers collected in this issue, the editorial is also concerned with three questions. Positively, has construction economics been recognized as a sub-discipline of economics? Normatively, is it desirable to develop construction economics into a sub-discipline of economics? Prescriptively, how can we develop construction economics into a sub-discipline of economics?

Biography of Graham Ive

Since Graham’s arrival at UCL in 1977, which overlapped with Patricia Hillebrandt’s time there and came immediately after the death of Duccio Turin, it seems appropriate to use the occasion of his retirement to reflect upon his work by putting it within the context of all the work done in construction economics at UCL.

Inception of economic study at The Bartlett

The study of building at The Bartlett School of Construction and Project Management, UCL, can be traced back to the appointment of Duccio Turin in 1966 as holder of the London Master Builders’ Association chair. Professor Turin was an inspirational leader who quickly established the Building Economics Research Unit (BERU), a leading research unit studying economic aspects of construction around the world. During the 1960s, the school’s two principal areas of interest were firmly established. John Andrews was instrumental in promoting the academic study of the management of the construction process at both macro and micro level, not only at UCL but also nationally; and Patricia Hillebrandt developed the discipline of construction economics. Outside BERU, in the teaching arm of the School, John Andrews and Patricia Hillebrandt in 1974 founded the MSc course in Building Economics and Management, bringing together The Bartlett’s expertise in these two fields. The first of its type, this programme allowed practitioners and academics, from both the UK and overseas, the opportunity to widen their knowledge of the nature of the construction process. This programme still runs today as the MSc in Construction Economics and Management, and has played a major role in establishing the global study of construction.

*E-mail: chen-yu.chang@ucl.ac.uk

Path dependency

Construction economics is a sufficiently unusual specialization that it may often be interesting to know how and why each of its practitioners came to it. Graham Ive began his path towards the economics of construction by reading economics at Cambridge in the early 1970s. This was the time and place of a great flourishing of the political economy tradition (epitomized at Cambridge by Piero Sraffa, Joan Robinson, Nikolas Kaldor, John Eatwell), before academic economics became exclusively a mathematical theory of individual choice: when economics was also explicitly a matter of history, sociology and politics, and when it dealt in aggregative categories (sectors, classes) more than in *homo oeconomicus* and representative agents. This had its influence. However, Graham's intellectual path was formed not only by this general milieu of Cambridge economics, but by the specific one of his college, St Catharine's, with first, its Director of Studies in Economics, Dudley Jackson, and his emphasis on measurable concepts and statistical data ('economics must be studied with data ... and it is not possible to count oneself an economist unless one has developed the ability to read and make sense out of such statistical information' (Jackson, 1982, pp. 1–2), and secondly its abundance of geographers and scarcity of other economists. His friends amongst the geographers introduced another important influence: David Harvey.

His first published work in 1974–75 was written in partnership and engagement with geographers (on theories of urban rent and regional underdevelopment), and his first academic job was as research assistant on a project studying the political economy of housing in Merseyside (at the Department of Surveying of Liverpool Polytechnic, now Liverpool John Moores University). At the time, local authority or 'council' housing was an effective provision of 'affordable housing'. His analysis of its finances and housing revenue and capital accounts showed that, where councils already owned enough land (not, in those days, required to be valued at opportunity cost), it could remain affordable and extendable thanks to its historic-cost basis and pooling of rents to cover pooled historic costs, so long as the rate of increase in price of construction of new dwellings (which determined the amount to be borrowed and thus the cost of debt service to be met from pooled rents) and in the price of housing maintenance work did not exceed the rate of increase in tenant incomes. It was this analysis, together with his work with others in the Political Economy of Housing Workshop of the Conference of Socialist Economists arguing the case for Council Direct Labour Organizations instead of

exclusively contractors as a mode of provision of this housing construction activity, that led him into construction economics, to attempt to investigate the question of what forces shaped and would in future shape the rate of increase of construction prices.

The early work on land rent led similarly to an interest in the relationship between owner-occupied house prices, land prices and housing construction prices and quantities. Thus when a vacancy arose in 1977 in the Building Economics Research Unit within The Bartlett School at UCL he successfully applied for the post, at the School where he was to remain until retirement.

Building Economics Research Unit

The Building Economics Research Unit (BERU) had been founded in the late 1960s by Duccio Turin, the first holder of the Chair of Building at UCL. After Duccio's death in 1976 it was headed by John Sugden. On his departure, Graham took over the completion of its contracts. Colleagues in BERU included the late Stephen Drewer, Linda Clarke and Ellen Leopold.

Duccio Turin had begun BERU by undertaking studies of the role of construction in national economic development. However, by this time BERU's main activity stemmed from a long-term contract from the UK government's Building Research Establishment (BRE) to undertake a series of studies into the 'Capacity and Response to Demand of the House-building Industry' in Britain, including separate studies of private housebuilding in South East England, the local authority/main contractor housebuilding market in London, and the subcontractors serving both markets.

It was here that Graham began to use company accounting returns as filed at Companies House as a data source. It is salutary to recall that this was then a matter of visiting Companies House, ordering and reading not always legible microfiches, manual transcription and entry on to punched cards. They were to remain a favourite source (especially when transformed in ease of use by the electronic database FAME), for both research and teaching throughout. These BERU studies produced findings of relatively high market shares and rates of profit in specific housebuilding markets.

Yet, by the time the research was completed, the UK government had changed, and the new government had no interest in problems of capacity and competition in the local authority market. The lack of interest extended to refusal to publish by BRE. It also meant an end to government funding of BERU.

The 1980s: teaching economics at The Bartlett, and Bartlett International Summer Schools

Outside BERU, in the teaching arm of the School, John Andrews (in management) and Patricia Hillebrandt (in economics) set up in the late 1960s as part of a multi-disciplinary MSc what would become in 1974 the separate MSc course in Building Economics and Management (today, Construction Economics and Management, CEM). Patricia Hillebrandt had been working at the National Economic Development Office (NEDO) and had been recruited by Duccio Turin to teach part-time at The Bartlett to help set up and deliver the new MSc. The closure of BERU happened to coincide with Patricia Hillebrandt's early retirement, and thus the existence of a part-time vacancy to teach economics on the MSc. Again, Graham successfully applied for the post. However, the dispersal of the staff of BERU meant he was now the sole construction economist at UCL.

The originality and value of Patricia Hillebrandt's teaching at The Bartlett can now best be appreciated by reading the two books that arose from it: *Economic Theory and the Construction Industry* (Hillebrandt, 1974) and *Analysis of the British Construction Industry* (Hillebrandt, 1984). Her work at Costain and then at NEDO undoubtedly informed the decision to focus on the industry level, and to structure teaching around the specific features and special problems of that industry, rather than teach a 'standard' unadapted body of economic theory. It was a complete departure from what had hitherto been taught as building economics in Britain.

However, whilst an increasing proportion of the students were coming from around the world, the danger was that the economics syllabus they were offered would be geared towards specific features of the UK construction industry only. It was also the case that the syllabus contained virtually no macroeconomics. Graham's new syllabus developed from the idea that it was possible to put macroeconomics and a range of national economies first, and then move down to the sectors described in national accounts, then to the many industries making up the construction sector and thus to real firms and groups of companies (with particular emphasis on the fundamental distinctions between the activities and characteristic business financial ratios of developers, user-clients, designers, main contractors, subcontractors and manufacturers).

Through most of the 1980s Graham earned his living from up to four parallel part-time Bartlett teaching contracts. As well as the MSc, these included: teaching economics to RIBA Part 2 architecture students; teach-

ing undergraduate building students; teaching urban economics to planning students; and teaching the economic history of the built environment to an integrated first-year undergraduate class of students of architecture, building and planning.

