ANALYSING THE CONSTRUCTION SECTOR: PROGRESS TOWARDS A NEW FRAMEWORK

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Since 1999, members of the Project Group of CIB TG31/W55 have been working on the development and application of a novel meso-economic framework for analysing and understanding the construction sector. The present paper reports on progress made by the Construction Economics Unit at University of Salford in applying that framework to the UK construction sector. Data is presented for the past ten years on the weight of construction, the main characteristics of construction works, the value of the stock of building and infrastructure which constitute the built environment, the segments of the construction sector, including construction, inputs to construction, such as professional services, management and manufacture, and the regulations which help to shape the system. It is concluded that there is a mismatch between the available data and the framework, and that the framework is more appropriate in case study work, such as the study of specific innovations.

Keywords: built environment, construction activity, construction analysis, construction data, macro-economic analysis

INTRODUCTION - THE FRAMEWORK

Meso-economic analysis focuses on the organized complex of commercial and non-commercial relations between producers and institutions in a specific area of interest (Carassus. 2000). In so doing, it complements micro-economic analysis – which tends to focus on the behaviour of individuals and organizations within an economy – macro-economic analysis – which focuses on the behaviour of the economy as a whole – and meta-economic analysis – which focuses on the flow of information and knowledge between and within organizations, such as firms and extra-firm institutions.

Figure 1 is a simple diagram of the production and management of the built environment in the UK (see Carassus. 2000).[2] It shows the main activities (design, fabrication, construction, etc.) and actors (producers, managers, owners, regulators, merchants, financiers etc) involved in the production and management of the built environment.

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[2] *The key difference between this and the "construction industry cluster" approach of Ive and Gruneberg (2000) is that the present framework covers both the production* and management *of the built environment, and not just the production of the built environment. It therefore highlights the role of services, and underlines the weight of existing stock.*

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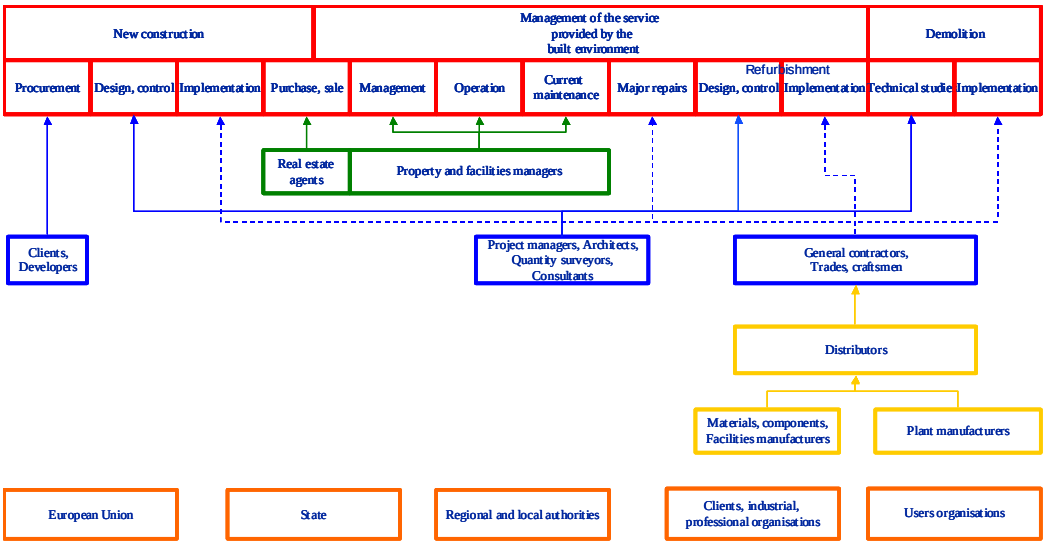

Figure 1: Meso-economic system of construction

There are three main sectors of activity, namely primary, secondary and tertiary, reflecting different stages in the production and management of the built environment. The primary sector involves the direct appropriation of natural resources and includes quarrying and mining. The secondary sector converts the output of the primary sector so that they are ready for use by final users, and includes material and component manufacturing and construction. The tertiary or service sector includes plant hire, professional services, such as design and control, and management of the existing stock of structures and property transactions. Management of the built environment includes strategic asset management (the procurement of new buildings and transfer of existing buildings), tactical property management (repair and maintenance, and use of property) and facilities management (day-to-day management of building services). In addition, the range of opportunities for the production and management of the built environment is influenced by a fourth set of factors – the surrounding environment of institutions, legal arrangements, macroeconomic settings, and other conditions, including building permits, health and safety legislation, and procurement systems, that exist regardless of any considerations of production and management of the built environment.

