Firms' Overhead Costs in Real Estate Construction Industry

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Abstract

Firms in Real estate construction industry typically use cost-based pricing schemes. Cost-based pricing schemes include direct costs plus remuneration for overhead costs, profits and risk. The literature on empirical estimates of the size and composition of overhead cost is thin. Firms though might have incentives to better understand overhead cost drivers to benchmark performance, reduce costs, and improve productivity. This paper aims to shed more light on firms' overhead cost considering the cost drivers for a sample of Dutch firms in real estate construction industry over 2006-2007.

Keywords: cost-plus pricing, overhead costs, cost drivers, main contractors

1. Introduction

Construction firms typically use cost-plus based pricing schemes that involve the allocation of both direct and indirect costs to a project. Direct costs include materials and labour costs and can be attributed to the project on a one-to-one basis. Indirect costs typically cannot be attributed straightforward to a specific project. Indirect costs include cost items like management, supervision and overhead. Deciding how to assign overhead costs to projects is a troublesome issue. Yet, cost-plus pricing is still the dominant strategy (Noble and Gruca, 1999). Firms' pricing practice typically is to calculate direct cost plus remuneration for overhead costs like for profit and risk. Tah et al. (1994) suggest that cost calculation software have been making direct cost estimates becoming increasingly similar across bidding firms, arguing that bids vary particularly in overhead costs. Banker and Johnston (1993) argue that these costs might be substantial. Managing overhead costs is a mean towards the firm objective of profit maximization. Firms may therefore aim to better understand the overhead cost drivers to reconfigure production processes to reduce costs, improve productivity and increase market share (see also Assaf et al. 2001).

The literature indicates significant variation in overhead costs across bidders for various reasons. Tah et al. (1994) and Assaf et al. (2001) observe that contractors have different perceptions as to what were overhead costs. Alles and Datar (1998) suggest that a firm's pricing strategy is a function of their market power rather than of the size of its direct costs and overhead costs only. The literature that provides empirical estimates of firms' overhead costs is rather thin. Foster and Gupta (1990) and Banker et al. (1995) are a few exceptions be it on a very limited number of manufacturing firms1. Estimates for overhead costs for other industries like construction are scarce. Assaf et al. (2001) provide overhead costs for construction companies, however, not formally addressing the interrelation between overhead costs and associated cost drivers. Assaf et al. (2001) who consider firms' overhead costs in construction industry do not distinguish between these various drivers formally, pointing towards volume-based and complexity-based drivers also. Furthermore, a systematic analysis on the interplay between overhead cost and inefficiency is missing to the best of our knowledge.

The research reported here serves to elaborate on firms' cost structure. It is the interplay between firms' cost structure, associated overhead cost drivers and productive performance which is at the centre of this paper. Do firms vary in overhead cost rates ? How can we understand differences in overhead costs between firms?

The organization of this paper is as follows. Section 2 discusses the literature on cost-plus pricing. Section 3 describes the survey and descriptive statistics of the sample. In section 4 we discuss the empirical model and estimation results. Conclusions and directions for future research follow in Section 5.

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[1] Foster and Gupta (1990) consider one manufacturing firm with 37 plants, Banker et al. (1995) 32 manufacturing firms, and Assaf et al. (2001) 61 construction firms.

2. Cost-plus pricing

A firm's cost structure can be modelled following Rogerson (1992), augmenting the model with overhead costs being now proportional to total direct costs. A firm's cost structure which is the sum of direct and indirect costs can be written as

(1) $C_i = L_i + M_i + IC_i$,

whereby L_i is cost of direct labour input, and M_i cost of direct materials and outsourcing and ICi total indirect costs. The total indirect costs consist of ICAi indirect costs allocated to particular projects2, and overhead costs OH, defined as:

(2) $IC_i = ICA_i + OH_i$

The overhead cost rate R^M is defined as:

(3) $R_i^M \equiv \frac{OH_i}{(L_i + M_i + ICA_i)}$

The associated cost-plus pricing scheme for firms that is typically observed in bidding for contracts reads as:

(4) $C_i = (1 + R_i^M)(L_i + M_i + ICA_i)$.