Graham also participated actively in the annual series of Bartlett International Summer Schools. Entitled *Production of the Built Environment*, from 1979 until 1989 these conferences and their published proceedings also showed the feasibility and value of looking at the sector that produces the built environment in broad and integrative terms, as opposed to the narrow SIC definition of construction as just the industry concerned with on-site assembly and repair of buildings and other structures. They also 'examined the potentials of relating analysis of the construction industry to urban questions' (*Production of the Built Environment*, Volume 1: back cover). Other Bartlett-based people amongst the international list of contributors to the series included Linda Clarke, Michael Edwards, Bill McGhie, Steve Merrett and Graham Winch, and students of the MSc included Getachew Alemayehu, Jonathan Charley, Nasser Massoud, and Andy Richardson.

The long 1990s (1989–2001): The Bartlett School of Graduate Studies

In 1989, Graham became course director of the MSc.

In 1984–85 Graham Winch interrupted his academic career in industrial sociology to become a student of Graham Ive on the CEM MSc in order to prepare to take on an emergency role in the family roofing business. After a short period, Graham Winch returned to academia, and when in 1990 a vacancy arose at the Bartlett, Graham Winch joined The Bartlett to teach the management part of the MSc.

Until 1992, both Grahams were members of the Building section of The Bartlett. In that year, reorganization created the new Bartlett School of Graduate Studies, and the two Grahams, alone amongst the staff of the Building section, moved to join it.

This marked a separation for Graham from involvement in teaching in other parts of The Bartlett. It also marked a turn back towards research. Though the two Grahams never published jointly, their ideas and interests had already begun to greatly influence each other.

One focus for early 1990s research was to explore the reasons for and the consequences of the emergence of complex conglomerate and other diversified ownership types amongst large construction groups of firms. Another was comparison of the large construction firms

in Britain and France, in which Elisabeth Campagnac was a key partner and influence. Her studies of the large French groups proved particularly valuable to Graham when, under the policy of the private finance initiative (PFI), British firms, albeit in different ways, also began to combine construction with ownership or management of some of the assets they constructed; for PFI was to become Graham's next research focus.

However, before that, some fruits of his earlier collaborative teaching with architects and historians appeared in the form of his contributions to *Architecture and the Sites of History* (Borden and Dunster, 1995). Few if any other construction economists have written on subjects like 'Urban classicism and modern ideology', or 'Demand and supply in renaissance Florence', though perhaps others have written on 'Commercial architecture'.

Also, it is at this point that another collaborator must be mentioned: Stephen Gruneberg. Like Graham Winch, Stephen too had been a mature student on the CEM MSc. Stephen now undertook his doctoral research into 'The growth and survival of firms in the heating & ventilating industry' under Graham's supervision (awarded 2001), a study combining and applying Graham's interests in the differences and relationships between subcontractor and main contractor firms, and in the strategies of businesses and change in industry structure within the construction sector. The long-term fruit from this collaboration would be the pair of co-authored books on which, beyond his teaching, Graham's wider reputation as an innovative but also systematic thinker in the field of construction economics is largely founded. Like almost all of Graham's 'outputs' (as academics were then beginning to learn to call their publications), these were many years in gestation and delivery, and that they were finished and delivered by 2000 is probably largely due to Stephen Gruneberg.

From 1996 onward, PFI became a focus of Graham's research. In co-authorship with Andrew Edkins (now Director of the School), a former MSc student in 1992, Graham published two PFI books (Ive and Edkins, 1998; Ive *et al.*, 2000).

As the content of the programme continued to evolve under the two Grahams, the relationship between the economics and the management taught in the MSc Construction Economics and Management had reached a high point of mutually beneficial influence. However, the fast increase in the number of student enrolments and applications laid bare the constraint understaffing imposed upon the development of the programme, which eventually prompted the restructuring of the programme and the emergence of a new School.

From 2001 to present: School of Construction and Project Management

In 2002, the arrival of Peter Morris as holder of the chair of management of projects diversified the interests of the school into non-construction projects and led to the formation of the School of Construction and Project Management, bringing together staff formerly divided between the undergraduate School of Construction and the Graduate School. The economics group grew along with the new school. I joined Graham to become the second permanent lecturer in economics in 2003. The appointment of Michelle Baddeley to the new Chair of Economics and Finance of the Built Environment in 2012 marked the establishment of an identity for the economics group. In 2015, the academic staff resource of the group comprises five full-time and two part-time staff with expertise spanning most of the areas associated with economics and finance of the built environment.

In this period, Graham had a range of research interests. First, Graham and I worked closely to develop my doctorate dissertation into journal papers, which came to fruition in two theory papers on the application of transaction cost economics (TCE) methodology to the analysis of procurement system selection (Ive and Chang, 2007; Chang and Ive, 2007b) and a case study paper on the Channel Tunnel project (Chang and Ive, 2007a). Graham deems the paper on the 'principle of inconsistent trinity' (Ive and Chang, 2007) the best scholarly work of his career. Second, in collaboration with Andrew Edkins, Kai Rintala (PhD awarded in 2004) and Alex Murray, Graham maintained momentum on public-private partnership research (Rintala *et al.*, 2008). Third, Graham worked with his PhD student, Marco Yu, on construction statistics (Yu and Ive, 2008; Ive and Yu, 2011). Fourth, Graham published two government-commissioned reports, on construction productivity (Ive *et al.*, 2004) and on trade credit (Ive and Murray, 2013).

On the teaching front, Graham led the design and development of a new MSc programme on Infrastructure Investment and Finance. With the assistance of European Investment Bank in course delivery, the programme has already begun to emerge as a premier provider of next generation leaders in the infrastructure financing sector.

Construction economics as a research sub-discipline: the positive analysis

In the positive analysis, construction economics is studied as a stock of knowledge, the quality of which is

judged by the recognition it receives from mainstream economists.

Broadly speaking, construction economics is aimed at exploring economic issues in respect of construction firms, construction process and construction markets (Hillebrandt, 1974). Specifically, it is concerned with how construction demand arises, how the demand is met by construction firms, and how these firms operate in competing for and producing work. As shown in Figure 1, the construction economy consists of three types of economic activity: at the core lies the contracting market through which construction contracts and subcontracts are placed; the left and right ends indicate the markets for building materials and for construction demand by project types. Construction economics can pitch itself as an application of economic methodology to develop a coherent understanding of economic activities within the construction economy.²

Before economic specialists in built environment departments existed, occasional economists made forays out from economics departments into the world

of construction. Of these, Marion Bowley’s work on innovation (Bowley, 1966) had perhaps the greatest influence upon ‘construction economics’ in the UK, while Mills’ (1972) work on labour and industrial relations informed construction economics in the US. While most were macroeconomic studies, works on costs and price formation (Cassimatis, 1969; Andrews and Brunner, 1975) stand out as exceptions.

Intellectually, in microeconomics the years from the 1930s to the 1970s were the period between the fall of the ‘old institutionalism’ in economics and the rise of the new (Hodgson, 1993). It has been argued by Hodgson that it was indeed the case that microeconomic theory then offered rather little to the would-be student of a particular industry and its firms, and that neoclassical economics was hostile to the very concept of an industry. (The *Journal of Industrial Economics* was founded and edited in the 1950s largely by economists sympathetic to the heterodox and, in orthodox neoclassical circles, hostilely received work of the ‘Oxford group’, such as P.W.S. Andrews.) Nevertheless, to take two