Construction, or work *in situ*, is the organizing concept of the framework. It is the last stage in the process of producing the built environment, and the most important single part of the construction sector, in terms of its contribution to the total value of the production of the built environment. According to the *SIC92* and *NACE Rev.1*, construction includes general construction and demolition work, construction and repair of buildings, civil engineering, installation of fixtures and fittings, and building completion work.[3]

As Ive and Grunberg (2000) point out, the technical economic process of construction can only be understood in the context of its social relations. For example, the general capitalist mode of social organization comprises property rights in land (landowners); exchange of buildings as commodities (producers, consumers, merchants); borrowing and lending of money at interest (financiers); alienation rights in land (buyers and sellers of land); a horizontal division of labour (building producers, including

[3] Since this is the basis for the collection of most data on construction, certainly in the UK, as shown below, there is a mismatch between the framework and the data.

specialist trades); property rights in buildings, separable form rights in land (landowners and building owners); commodified labour power (employers and employees); separation of mental and manual labour (designers and constructors); and production directed by and in large organizations (managers and owners). This, as with non-capitalist social structures, embraces a range of specific social arrangements, and correspondingly different modes of economic construction.

The system of economic and social relations shown in the framework is cyclical to the extent that its products give rise to activities, which influence the demand for replacement, accumulation, alteration, and maintenance of the general built environment.[4] The principal decisions about what and how to replace, add to, alter, and maintain the built environment are made by owners and managers of the built environment. This highlights the importance of the existing stock of buildings and infrastructure and the role of managers and owners. The present framework differs from other frameworks, such as the "construction industry cluster approach" of Ive and Gruneberg (2000), by explicitly incorporating the management aspect of the built environment.

The present framework can be used to address various questions about the construction sector, including What is produced? Who are the products produced for? Why are they produced? and How are they produced? It can also be used to address more specific questions such as Why does innovation occur? And How are new ideas generated and implemented? The present application of the framework is the comparative analysis of national systems. In the next section we report on the progress made to date in collecting data.

DATA

At a recent meeting of the Project Group a plan of action was agreed for the harmonization of statistical data to facilitate international comparison of meso-economic systems using the framework outlined in the previous section. In general terms, the plan was for the respective members of the Group to collect national data for the past ten years on the weight of *in situ* construction, the main characteristics of *in situ* construction works, the value of the stock of building and infrastructure which constitute the built environment, the segments of the construction sector, including construction, inputs to construction, such as professional services, management and manufacture, and the regulations which help to shape the system. This is expected to reveal cross-national differences in socio-economic trends within the construction sector. This section presents an overview of the latest available data on construction activity in the UK.

From the point of view of economic development, it is the differential success of firms and other organizations which shapes economic outcomes and is of policy significance. National data is therefore usually collected on the activities of firms rather than activities per se. This is the case in the UK with regard to both construction and construction-related activities.

[4] "Generally, buildings shelter and accommodate specific activities… Dwellings provide spaces for residential activities"; and commercial buildings provide spaces for commercial activities. Infrastructure links "spaces and facilitates movement, distribution and transfer *through* space" (Ive and Gruneberg). All of these activities generate changes in the built environment.

Official UK data on construction (see SIC92 / NACE Rev.1 definition above) refers to the activities of firms whose principal activity is construction and the construction activities of public-sector direct-labour departments. This is essentially *in situ* assembly of buildings and infrastructure. By default, the data also refer to secondary activities, such as 'Architectural activities and technical consultancy'.

Weight of the construction industry

Table 1: ***Share of economic activity, 1991-1999***

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Share of Value Added (%)	6.1	5.5	5.1	5.2	5.2	5.1	5.2	5.2	5.2
Share of Employment (%)	7.8	7.1	6.8	6.8	6.7	6.6	6.3	6.4	6.4

Source: UK National Accounts, 2000

Table 1 shows changes in the UK construction sector's share of UK economic activity in terms of gross value added and employment. The data indicates that the construction sector was in relative decline between 1991 and 1993, but has experienced lesser change since then. The relative decline in construction is largely accounted for by a fall in real construction output, which was accompanied by a fall in the number of employees and self-employment jobs. The subsequent decline in the share of national employment between 1996 and 1997 is largely accounted for by a fall in the number of self-employment jobs, which may be due to the abolition of 714 taxation in 1996.