In this paper we are particularly interested in the overhead cost rate R^M, specified as:

(5) $R_i^M = g(OH_i, L_i, M_i, ICA_i)$.

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Interpretation of equation (5) is straightforward. The overhead cost rate is a function of overhead costs (OH), volume-based drivers (L and M) and to those indirect costs that could be allocated to specific projects (ICA), conditional on a firm's production technology (cf. Banker et al. 1995).

[2] Activity costing will allocate all indirect costs to activities and likewise to specific projects.

3. Survey and descriptive statistics

3.1 Survey design

The data comes from a questionnaire held in the second half of 2007 and of 2008 among all Dutch main contractors with employees, registered at the Cordares Pensions. In this paper we concentrate on real estate construction firms. The 2006 population of real estate construction firms3 comprise 5.562 firms with 100.020 employees measured in terms of full time equivalent (fte). Table 1 gives population and sample information on the distribution of number of firms and number of employees by firm size.

Table 1 Share of firms and employees by size in the population

		Sample		*Population*	
Size	*Size in fte*	*Number of firms*	*Number of Employees*	*Number of firms*	*Number of employees*
Small	*< 20*	*55*	*14*	*81*	*28*
Medium	*21 – 50*	*24*	*21*	*12*	*22*
Large	*> 50*	*21*	*65*	*7*	*50*
Total		*100*	*100*	*100*	*100*
Number of firms		*304*	*11710*	*5792*	*100591*

The sample obtained does not fully represent the population in each and every aspect. From Table 1 one observes that the sample under-represents small firms, yet over-represents large firms measured in the number of employees.

The survey is based on a written questionnaire either being filled out on paper or via the Internet. The questionnaire is designed to elicit more detailed information on the size and composition of firms' indirect cost structure. Cost-items were identified on the basis of construction firms' profit and loss statements.

A second questionnaire provides information on output and direct costs including materials, outsourcing, and direct labour costs. Information on these cost items together with the survey on indirect costs allows one to determine the size and composition of overhead costs. In addition, the questionnaire provides us with information on type of work (residential or non-residential construction), client type (government, housing associations, or firms and households), type of output

[3] We confine ourselves to real estate construction firms discarding the civil engineering firms.

(new construction or maintenance) and tendering (open, selective, single). These data are merged with the questionnaire on indirect costs by firm-id.

3.2 Sample description

The descriptive statistics of the sample is given in Table 2 presenting summary statistics on the various cost drivers over 2006-2007. In total we have 225 observations for 206 firms for which we have full information. Following the literature we distinguish between volume-based drivers and complexity or operations-based cost drivers. Volume-based overhead cost drivers include Labour (L), Materials (M), OUTPUT, the number of white collar workers (INDIRECT) and blue-collar workers (DIRECT). Complexity-based overhead cost drivers include a variety of measures including: type of work (residential- or non-residential construction), market (government, housing associations, firms, and households), and type of output (maintenance or new construction). Output, labour costs and materials have been deflated to 2006 values.

Table 2 Summary statistics of the sample

Variable	*Description*	*Mean*	*Std. deviation*
Volume-based cost drivers			
FTE	*Labour (in fte)*		
INDIRECT	*Indirect Labour (in fte)*	*12*	*21*
DIRECT	*Direct Labour (in fte)*	*30*	*41*
OUTPUT	*Sales (in 1,000,000 euro's)*	*13*	*23*
L	*Direct labour costs (in 1,000,000 euro's)*	*2.3*	*3.7*
M	*Direct costs for materials and subcontracting (in 1,000,000 euro's)*	*9.7*	*9.7*
Complexity or Operations-based cost drivers			
PRES	*Residential construction (share in sales)*	*.64*	*.29*
PMAINT	*Maintenance, repair and reconstruction (share in sales)*	*.48*	*.37*
PGOV	*Government (share in sales)*	*.07*	*.12*
PWOCO	*Housing associations (share in sales)*	*.15*	*.23*
PPART	*Households (share in sales)*	*.39*	*.35*