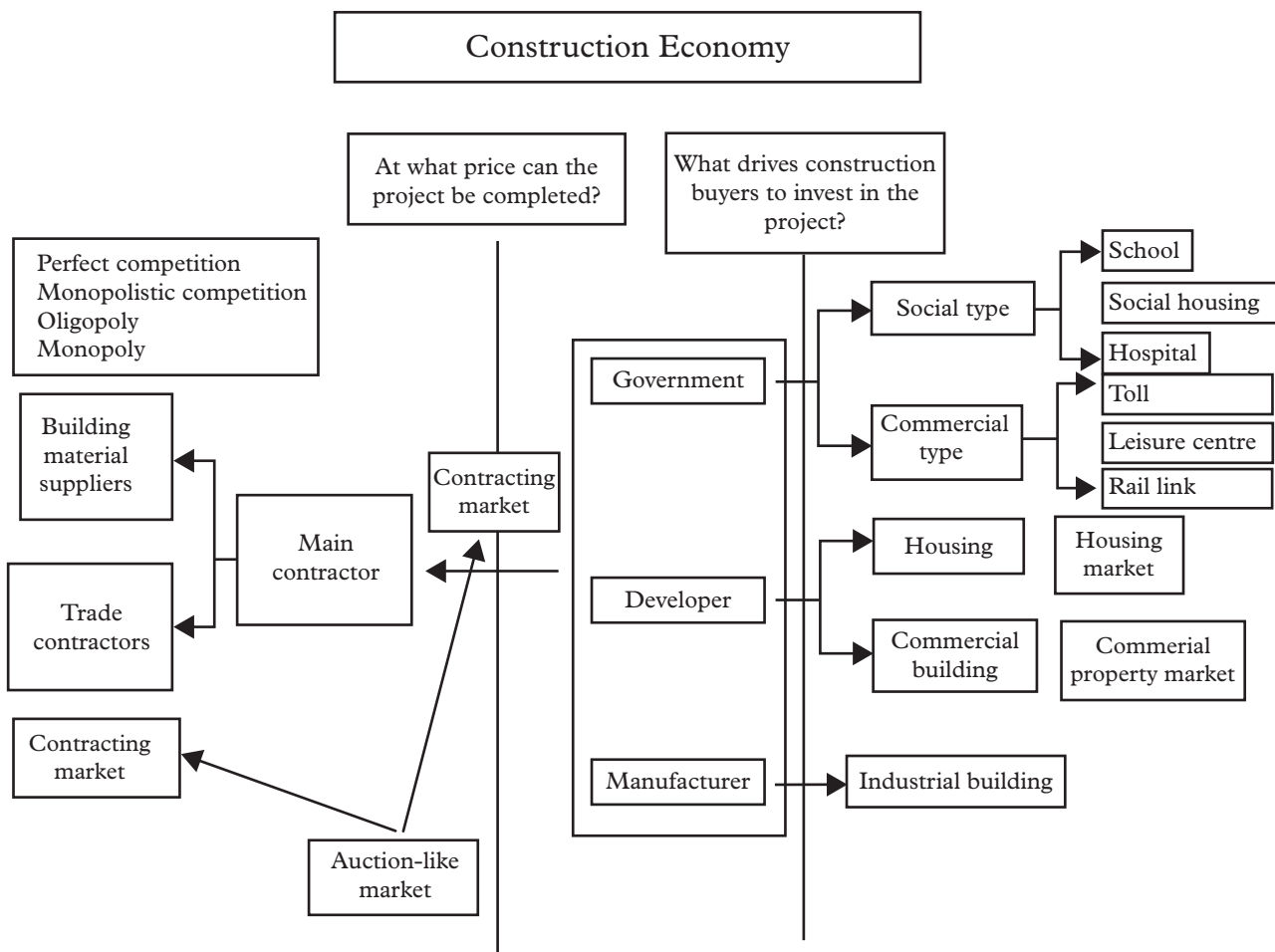


Figure 1 Components of the construction economy and their economic characteristics

examples of influential early works of construction economics, the lack of reference to microeconomic theory in either Bowley (1966) or Turin and Reid (1975) is, in retrospect, striking. On the other hand, those early microeconomists of construction that did acknowledge theoretical debts tended towards the heterodox, taking their inspiration not from orthodox neoclassical microeconomics but from sources such as Shackle (Hillebrandt, 1974).

Meanwhile, the 1950s were the key decade for the establishment of operations research (hereafter, OR) (the eponymous journal began in 1953, *Operational Research Quarterly* and the *Journal of the Operational Research Society* both in 1950). This marked the emergence of 'decision theory and application' as an important offshoot of economics. An early application to construction (bidding strategy) was offered by Friedman (1956).

Economics-of-construction studies of building cycles and the determinants of long-term fluctuations in construction demand in advanced industrial economies (JEL E3) first flourished, largely as a series of monographs (Kuznets, 1930; Long, 1940; Isard, 1942a, 1942b; Kuznets, 1958; Abramovitz, 1961, 1968; Lewis and Weber, 1965; Richardson and Aldcroft, 1968), then fell with the emergence of the view that such long building cycles (Kuznets cycles) and their drivers had become things of the past, suitable only for study by economic historians (Abramovitz, 1968).

Another important early offshoot, not surprisingly given the then-salience of 'development studies' and 'development economics' (JEL O1), was work on 'the construction sector in economic development'. Of work published in economics journals, the paper most influential on the economics of construction was by Strassmann (1970), and the book with most influence that by Hirschman (1958). Hirschmanian linkages were taken up by Jones (1976) and Schultz (1976), the latter published in Polenske and Skolka (1976), a work on 'advances in input-output analysis', a topic soon to be the subject of a series of papers by Bon in economic journals (Bon, 1977, 1984, 1986) (JEL O18, O41, D57, R15). This body of work was the product mainly of economists who were not (or not yet) located in built environment departments and who were economists rather than construction economists. Interest in these topics however declined with the fall in 'development economics' (Lal, 1985; Krueger, 1990) and in economic planning around fixed (Keynesian/neo-Ricardian) production technology proportions.

Construction Management and Economics (CME) was founded in 1982, and the *Journal of the Construction Division of ASCE* was replaced by the *Journal of Construction Engineering and Management* in 1983.

These events helped to separate construction economics from urban, property and housing economics, and to facilitate the decision-economics of construction by conjoining construction economics with construction management.

By the late 1970s, both regional and urban economics (JEL R) were booming, within which housing economics was emerging as a sub-discipline (R21 Housing Demand, and R31 Housing Supply and Markets). Housing economics was soon to occupy a large part of journals about space and products fixed in space, such as *Urban Studies*, *Housing Studies*, *Environment and Planning*. Departments of Land Economy, Real Estate, Planning and Urban Policy all grew, and often housed researchers working on housing and commercial property supply (and thus its development industries) as well as demand. It was in the late 1970s and early 1980s that 'real estate economics' and 'housing economics' became detached from 'construction economics' in the UK. The practical disadvantages of this split for the latter included loss of funding streams and rich markets for research and teaching. The intellectual disadvantages of the separation included an excessive separation of the economics of construction from the broader economics of the development process, including issues of land, user demand and financial assets (Bon, 1989, 2001; Ive, 2005). The compensating intellectual advantage was the resulting focus upon relationships between construction clients and their contractors.

This brings us then to the economics of the industrial organization (JEL L) of construction. In the 1970s, the 'old industrial economics' paradigm of structure-conduct-performance prevailed (Bain, 1956; Bain and Qualls, 1968). Within it, construction in advanced industrial economies was most obviously characterized by its low levels of national market concentration, and by being 'closed' to international competition.

The economics of organization was then transformed within a decade. Alchian and Demsetz's generally influential paper on the consequences of information costs came in 1972 (Alchian and Demsetz, 1972) and Williamson's book on the make-or-buy/market or hierarchy paradigm in 1975 (Williamson, 1975). Soon came Klein *et al.* (1978a) and Dahlman (1979). Eccles' two papers, much cited in the literature of the economics of construction, appeared in 1981 (Eccles, 1981a, b), but the emerging transaction cost economics and economics of information were not taken up for construction until Reve and Levitt (1984), Stinchcombe and Heimer (1985) and Winch (1989). It is notable that Eccles, Stinchcombe and Winch are all sociologists and not economists by original discipline, and became students of organizations from that route.

From the 1980s onward, fields began to emerge and gain recognition within economics that potentially bear closely upon the practical concerns of construction economics. These include: transactional relationships, contracts and reputation, networks (JEL L14); contracting-out and joint ventures (L24 and L33).