Table 2: ***Parts of construction and repair and maintenance: % share***

Year	All work					
	New Work	R&M	New residential	R&M residential	New non-residential	R&M non-residential
1989	56.2	43.8	15.5	25.1	40.7	18.7
1990	55.6	*44.4*	12.1	25.0	43.5	19.4
1991	54.2	45.8	11.3	25.4	42.9	20.3
1992	52.3	47.7	12.8	26.5	39.4	21.2
1993	50.9	49.1	14.3	27.7	36.5	21.5
1994	50.7	49.3	15.0	27.8	35.7	21.4
1995	50.7	49.3	13.6	27.7	37.1	21.6
1996	50.6	49.4	12.7	27.2	37.9	22.2
1997	51.3	48.7	13.7	27.0	37.6	21.7
1998	52.4	47.6	13.6	26.1	38.8	21.5
1999	54.9	45.1	12.8	25.1	41.2	21.0

Source: Annual Abstract of Statistics, 2001.

The main characteristics of construction works

Table 2 shows total new work and total repair and maintenance work expressed as a percentage of the total value of construction output in Great Britain for the years 1989 to 1999. These figures are further analysed by housing work, total other new work, total housing repair and maintenance work, and total other repair and maintenance work. It is not possible to express other work and infrastructure as a percentage of total construction work, using available data.

The figures indicate that the period of relative decline and instability during the early nineties was accompanied by a rise in the R&M share and a fall in the new share. Both remained fairly constant until 1997, when new share rose and R&M fell. This correlates to increased absolute growth in construction activity, which may have been due to economic stability increasing business confidence. The fall in new work is

mostly accounted for by the fall in non-residential, while fluctuations in R&M are accounted for by fluctuations in both its residential and non-residential parts.

Table 3: Parts of households, firms, government

Year	New orders obtained by contractors		
	Households Share (%)	Firms Share (%)	Government Share (%)
1989	23.9	50.0	26.1
1990	21.6	52.5	25.9
1991	23.4	47.7	29.0
1992	23.0	44.5	32.6
1993	24.4	37.8	37.8
1994	26.9	39.0	34.1
1995	22.2	47.4	30.4
1996	23.7	51.3	24.9
1997	25.2	53.6	21.1
1998	21.8	56.5	21.6
1999	22.6	55.4	22.0

Source: Annual Abstract of Statistics, 2001

Table 3 shows total new private housing orders, total new private non-housing orders, and total new public orders expressed as a percentage of the total current value of new orders obtained by contractors in Great Britain for the years 1989 to 1999. This provides a rough measure of the construction industry's client structure. The data indicate that during the period of decline in the early nineties there was a marked decline in the firms' share of orders, and a marked increase in the government's share. During the latter period there was a super recovery of firm share, and super decline of government share. The longer-term trend for the nineties as a whole seems to reflect longer-term withdrawal of government, as indicated by privatization, changes in procurement methods etc.

The value of stock

Table 4 shows the market value of residential buildings, the market value of commercial, industrial and other buildings, the market value of civil engineering works and the total value of construction stock in current prices for the years 1991-99.

The data suggest that the real value of stock declined during the early nineties and rose during the late nineties, and that this is largely accounted for by fluctuations in the value of residential stock. The fluctuations in the value of the built environment are consistent with changes in both general economic activity and changes in construction activity.

Table 4: Value of stock (£ billion at end year)

Year	Value of Residential Stock	Value of Non-Residential Stock	Value of Civil Engineering Stock	Value of Total Construction Stock
1991	1267.9	481.5	245.6	1995.0
1992	1196.4	440.4	262.6	1899.4
1993	1215.6	533.4	312.8	2061.8
1994	1201.5	518.1	374.1	2093.7
1995	1199.9	470.1	395.9	2065.9
1996	1315.0	508.9	415.1	2239.0
1997	1416.8	549.4	428.6	2394.8
1998	1630.2	529.0	453.6	2612.8
1999	1857.8	611.0	478.7	2947.5

Source: United Kingdom National Accounts 2000

Construction sector segments

Previous Tables show measures of economic activity in construction. The following section reports on the distribution of contractors, both by size and trade.