Considering the descriptive statistics in Table 2 one observes substantial variation or heterogeneity in size of the firm in terms of numbers of both direct and indirect workers. Most of the construction work for firms in our sample consists of residential construction. On average, maintenance output accounted for almost two thirds (64.1 percent) of total output. The standard deviations for the general characteristics of the contractors indicate substantial variation in the mean values. Regarding the type of client, the sample indicates that on average about forty percent come from households.

Construction work for the government or housing associations is much smaller measured in percentage output.

4. Size and composition of overhead costs

We decomposed the firm's i cost structure into components of direct costs and indirect costs by rearranging equation (1) and (3), such that

(6) $C_i = L_i + M_i + ICA_i + OH_i$

Table 4 gives a decomposition of total costs for our sample of firms in median percentage of total costs C.

Table 4 Cost structure by direct, indirect and overhead costs

Costs	*Definition*	*Median percentage*
Direct costs in total direct costs	*(L + M) / (L+M+* ICA *)*	*88.1*
Total indirect costs in total direct costs	*IC / (L+M+* ICA *)*	*11.9*
Overhead cost rate RM	*OH / (L+M+* ICA *)*	*8.8*

Following firms' bidding practice we express overhead costs in percentage total direct costs viz. $(L+M+ICA)$. The sector-weighted median overhead cost rate equal to 8.8, and total indirect cost rate equal to 11.9. This percentage is in line yet somewhat lower than the 15 percent reported by Assaf et al. (2001). This is not unreasonable. We expect the estimate of Assaf et al. to be higher as civil engineering firms (which are excluded in our sample) do have higher overhead costs relative to construction firms.

5. Conclusions

Construction firms' pricing practice typically is to calculate direct cost plus remuneration for overhead costs like for profit and risk. This paper considered firms' overhead costs structure. The research reported here serves to elaborate on the interplay between firms' cost structure and associated drivers. Do firms vary in overhead costs rates? How can we understand differences in overhead costs between firms? Do productivity differences relate to variation in overhead cost rates?

Insight into firms' overhead cost structure is of great importance for society at large. Managing overhead costs is a mean towards the firm objective of profit maximization. Firms might aim to better

understand indirect cost drivers to reconfigure production processes to reduce costs, and improve productivity. Note that in practice a firm's overhead cost rates vary for various reasons:

- Firms might differ in to what belongs to overhead costs;
- Firms might differ into cost accounting method;
- Strategic pricing depending on bargaining power;
- Firms differ in overhead costs.

Our research aims to get more detailed information on the latter considering the size and composition of firms' overhead cost structure. To prevent overhead costs to be depending on firms' definition, cost accounting approach and/or pricing strategies here, we take a rather normative approach by identifying pre-defined overhead cost items.

The results indicate that volume-based measures do play a significant role in explaining variation in overhead cost rates. The data give evidence of scale effects with overhead cost rates reducing with firm size as measured by output. Furthermore, we find evidence that operation-based cost drivers like specialisation, type of clients and type of output do play a significant role. The share of residential construction in output do increase overhead cost rates relative to non-residential construction. Residential construction includes a wide variety of activities including new construction, and maintenance for households. These activities are most likely of limited size as measured in terms of output and associated with higher overhead costs rates. Maintenance is also associated with higher overhead cost rates. The interaction term indicates that while correcting for firm size, residential construction activities that relate to maintenance do not have significantly higher overhead cost rates. This is reasonable. Whether maintenance is in residential or non-residential buildings ceteris paribus do not lead to lower or higher overhead cost rates. Furthermore, the results indicate that type of client does make a significant difference in overhead cost rates, with lower overhead cost rates for maintenance for housing associations. Summarizing, the results suggest that for construction, overhead rates do vary with firm size and nature of the project.

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