Meanwhile, the economics of auctions (JEL D44) received a stimulus. It is instructive to compare two early surveys by Engelbrecht-Wiggans (1980) and McAfee and McMillan (1987). The former appeared in *Management Science*, reviewing bid strategy (bidder decision) literature (some game-theoretic in method, some not) that had mostly been published in OR or management science journals. The latter was able to report a new wave of interest by theoretical economists, and to answer the question ‘why study auctions?’ as follows (1987, pp. 699–700):

Some of the most exciting of the recent developments in microeconomic theory have been in the modelling of strategic behaviour under asymmetric information.

This is indeed economics-as-social-science, with a remit much broader than bid decision-support.

Important works of economics applied to construction written by non-specialist economists include: Laffont and Tirole (1993), McAfee and McMillan (1987), McAfee and McMillan (1988), Dasgupta and Spulber (1990) on procurement auctions; Masten *et al.* (1991) and Lee and Png (1990) on temporal specificity; De Long and Summers (1991, 1993) on investment and economic growth.

Twenty years ago, Ofori examined the state of construction economics with a conclusion that ‘construction economics cannot be described as a bona fide academic discipline. It lacks a clear indication of its main concerns and contents and a coherent theory. It is not recognized as a distinct part of general economics’ (Ofori, 1994, p. 304). The question of interest is whether construction economics has gotten closer to this admirable goal.

Davis (2002) suggests that the ‘professionalization’ of an emergent sub-discipline could exhibit nine signs. As reported in Table 1, construction economics scores ‘Yes’ in five activity-related criteria, but fails to meet the four quality-related ones. This assessment result attests that whilst there has been a torrent of research activity in construction economics, the quality of output falls short of the standard of mainstream economics. In pursuit of recognition, acceptance by the *JEL Index* as a new entry is perhaps the ultimate goal. The key test lies in whether construction economics papers can secure a place in major economics journals. Actually, in recent years, construction issues have received increasing attention from mainstream

economists. The most remarkable stream of research is owing to the works of Steven Tadelis and Patricia Bajari (Bajari *et al.*, 2009; Levin and Tadelis, 2010; Bajari and Lewis, 2011; Bajari *et al.*, 2014). These papers are concerned with some of the core issues in construction economics, including construction contracts or public procurement (see a summary in Table 2). In terms of subject matters, these topics are classified into the categories of Construction (L74), Procurement (H57), and Contracting Out (L33) under the current *JEL* indexing system. These papers manifest that construction topics per se are intriguing for mainstream economists. However, these papers merely use construction as a context for testing existing theories (auction theory, transaction cost economics and contract theory), instead of attempting to develop an integrated theoretical understanding of construction activity. From this point of view, the study of construction economic issues has made considerable strides in recent years, but it has not translated into the momentum to drive forward construction economics as a discipline.

Construction economics as a research sub-discipline: the normative analysis

Who might wish to achieve such an outcome of recognition, and why? For anyone wishing to specialize in the study of construction from within the institutional support system of economics (that is, university departments of economics, Economic Research Council funding) it is an obvious necessity. However, as Buchanan (1969) pointed out, not all practitioners of ‘the economics of X’ are in fact dependent on such support systems. Buchanan had in mind agricultural economics:

Within a single (economics) department, fields or areas of ... specialization may be added, dropped, transformed ... Agricultural economics is however different precisely because in most universities it is organized independently as a self contained departmental unit, often ... in a wholly different school from that which houses ... economics. (Buchanan, 1969, p. 1028)

Lack of recognition may impose constraints on the development of construction economics. First, in contemporary academic systems, the level of research activity is mostly driven by funding. The persistence of underperformance and low innovation in the construction industry has prevented its related issues from attracting a level of funding proportionate to its economic contribution to the national economy. Whereas the recent revival of interest in infrastructure

Table 1 An assessment of construction economics as a sub-discipline

Key criteria for professionalization	Evaluation
1. Speciality journals.	Yes <i>CME</i>
2. Organization of associations and societies.	No
3. Regular scholarly association meetings both apart from and in conjunction with general economics meetings.	No CIB W055 Construction Industry Economics is a division for construction economics, but no session has been dedicated to construction economics in major economics meetings.
4. Inclusion of the field in scholarly classification systems (e.g. the <i>Journal of Economic Literature (JEL)</i> , <i>Social Science Citation Index (SSCI)</i>).	No There are many entries associated with the activity of construction in the economy, but construction economics has not been recognized by <i>JEL</i> . <i>CME</i> is not SCI/SSCI indexed.
5. University instruction and doctoral supervision dedicated expressly to the field.	Yes Specialist doctorate degrees in construction economics are offered at some major universities.
6. Ability of individual academics to gain credentials for themselves for careers within universities by work done in the field.	Yes But the population of construction economists is tiny, even on a global scale.
7. Book publishing opportunities with major publishers for scholars in the field.	Yes Major publishers are interested in publishing both textbooks and monographs on construction economics.
8. Identification of special library collections.	No
9. Newsletters, bulletins, electronic lists.	Yes

Table 2 JEL classifications of construction-related economics papers

Authors	Title of the paper	Focus	JEL classification
Bajari <i>et al.</i> (2014)	Bidding for Incomplete Contracts: An Empirical Analysis of Adaptation Costs	Highway procurement contracts	D44: Auctions D82: Asymmetric and Private Information D86: Economics of Contract: Theory H57: Procurement L13: Oligopoly and Other Imperfect Markets L74: Construction R42: Government and Private Investment Analysis; Road Maintenance; Transportation Planning
Lewis and Bajari (2011)	Procurement Contracting with Time Incentives: Theory and Evidence	Highway procurement contracts	D44: Auctions H41: Public Goods H57: Procurement L91: Transportation: General
Levin and Tadelis (2010)	Contracting for Government Services: Theory and Evidence from U.S. Cities	Modes of public service provision	D23: Organizational Behavior; Transaction Costs; Property Rights D73: Bureaucracy; Administrative Processes in Public Organizations; Corruption H11: Structure, Scope, and Performance of Government L33: Comparison of Public and Private Enterprises and Nonprofit Institutions; Privatization; Contracting Out
Bajari <i>et al.</i> (2009)	Auctions versus Negotiations in Procurement: An Empirical Analysis	Building contracts	D23: Organizational Behavior; Transaction Costs; Property Rights D82: Asymmetric and Private Information H57: Procurement L14: Transactional Relationships; Contracts and Reputation; Networks L22: Firm Organization and Market Structure L74: Construction

investment has led to a modest increase in funding, the issues that could win the favour of research councils are confined to those identified as having strategic importance, such as sustainability, building information modelling and smart infrastructure. Pursuit of topical research largely proves to be effective in securing funding, achieving publications and attaining promotions. Whilst diverting funding to a limited range of issues might cost-effectively establish national research capability in key strategic areas, this funding policy will inevitably impact upon the diversity of approaches and issues addressed. Under this trend, the traditional topics studied by construction economists could gain little favour in funding competition. Second, in the social sciences sphere, economists normally serve as the suppliers of high theories with potential for wide applications. Yet, construction economics has not assumed a similar role in advancing the study of construction issues. The low influence of construction economics on construction/project management is largely attributed to two reasons. First, construction economics works are mostly focused on the application of existing economic approaches rather than on the development of indigenous theory, leading citations to go direct to the original sources of economic methods instead of the construction economics papers that draw upon them. Second, the issues chosen for study by construction economists are largely driven by theory rather than by topicality, so the output of construction economics cannot normally attract research funding. These two factors have brought the development of construction economics into a predicament analogous to the ‘poverty trap’ experienced by many low-income countries: lack of funding reduces the intensity of research activity in construction economics, which then further lowers construction economists’ chances of obtaining funding. To break out of this trap, it is instrumental to contemplate a plan for the future development of construction economics.

Construction economics as a research sub-discipline: the prescriptive analysis

Nearly half a century has elapsed since the inception of economic analysis of construction activity in the 1960s within The Bartlett. In stark contrast to the outgrowth of many economics sub-fields (e.g., organizational economics, experimental economics and behavioural economics) emerging around the same time, the development of construction economics appears enormously sluggish.