Table 5: Private Contractors: Number of firms by size of firm

Size	Year										
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1	94218	101223	103169	94452	93585	97141	99099	81363	86269	87837	88018
2-13	98042	100263	97097	104121	95140	91554	89146	75789	67168	68297	70467
14-59	7148	6660	5715	5868	5293	4845	4734	5039	5433	5738	5791
60-299	1401	1381	1185	1065	907	943	902	936	1073	1143	1080
300-1199	219	219	195	162	149	142	156	155	167	181	163
1200 plus	48	47	39	36	33	32	33	33	38	40	42
Total	201076	209793	207400	205704	195107	194657	194070	163315	160148	163236	165561

Source: Construction Statistics Annual 2000

Table 5 shows the number of private contractor firms in Great Britain for years 1989 to 1999 analysed by size of firm. Information on the number of firms relates to the number of private contractors on the DETR's register. There is a discontinuity in the series between 1991 and 1992 when the DETR's register was enhanced by integration with the ONS register. There is also a discontinuity in the series between 1995 and 1996 as improved survey techniques were incorporated, resulting in better coverage and classification of businesses with 7 or fewer employees.

Fluctuations in total number of firms are largely accounted for by changes in the number of "micro firms" (single proprietors and 2 – 13), and especially the number of single proprietors. This partly reflects the numerical dominance of micro firms. The most significant change in the number of micro firms occurred between 1995 and 1996, and coincided with a recovery in the construction sector. It also coincided with a change in survey techniques, which is probably the best explanation for the change. Otherwise, the gradual decline in the (absolute – the proportional fall is insignificant) numbers of micro firms, especially sole proprietors, between 1990 and 1993 correlates positively with the decline in the construction sector; and the gradual recovery between 1997 and 1999 correlates positively with recovery in the construction sector. The short-term recovery in construction between 1993 and 1994 is also correlated positively with a significant increase in the (absolute) numbers of sole proprietors.

The significant proportional fall in the number of small firms between 1989 and 1994 correlates strongly and positively with the decline in construction – the increase in numbers of small and micro firms between 1991 and 1992 is probably best explained by the enhancement of the DETR's register of firms. Likewise the recovery in numbers between 1995 and 1998 is best explained by the recovery in construction.

The same arguments can be made regarding the numbers of medium-sized firms, large firms and very large firms – i.e. pattern of change is the same for all classes of firm. The only significant difference occurs in micro firms, where the proportional change in numbers is relatively slight, bearing in mind changes in survey techniques. This should not be too surprising since declines are associated more with shrinkage (downsizing) than with extinction (and recovery with growth rather than birth) – in other words, firms move toward the left wall of the size distribution. That said, there was a significant fall in numbers towards the end of the nineties despite the recovery

in construction, possibly due to rationalization/consolidation/scale-and-scope effects in a climate of increasing competition – see changes in process and structure of surveying, for example.

Table 6: Main intermediate inputs by product group (1998)

	Expenditure (£ million)	Share of total expenditure on intermediate products (%)
Mining and quarrying	1854	2.9
Wood and wood products	*2040*	3.2
Chemicals and man-made fibres	649	1.0
Plastic products	2967	4.7
Structural clay products	685	1.1
Articles of concrete stone etc	4110	6.5
Other non-metallic products	1308	2.1
Iron and steel	820	1.3
Structural metal products	1138	1.8
Metal forging, pressing etc	1586	2.5
Other basic metals and metal products	983	1.5
Machinery and equipment	1190	1.9
Electrical and optical equipment	716	1.1
Other manufacturing	1803	2.8
Construction	26073	41.2
Transport and communication	1167	1.8
Owning /dealing in real estate	4005	6.3
Renting of machinery etc	2927	4.6
Computer services	623	1.0
Architectural activities and technical consultancy	1237	2.0
Other business services	4801	7.6
Other products	647	1.02
Total intermediate consumption at purchasers' prices	63329	100.0

Source: United Kingdom National Accounts 2000

Analysis of private contractors by trade of firm for the third quarter of 1998 (see Construction Statistics, 2000) is also revealing. It shows that Construction firms are predominantly non-specialist, main trades. This is most obvious in terms of work done and employment. Electrical contractors are the second largest type, accounting for about 10 per cent of number of firms, work done, and total employment. These are followed by heating and ventilating engineers, plumbers, carpenters and joiners, painters, and roofers. Their share of work done varies from 5 to 2%. Interestingly, the H&E engineers share of firms is relatively low within this group, while their share of work done and share of employment is relatively high.

Table 6 shows total expenditure on key intermediate products expressed as a percentage of total expenditure on intermediate products for year 1998. The product groups are based on the SIC. The key intermediate products are defined as those which contribute at least 1% of total expenditure on intermediate products. Aside from construction (the activities of which are analysed indirectly above in terms of the distribution of trades), the main contributions to the construction process in production terms were made by firms who specialized in 'other business services', 'articles of concrete stone etc.', 'owning and dealing in real estate', 'plastic products', and 'renting of machinery etc'. In terms of the main SIC product classes, the main contributions were made by the construction sector (41.2%), the manufacturing sector (31.5%), and business services (21.5%). We should be able to use this data to estimate the level of employment in the input sector of the meso-system.

The figures in Table 7 are based on quarterly surveys of private-practice architects carried out by RIBA since the 1960s and more recently by Aziz and Mirza. The figures are estimates because they are grossed up from survey data. Workload 1 (new commissions) refers to Stages B & C of the design process (Part A is feasibility – see RIBA). This includes outline proposals etc. The variable is a leading indicator of architects' work down the line – e.g. 2 years in the case of offices, and one year in the case of residential. The height of the figures (relative to actual construction work) reflects cancellations of projects, and instances of more than one firm working on the same project. Workload 2 refers to Stage E of the design process, 'production and drawings', which includes detailed design work – specifying lifts etc – and provides a better indication of architects' actual contribution to construction work.

Table 7: Architects: workload

Year	Workload 1(£ m)	Workload 2(£ m)
1995	42717	23445
1996	45278	26223
1997	58959	*31850*
1998	65563	41264
1999	76618	32057

Source: Construction Statistics 2000.

Table 8 shows the gross turnover of consulting engineers for years 1990 to 1999 – this is a measure of firms' total activities, including their principal activity. They reveal a three-year-lag positive correlation with the decline in output of the construction sector during the early nineties. Growth in fees during the late nineties is positively and contemporaneously correlated with recovery in construction. Growth in fees appears to have outstripped growth in construction. This may indicate a change in the competitive position of consulting engineers. The entire series suggests structural resistance during the early nineties, followed by liberal restructuring of the sector.

Table 8: Consulting Engineers: Turnover

Year	Gross Fees (£ Million, current prices)	Gross Fees (£ Million, constant 1982 prices)
1990	1241	788
1991	1208	734
1992	1298	768
1993	1248	725
1994	1162	660
1995	1091	602
1996	1083	579
1997	1279	660
1998	1677	847
1999	1834	936

Source: Construction Statistics 2000

Data has also been found on the activities of construction property management (CPM). According to Centre for Facilities Management (CFM) at University of Salford, CPM includes agency services (acquisitions, sales, lettings, investments) – which suggests some overlap with activities of estate agents – professional services (rating, valuation, building surveys, and management) and consultancy services (development, planning, and fund management) – which suggests that the former two services are in-house. CFM estimate the value of commercial property management using the formula 0.1*value of commercial property. In 1998 the estimated value of

CPM was £10.3b. This figure would appear to refer to principal and secondary CPM, in contrast to the data for contractors and construction engineers, which refers only to firms whose principal activity is construction.

Main regulations and institutional actors

Table 9: Regulations and regulators

	Const. Permits	Structu -res	Materials	Prof. rules and firms' standards	*Safety, security and personnel man*	Price/ quality of products	Competition and procurement systems	Financing *Taxation*	R&D support Educ'n
European Community		X	X		X	X	X	X	X
Nat. Govt.	X	X	X	X	X	X	X	X	X
Local Govt.	X							X	
Clients, ind., prof. orgs.				X					X
Trade unions									
Users' Assocs.									

Table 9 shows the main areas of regulation for construction in UK by institutional actor and the principal regulators. It has been prepared on the basis of data from various sources, including Government departments, professional associations, and trade associations. The data indicates a bias toward top-down regulation, although there is considerable evidence of self-regulation through professional institutions. Indeed, many of the Government's regulations, such as building regulations rely to an increasing extent on self-regulation, placing the onus on contractors to satisfy regulations.

CONCLUSIONS AND FUTURE WORK

It is evident that there are problems with the data's compatibility with the framework. These arise because of the definition of construction and the way that construction activity and other activities are measured. This suggests that it may be easier to apply the framework to the analysis of individual processes. Furthermore, the number and variety of regulations is large, which suggests that work should be done to identify critical areas of regulation and to weight them in terms of importance to the production and management of the built environment.

Further work on the application of the framework is already envisioned. At the recent meeting of the Project Group it was proposed that we also develop a more dynamic approach, showing the critical flows or interactions between actors, and change, including innovation. This work has not yet begun. The CEU at Salford is also planning to explore the possibility of using the framework on a new EU-funded project which aims to improve the productivity of RTD in small construction firms throughout Europe. It is thought that the framework would help to reveal the key sources of ideas and the key means of applying those ideas.

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