The future development of construction economics should have much to learn from the research fields that have risen prominently since the 1970s. An authoritative indicator for the success of a sub-discipline is the award of a Nobel Prize to its founder. By this criterion, transaction cost economics (2009 Nobel Prize to Oliver Williamson), behavioural economics (2002 Nobel Prize to Daniel Kahneman) and experimental economics (2002 Nobel Prize to Vernon Smith) are all good examples. These three sub-disciplines share some common characteristics (see Table 3). First, there is a categorical issue that has implications for the wider economy. For example, in the late 1960s, Oliver Williamson was intrigued by the inadequacy of over-reliance upon monopoly arguments in judging anti-trust cases (Williamson, 1996) and went on to rethink the rationale of make-or buy-decisions in light of transaction costs. Relatively, the origin of experimental economics is not easy to discern owing to its multidisciplinary nature (Guala, 2008). The games played in class in the 1950s at Harvard as an illustration of the real market equilibrium process inspired Vernon Smith to refine the practices and methods of economic experimentation (Smith, 1962). Behavioural economics was largely originated in psychology, which had a tradition of challenging rational theory³ and focus on the effect of behavioural biases.

In the initial stage, a new idea normally found it hard to reach an audience and would be subject to

Table 3 Key facts of three successful sub-disciplines since the 1970s

	Transaction cost economics	Behavioural economics	Experimental economics
Origin of ideas	Anti-trust cases	Irrational decision found at labs	Market price equilibrium
Main focus	Make-or-buy decisions	Behavioural biases	Design of institutions and policy-making
Milestone theoretical contributions	Williamson (1979), Klein <i>et al.</i> (1978b), Williamson (1991)	Kahneman and Tversky (1979)	Smith (1976)
Milestone empirical contributions	Monteverde and Teece (1982)	Tversky and Kahneman (1974)	Grether and Plott (1979)

resistance from the protagonists of existing views. The change of wind will not come until either sufficient good-quality evidence is mounted in support of the new perspective or the theoretical foundation is firmly laid. In the case of TCE, whilst the first theory paper was published in 1971 (Williamson, 1971) and the first of Williamson's trilogy of books (*Markets and Hierarchies*) in 1975, transaction cost arguments had not won much favour until transaction attributes were 'operationalized' to enable the predictions of theory testable in terms of asset specificity, uncertainty and frequency (Klein *et al.*, 1978b; Williamson, 1979). This theoretical advance led to an explosion of empirical TCE literature in the ensuing three decades (Shelanski and Klein, 1995; Macher and Richman, 2008). The TCE methodology was completed with the publication of the paper 'Comparative economic organization: the analysis of discrete structural alternatives' (Williamson, 1991). Williamson's engagement strategy by publishing TCE papers in the major journals of contiguous disciplines (e.g., *Administrative Science Quarterly*, *Strategic Management Journal*, *Journal of Finance* and *American Journal of Sociology*) made him one of the most notable economists within the social sciences arena. The development of behavioural economics is slightly different because it was motivated by systematic biases found in experiments that 'separate the beliefs that people have and the choices they make from the optimal beliefs and choices assumed in rational-agent models' (Kahneman, 2003, p. 1449).

Similarly, since Vernon Smith's first important experiment paper came out in 1962 (Smith, 1962), experimental economics experienced a dormant period after the late 1970s. Lack of interest among peer economists even led Vernon Smith himself to turn to other research topics in some years (Guala, 2008). With the emergence of behavioural economics in the 1970s, experimental methods started to gain increasing prominence, which naturally contributed to a revival of interest. Even more important are the formalization of experimental methodology, known as 'induced value theory' (Smith, 1976), and the publication of an important experiment result designed to 'discredit the psychologists' works as applied to economics' (Grether and Plott, 1979, p. 623) with the effect of opening a new frontier for economic experimental methods.

The successes of these sub-fields are primarily attributed to three factors: first, they can expand the border of economics by addressing new issues through the development of theory; second, the new theory rests upon a solid theoretical foundation with a clear connection with mainstream economics; third, the new theory is supported by high-quality empirical evidence.

What lessons can construction economists learn from the history of three sub-disciplines? First and foremost, construction economists have to expound upon an indigenous theory enough to explain primary economic issues within the construction economy and with applicability to other economic sectors. Certainly, Rome wasn't built in a day. The application of existing approaches can serve as a stepping stone towards the ultimate goal. However, without venturing into advanced theorization, construction economists will always see the issues of their interest remain as an untapped gold mine waiting for economists to dig for more evidence in support of existing theories. An indigenous theory is a necessary condition for construction economics to establish its own identity.

Second, construction economists need to identify an idiosyncratic research agenda to facilitate effective knowledge accumulation. In recent years, we have seen an imposing body of work on construction-related issues in mainstream economics journals, including contract forms (Bajari and Tadelis, 2001; Ewerhart and Fieseler, 2003), award procedure (Tadelis and Bajari, 2006; Ganuza, 2007; Bajari *et al.*, 2014), risk sharing (Olsen and Osmundsen, 2005), subcontracting (Tadelis, 2002), bidding behaviour (Bajari *et al.*, 2006), procurement efficiency (Jensen and Stonecash, 2005; Bajari *et al.*, 2014), corruption in procurement (Auriol, 2006), and public-private partnerships (Hart, 2003; Maskin and Tirole, 2008; De Bettignies and Ross, 2009). While modelled elegantly, these works may not be pieced together coherently enough to form an integrated understanding of construction economic activity.

Third, scientific disciplines must be built upon facts, and so must construction economics. Currently, case study seems to have been overly relied upon in empirical investigations of construction problems (Chang, 2015). Generally, the maturity of a discipline is gauged by sophistication, depth, rigour, and consistency of arguments and methods (Durisin and Puzone, 2009). To progress construction economics to a higher level, it is imperative for construction economists to demonstrate mastery of rigorous empirical methods. Figure 2 gives a classification of methods suitable for the analysis of human interactions in terms of data sources (hypothetical world such as laboratories versus real world) and how game rules are defined (loosely defined versus tightly defined) (Chang, 2014b). The best choice of methods depends on the questions under study. A good indicator for the academic standard of a research field lies in the appearance of a good mix of these tools in its empirical literature. It will be encouraging to see more empirical studies in construction economics attempting to test hypotheses via econometric, simulation-based or experimental methods.

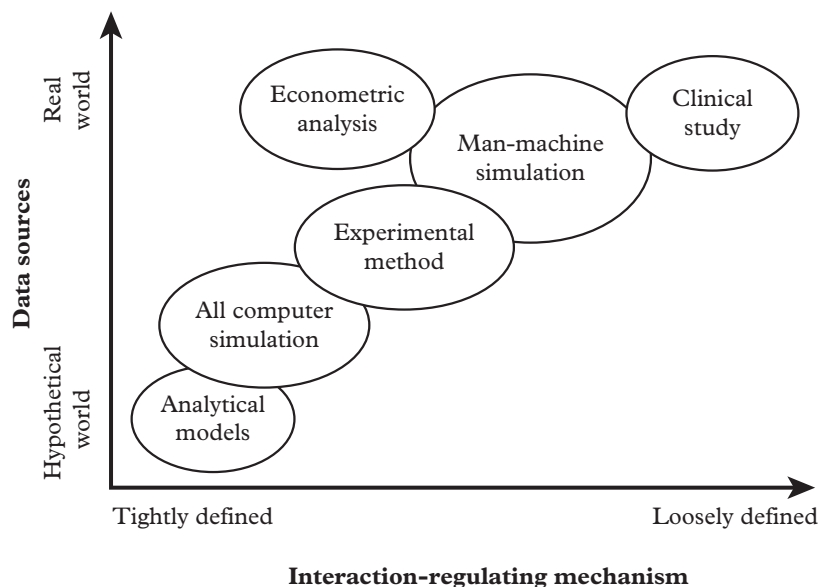


Figure 2 Empirical methods useful for construction economics
(Source: Chang, 2014)

Papers in this special issue

The participants of this special issue were all invited according to their publication track record on a specific topic of construction economics. Of the 10 papers submitted to this issue, five papers successfully went through three rounds of reviews.

The first paper by Graham Winch addresses an essential issue in construction economics: how to organize projects? All economic activity involves organizing. This is why the study of organizations occupies the central ground in most of the social science disciplines. The multidisciplinary of the existing approaches to organizations is evidenced by the wide spectrum of methodologies employed, ranging from formalizable⁴ to softer approaches. A distinction between them lies in the assumption about rationality. Graham perceptively points out that the information processing perspective could have some untapped potential for the analysis of construction organizations. As potently demonstrated by Levitt *et al.* (1999), this perspective can provide a theoretical basis for the design of project work processes. Conceptually, this perspective shares commonality with the presumptions of behavioural approaches on bounded rationality (Lipman, 1995). Humans have two types of cognitive systems (Stanovich and West, 2000; Kahneman, 2003): intuition (fast, automatic, effortless, associative, and difficult to control or modify) and reasoning (slower, serial, effortful, and deliberately controlled). Both of these cognitive abilities should have a role to play in explaining construction behaviour. For

those readers interested in the debate on rationality, the best source of reference is in special issue 59(4) of the *Journal of Business*. Zeckhauser's penetrating comment is still pertinent nearly 30 years later: 'prospects for a settlement of the rational-versus-behavioral battle seem dim' (Zeckhauser, 1986, p. S436). In my view, the progress of both approaches independently or synthetically can enrich the research field.

In the second paper, Runeson and de Valence look at the crisis in research, where it is said that because of poor methodologies, methods and analysis, the conclusions of some 80% of published papers in all social science (of which we are part) should be reversed. The authors suggest that a more rigorous use of existing and tried theories in construction management research in general, and in building economics in particular, should remove many of the problems. They also suggest that when theories do not appear to fit construction management problems, the strategy should be, not to reject the theories in favour of ill-considered versions of methodologies like grounded or action theory, but to modify the auxiliary statements until they apply. The authors also touch on the inappropriateness of Popper's methodology and the inadequacy of peer review and replicability as guarantors of quality. Rather than peer review and replicability the primary guarantee of quality of research is an extensive and thorough understanding of the theoretical framework of the research discipline.

In the third paper, de Valence and Runeson focus on one of Graham Ive's methodological positions: that

the acceptance of neoclassical economics has been an important methodological problem in construction economics. Given that neoclassical economics is the dominant paradigm in contemporary mainstream economics, this is a controversial claim that should be tested. Two topics are used as examples to highlight both Ive's approach and the strengths and weaknesses of the positivist and alternative approaches. These topics are the adoption of innovations in construction, and microeconomic analysis as it relates to price determination in the market for construction. Ive and his collaborators adopt a horses for courses approach in order to find the best explanation for the observed facts, a respectable methodological position. They also emphasize theory and argue the models we use should match the aspects of the industry as we find it. The distinctive characteristic of Ive's research is his focus on the industry and the firm, rather than the more widely found emphasis on projects. This means that he is investigating the processes involved in building and organizing the production of buildings, and theories from sociology, psychology and institutional economics have been applied to this task. The authors' review of Ive's research on innovation and price determination in the building industry shows that his findings are important, and that methodological pluralism in construction research can help explain the diversity seen in the building and construction industry.

The next paper from Gregori and Pietroforte addresses the issue of construction performance in emerging economies. International comparisons are of great interest to practitioners and stakeholders, but there is little agreement about how these studies should be performed. The authors use a set of OECD input-output tables for Brazil, Russia, India, Indonesia, China and South Africa (BRIICS) to evaluate construction performance from 1995 to 2005. Input-output analysis can assess the role of construction in terms of value added, gross output, final demand, intermediate input provision and interdependencies between construction and other industries in a national economy. These characteristics of construction in emerging economies have not been studied yet. Gregori and Pietroforte fill this gap by demonstrating that in BRIICS, construction proves to be important for stimulating economic activities and the share of construction output is larger when measured in total gross output than in total value added. These findings evince that the nature of construction operations involves the assembly of many different products from a large number of industries. The issue of technology comparability is also tackled. The authors argue that a fundamental input provision structure exists. Even if BRIICS do not share the same recipe, the construction industry uses a common set of inputs such as chemicals, wood,

coke and refined petroleum products, basic metals, other non-metallic products, wholesale, transport, plus some private services. Further research should be undertaken to examine whether other countries exhibit a similar input mix.

In the last paper, Connaughton, Meikle and Teerikangas analyse the evolution of the top 25 UK-based construction professional services firms (CPSFs) in the period 1988–2013, characterized by the vibrant growth of major construction companies. Academic studies of construction firm strategy have been relatively scant. To gain insights into the patterns of construction firm growth and evolution, this study is focused on the employment of mergers and acquisitions (M&As) as firm growth strategies by CPSFs. It is found that, since the 1990s, increasing M&A activity has shaped the size, international presence, and multidisciplinary reach of the major CPSFs. Whilst public limited companies are active acquirers, privately owned firms are more successful in growing with a selective acquisitive strategy. These findings can serve as an evidence base for construction economists to develop a full understanding of the evolution of the business landscape in the UK construction industry.

Concluding thoughts

In this special issue, we not only honour Graham Ive's contribution to construction economics, but also explore one of his long-standing pursuits in raising the profile of construction economics to a recognizable status. During his service at UCL, Graham has commanded great respect for his unrelenting passion for teaching. As his PhD student and his colleague for 18 years, I have had the distinct privilege to observe both his words and his deeds. His teachings, tutoring and writings are always imbued with inexhaustible inspirations. His emphasis on theory and deep thinking should be heartily embraced as principles by construction economists.

In terms of the current state of construction economics, it is unfortunate that one must draw the same conclusion as George Ofori that construction economics is far from being accorded official recognition. However, it is my belief that construction has a great deal of fascinating issues remaining unexplored. Unlike some industries that may vanish owing to economic growth or technological progress, construction is an indispensable pillar of any domestic economy. The sheer volume, pervasiveness and peculiarities of construction activity can justify it as a research field in its own right. In the short run, construction economists can deepen theorization through sound applications of the latest economic theories. Whereas imitation

may prove effective to expedite catch-up, it is unlikely to earn construction economics an independent identity in the long run. It is innovative breakthroughs in theory building that hold the key to upgrading construction economics to a recognizable discipline.

Acknowledgements

I am grateful for Graham Ive's insightful input for writing the history of construction economics in general and at The Bartlett in particular.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes

1. The recent suicide of a professor at Imperial College is a horrific consequence of this system (<http://www.timeshighereducation.co.uk/news/imperial-college-professor-stefan-grimm-was-given-grant-income-target/2017369.article>).
2. Apart from these core issues, it has been suggested that construction economics could also encompass cost planning, life cycle costing and value engineering (Myers, 2003).
3. Tversky and Kahneman (1987) suggest that 'normal and descriptive analyses of choice should be viewed as separate enterprises' (p. 91).
4. *The Handbook of Organizational Economics* edited by two eminent economists, Robert Gibbons and John Roberts, provides a good collection of formalizable approaches (Gibbons and Roberts, 2013) fit for the analysis of procurement systems, construction supply chain governance and internal construction organizations (Chang, 2014a).

References

- Abramovitz, M. (1961) The nature and significance of Kuznets cycles. *Economic Development and Cultural Change*, **9**, 225–48.
- Abramovitz, M. (1968) The passing of the Kuznets cycle. *Economica*, **35**, 349–67.
- Alchian, A.A. and Demsetz, H. (1972) Production, information costs, and economic organization. *The American Economic Review*, **62**, 777–95.
- Andrews, P.W.S. and Brunner, E. (1975) *Studies in Pricing*, Macmillan, London.
- Auriol, E. (2006) Corruption in procurement and public purchase. *International Journal of Industrial Organization*, **24**, 867–85.
- Bain, J.S. (1956) *Barriers to New Competition*, Harvard University Press, Cambridge, MA.
- Bain, J.S. and Qualls, P.D. (1968). *Industrial Organization*. Wiley, New York.
- Bajari, P., Houghton, S. and Tadelis, S. (2006) Bidding for incomplete contracts: an empirical analysis. *National Bureau of Economic Research*.
- Bajari, P., Houghton, S. and Tadelis, S. (2014) Bidding for incomplete contracts: an empirical analysis of adaptation costs. *The American Economic Review*, **104**, 1288–319.
- Bajari, P., McMillan, R. and Tadelis, S. (2009) Auctions versus negotiations in procurement: an empirical analysis. *Journal of Law, Economics, and Organization*, **25**, 372–99.
- Bajari, P. and Lewis, G. (2011) Procurement contracting with time incentives: theory and evidence. *Quarterly Journal of Economics*, **126**, 1173–211.
- Bajari, P. and Tadelis, S. (2001) Incentives versus transaction costs: a theory of procurement contracts. *RAND Journal of Economics*, **32**, 387–407.
- Bon, R. (1977) Some conditions of macroeconomic stability of multiregional input-output models. *Economic Analysis*, **16**(1), 23.
- Bon, R. (1984) Comparative stability analysis of multi-regional input-output models. *Quarterly Journal of Economics*, **99**, 701–815.
- Bon, R. (1986) Comparative stability analysis of demand-side and supply-side input-output models. *International Journal of Forecasting*, **2**, 231–5.
- Bon, R. (1989) *Building as an Economic Process: An Introduction to Building Economics*, Prentice Hall, Englewood Cliffs, NJ.
- Bon, R. (2001) The future of building economics: a note. *Construction Management & Economics*, **19**, 255–8.
- Borden, I. and Dunster, D. (1996). *Architecture and the sites of history: interpretations of buildings and cities*. Watson-Guptill, London.
- Bowley, M. (1966) *The British Building Industry: Four Studies in Response and Resistance to Change*, Cambridge University Press, Cambridge.
- Buchanan, J.M. (1969) A future for "Agricultural Economics"? *American Journal of Agricultural Economics*, **51**, 1027–36.
- Cassimatis, P.J. (1969). *Economics of the Construction Industry*. National Industrial Conference Board, New York
- Chang, C.-Y. (2014a) The handbook of organizational economics. *Construction Management and Economics*, **32**, 309–13.
- Chang, C. (2014b) Assessment of Empirical Techniques for the Study of BIM Incentivization: Roadmap for Knowledge Accumulation. *Working paper, Bartlett School of Construction and Project Management*, University College London.
- Chang, C. (2015) Risk-bearing capacity as a new dimension to the analysis of project governance. *International Journal of Project Management*, available at <http://www.sciencedirect.com/science/article/pii/S0263786315000368> (accessed 27 February 2015)
- Chang, C.Y. and Ive, G. (2007a) The hold-up problem in the management of construction projects: a case study of the channel tunnel. *International Journal of Project Management*, **25**, 394–404.
- Chang, C.Y. and Ive, G. (2007b) Reversal of bargaining power in construction projects: meaning, existence and implications. *Construction Management and Economics*, **25**, 845–55.
- Dahlman, C.J. (1979) The problem of externality. *Journal of Law and Economics*, **22**, 141–62.

- Dasgupta, S. and Spulber, D.F. (1990) Managing procurement auctions. *Information Economics and Policy*, **4**, 5–29.
- Davis, J.B. (2002) The history of economics as a subdiscipline: the role of the history of economics society meetings. *History of Political Economy*, **34**, 62–76.
- De Bettignies, J.E. and Ross, T.W. (2009) Public-private partnerships and the privatization of financing: an incomplete contracts approach. *International Journal of Industrial Organization*, **27**, 358–68.
- De Long, J.B. and Summers, L. (1991) Equipment investment and economic growth. *Quarterly Journal of Economics*, **106**, 58.
- De Long, J.B. and Summers, L.H. (1993) How strongly do developing economies benefit from equipment investment? *Journal of Monetary Economics*, **32**, 395–415.
- Durisin, B. and Puzone, F. (2009) Maturation of corporate governance research, 1993–2007: an assessment. *Corporate Governance: An International Review*, **17**, 266–91.
- Eccles, R.G. (1981a) Bureaucratic versus craft administration: the relationship of market structure to the construction firm. *Administrative Science Quarterly*, **26**(3), 449–69.
- Eccles, R.G. (1981b) The quasifirm in the construction industry. *Journal of Economic Behavior & Organization*, **2** (4), 335–57.
- Engelbrecht-Wiggans, R. (1980) Auctions and bidding models: a survey. *Management Science*, **26**(2), 119–42.
- Ewerhart, C. and Fieseler, K. (2003) Procurement auctions and unit-price contracts. *RAND Journal of Economics*, **34**, 569–81.
- Friedman, L. (1956) A competitive-bidding strategy. *Operations Research*, 104–12.
- Ganuzza, J.J. (2007) Competition and cost overruns in procurement. *The Journal of Industrial Economics*, **55**, 633–60.
- Gibbons, R. and Roberts, J. (2013) *The Handbook of Organizational Economics*, Princeton University Press, Princeton.
- Grether, D.M. and Plott, C.R. (1979) Economic theory of choice and the preference reversal phenomenon. *The American Economic Review*, **69**, 623–38.
- Guala, F. (2008) History of experimental Economics, in Blume, L. and Durlauf, S.N. (eds.) *The New Palgrave Dictionary of Economics*, 2nd edn, Palgrave Macmillan, Basingstoke, UK.
- Guala, Francesco. "experimental economics, history of." *The New Palgrave Dictionary of Economics*. Second Edition. Eds. Steven N. Durlauf and Lawrence E. Blume. Palgrave Macmillan, 2008. *The New Palgrave Dictionary of Economics Online*. Palgrave Macmillan. http://www.dictionaryofeconomics.com/article?id=pde2008_E000289 doi:10.1057/9780230226203.0528
- Hart, O. (2003) Incomplete contracts and public ownership: remarks, and an application to public-private partnerships. *The Economic Journal*, **113**, C69–76.
- Hillebrandt, P.M. 1974. *Economic Theory and the Construction Industry*. Macmillan, London.
- Hillebrandt, P.M. (1984) *Analysis of the British construction industry*, Macmillan, London.
- Hirschman, A.O. (1958) *The strategy of economic development*, Yale University Press, New Haven, CT.
- Hodgson, G.M. (1993) Institutional economics: surveying the 'old' and the 'new'. *Metroeconomica*, **44**, 1–28.
- Isard, W. (1942a) A neglected cycle: the transport-building cycle. *The Review of Economics and Statistics*, **24**, 149–58.
- Isard, W. (1942b) Transport development and building cycles. *The Quarterly Journal of Economics*, **57**, 90–112.
- Ive, G. (2005) Review of Evans, A (2004) Economics, real estate and the supply of land. *Construction Management and Economics*, **23**(9), 767–73.
- Ive, G. and Chang, C.Y. (2007) The principle of inconsistent trinity in the selection of procurement systems. *Construction Management and Economics*, **25**, 677–90.
- Ive, G. and Edkins, A. (1998) *Constructors' Key Guide to PFI*, Thomas Telford, London.
- Ive, G. and Murray, A. (2013) *Trade Credit in the UK Construction Industry: An Empirical Analysis of Construction Contractor Financial Positioning and Performance*, BIS Research Papers, Department for Business, Innovation and Skills, London.
- Ive, G.J. and Yu, M.K.W. (2011) Orders and output in UK construction statistics: new methodology and old problems. *Construction Management and Economics*, **29**, 653–8.
- Ive, G.J., Edkins, A. and Millan, G. (2000) *The Role of the Cost Saving and Innovation in PFI Projects*, Thomas Telford, London.
- Ive, G., Gruneberg, S., Meikle, J. and Crosthwaite, D. (2004) *Measuring the Competitiveness of the UK Construction Industry, Construction Economics and Statistics (04/2004)*, Department of Trade and Innovation, London.
- Jackson, D. (1982) *Introduction to Economics: Theory and Data*, Macmillan, London.
- Jensen, P.H. and Stonecash, R.E. (2005) Incentives and the efficiency of public sector-outsourcing contracts. *Journal of Economic Surveys*, **19**, 767–87.
- Jones, L.P. (1976) The measurement of Hirschmanian linkages. *The Quarterly Journal of Economics*, **90**, 323–33.
- Kahneman, D. (2003) Maps of bounded rationality: psychology for behavioral economics. *American Economic Review*, **93**, 1449–75.
- Kahneman, D. and Tversky, A. (1979) Prospect theory: an analysis of decision under risk. *Econometrica*, **47**, 263–91.
- Klein, B., Crawford, R.A. and Alchian, A.A. (1978a) Vertical integration, appropriable rents, and the competitive process. *Journal of Law and Economics*, **21**, 30.
- Klein, B., Crawford, R.G. and Alchian, A.A. (1978b) Vertical integration, appropriable rents, and the competitive contracting process. *Journal of Law and Economics*, **21**, 297–326.
- Krueger, A. (1990) Government failures in development. *Journal of Economic Perspectives*, **4**, 15.
- Kuznets, S.S. (1930) *Secular movements in production and prices: Their nature and bearing upon cyclical fluctuations*, Houghton Mifflin, Boston.
- Kuznets, S. (1958) Long swings in the growth of population and in related economic variables. *Proceedings of the American Philosophical Society*, **102**, 25–52.
- Lal, D. (1985) The misconceptions of development economics. *Finance and Development*, **22**(2), 10–3.
- Laffont, J.J. and Tirole, J. 1993. *A Theory of Incentives in Procurement and Regulation*. MIT Press.

- Lee, T.K. and Png, I.P.L. (1990) The role of installment payments in contracts for services. *RAND Journal of Economics*, 21(1), 83–99.
- Levin, J. and Tadelis, S. (2010) Contracting for government services: Theory and evidence from US cities*. *The Journal of Industrial Economics*, 58(3), 507–41.
- Levitt, R.E., Thomsen, J., Christiansen, T.R., Kunz, J.C., Jin, Y. and Nass, C. (1999) Simulating project work processes and organizations: toward a micro-contingency theory of organizational design. *Management Science*, 45, 1479–95.
- Lewis, G. and Bajari, P. (2011) Procurement Contracting With Time Incentives: Theory and Evidence*. *Quarterly Journal of Economics*, 126(3), 1173–211.
- Lewis, J.P. and Weber, B. 1965. *Building Cycles and Britain's Growth*. Macmillan, London.
- Lipman, B.L. (1995) Information processing and bounded rationality: a survey. *Canadian Journal of Economics*, 42–67.
- Long, C.D. 1940. *Building Cycles and the Theory of Investment*. Princeton University Press, New Jersey.
- Macher, J.T. and Richman, B.D. (2008) Transaction cost economics: an assessment of empirical research in the social sciences. *Business and Politics*, 10, 1–63.
- Maskin, E. and Tirole, J. (2008) Public–private partnerships and government spending limits. *International Journal of Industrial Organization*, 26, 412–20.
- Masten, S.E., Meehan, J.W. and Snyder, E.A. (1991) The costs of organization. *Journal of Law, Economics, & Organization*, 7, 1–25.
- McAfee, R.P. and McMillan, J. (1987) Auctions and bidding. *Journal of Economic Literature*, 25(2), 699–738.
- McAfee, R.P. and McMillan, J. (1988) *Incentives Incentives in government contracting*, Univ of Toronto Press, Toronto.
- Mills, D.Q. (1972) *Industrial relations and manpower in construction*, The MIT Press, Cambridge MA.
- Monteverde, K. and Teece, D.J. (1982) Supplier switching costs and vertical integration in the automobile industry. *The Bell Journal of Economics*, 13(1), 206–13.
- Myers, D. (2003) The future of construction economics as an academic discipline. *Construction Management & Economics*, 21, 103–6.
- Ofori, G. (1994) Establishing construction economics as an academic discipline. *Construction Management and Economics*, 12(4), 295–306.
- Olsen, T.E. and Osmundsen, P. (2005) Sharing of endogenous risk in construction. *Journal of Economic Behavior & Organization*, 58, 511–26.
- Polenske, K.R. and Skolka, J. 1976. *Advances in Input-Output Analysis: Proceedings of the Sixth International Conference on Input-Output Techniques*, Vienna, April 22–26, 1974. Ballinger Publishing, Cambridge MA.
- Reve, T. and Levitt, R.E. (1984) Organization and governance in construction. *International Journal of Project Management*, 2, 17–25.
- Richardson, H.W. and Aldcroft, D.H. (1968) *Building in the British Economy between the Wars*, Allen & Unwin, London.
- Rintala, K., Root, D., Ive, G. and Bowen, P. (2008) Organizing a bidding competition for a toll road concession in South Africa: the case of Chapman's peak drive. *Journal of Management in Engineering*, 24, 146–55.
- Schultz, S. (1976) *Intersectoral Comparisons as an Approach to the Identification of Key Sectors. Advances in Input/Output analysis*, Ballinger, Cambridge, Mass.
- Shelanski, H.A. and Klein, P.G. (1995) Empirical research in transaction cost economics: a review and assessment. *Journal of Law, Economics, & Organization*, 11, 335–61.
- Smith, V.L. (1962) An experimental study of competitive market behavior. *The Journal of Political Economy*, 70, 111–37.
- Smith, V.L. (1976) Experimental economics: induced value theory. *The American Economic Review*, 66, 274–9.
- Stanovich, K.E. and West, R.F. (2000) Individual differences in reasoning: implications for the rationality debate? *Behavioral and Brain Sciences*, 23, 645–65.
- Stinchcombe, A.L. and Heimer, C.A. (1985). *Organization Theory and Project Management: Administering Uncertainty in Norwegian Offshore Oil*. Oxford University Press, Oxford.
- Strassmann, W.P. (1970) The construction section in economic development. *Scottish Journal of Political Economy*, 17, 391–409.
- Tadelis, S. (2002) Complexity, flexibility, and the make-or-buy decision. *The American Economic Review*, 92, 433–7.
- Tadelis, S. and Bajari, P. (2006) Incentives and award procedure: competitive tendering vs. Negotiations in procurement, in Dimitri, N., Piga, G. and Spagnolo, G. (eds.) *Handbook of Procurement*, Cambridge University Press, Cambridge, UK, pp. 121–39.
- Turin, D. and Reid, D.A.G. (1975). *Aspects of the Economics of Construction*. Godwin, London.
- Tversky, A. and Kahneman, D. (1974) Judgment under uncertainty: heuristics and biases. *Science*, 185, 1124–31.
- Tversky, A. and Kahneman, D. (1987) Rational choice and the framing of decisions, in Hogarth, R.M. and Reder, M.W. (eds.) *Rational Choice: The Contrast between Economics and Psychology*, University of Chicago Press, Chicago.
- Williamson, O. (1971) The vertical integration of production: market failure considerations. *The American Economic Review*, 61, 112–23.
- Williamson, O. (1975) *Markets and Hierarchies: Analysis and Antitrust Implications*, Free Press, New York.
- Williamson, O.E. (1979) Transaction-cost economics: the governance of contractual relations. *Journal of Law and Economics*, 22, 233–61.
- Williamson, O.E. (1991) Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly*, 36, 269–96.
- Williamson, O.E. (1996) *The Mechanisms of Governance*, Oxford University Press, New York.
- Winch, G. (1989) The construction firm and the construction project: a transaction cost approach. *Construction Management and Economics*, 7, 331–45.
- Yu, M.K.W. and Ive, G. (2008) Compilation methods of building price indices in Britain: a critical review. *Construction Management and Economics*, 26, 693–705.
- Zeckhauser, R. (1986) Comments: behavioral versus rational economics: what you see is what you conquer. *Journal of Business*, 59, S435–49.