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Construction Management and Economics

ISSN: 0144-6193 (Print) 1466-433X (Online) Journal homepage: www.tandfonline.com/journals/rcme20

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To cite this article: John C. S. Tang, Pisidhi Karasudhi & Porntipa Tachopiyagoon (1990) Thai construction industry: Demand and projection, Construction Management and Economics, 8:3, 249-257, DOI: 10.1080/01446199000000022

To link to this article: https://doi.org/10.1080/01446199000000022

Published online: 28 Jul 2006.

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Construction Management and Economics, 1990, **8**, 249–257

Thai construction industry: Demand and projection

JOHN C.S. TANG[a], PISIDHI KARASUDHI[b] and PORNTIPA TACHOPIYAGOON[c]

[a]*Associate Professor, Industrial Engineering & Management Division, Asian Institute of Technology, GPO Box 2754, Bangkok 10501, Thailand*

[b]*Professor, Structural Engineering & Construction Division, Asian Institute of Technology, GPO Box 2754, Bangkok 10501, Thailand*

[c]*Graduated Student, IE & M Division, AIT*

Thailand is fast becoming a newly industrializing country and, consequently, a large number of construction works are projected for the future. This study is an attempt to gain further insight into the demand for construction activities in Thailand. Three types of construction – residential, non-residential and 'other' (mainly public projects) – were considered. The demand function for each type of construction was estimated using regression analysis. Results indicate that rising per capita income, the ratio of consumer price index to the construction cost index, and population are the major determinants of demand for residential construction. The expansion of industrial production capacity and the ratio of corporate savings to the construction cost index are the most significant factors affecting the demand for non-residential construction. The demand of other construction is found to be largely a function of rising revenues of government and of public utilities.

Further, projection results indicate that total construction activities in Thailand appear to have a bright future: projected values range from an annual average of 230 481 million Baht to 310 599 million Baht for the next 5 five years.

Keywords: Construction industry, demand analysis

Introduction

Construction is an essential activity in any economy and plays an important role in its development. The importance of the construction industry is such that there is hardly any sector in the national economy where the construction industry does not play an important role.

From 1976 to 1985, the value of total construction in Thailand increased from 35 860 million Baht to 124 835 million Baht, representing an increase of slightly over 13% per annum. During the first half of the 10-year period, non-residential construction predominated (activities in this category include construction of factories, offices, stores, hotels and institutional buildings), whereas for the latter half, other types of construction predominated (other construction activities are mainly public works and utilities, e.g. roads, ports and airports). Detailed data are shown in Table 1.

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Table 1. Construction output by type in current year (million Baht)

Year	Residential	Non-residential	All other construction	Total construction
1976	9 126	14 036	12 698	35 860
1977	11 329	17 532	17 834	46 695
1978	15 876	29 025	11 892	56 793
1979	17 484	29 899	18 970	66 353
1980	19 269	37 478	32 408	89 155
1981	26 524	38 352	29 036	93 912
1982	29 685	29 051	39 025	97 761
1983	37 549	27 728	45 265	110 542
1984	39 754	30 575	53 039	123 338
1985	38 072	31 384	55 379	124 835

Source: National Income 1985
25 Baht = US$1.00

Objectives of the study

The objectives of this study are, first, to estimate the demand functions for construction activities in Thailand. Using the above results, the second objective is to project the growth of the construction industry in Thailand to 1993.

Demand models

To estimate the demand functions for construction activities in Thailand, segregation is first necessary, since the factors affecting demand for different types of construction are usually different. The nature of those factors, together with an analysis of their relationships to the demand for construction will then be looked into.

In this study, the construction industry is divided into *residential*, *non-residential* and *other*.

Demand for residential construction

Residential construction constitutes the largest (in terms of units) and most homogeneous group in the construction family. The demand for residential construction is subject to postponement decisions by the consumer for whom the purchase of a house or an apartment typically represents their largest investment. Consequently, in times of recession or when credits are tight, the demand for residential construction tends to decline. On the other hand, when the economy is booming, demand increases. In the case of Thailand, specific factors affecting the demand for residential construction (RES) are found to include national income per capita (NPCI), relative price index (PI) – which is expressed as a ratio of consumer price index to the construction cost index – rate of household formation (HF), size of population (POP), and prevailing interest rates (INT). The implicit demand function is as follows (see also Cassimatis, 1975):

$$RES = f(NPCI, PI, HF, POP, INT) \quad (1)$$

It is hypothesized that the demand for residential construction will increase with increasing national income per capita, relative price index, rate of household formation, and size of population; at the same time, demand for residential construction is expected to move in the opposite direction with prevailing interest rates. Impacts of national income, household formation, population, and interest rates on demand for residential construction are fairly obvious. Since relative price index is defined to be the ratio of consumer price index over construction cost index, an increase in the relative price index implies that the consumer price index is increasing at a faster rate relative to the construction cost index and this will have a positive effect on the demand for residential construction.

Demand for non-residential construction

The level of activities in non-residential construction is generally considered to be an excellent indicator of the degree of industrialization of a country. Non-residential construction includes factories, offices, stores, hotels and institutional buildings. The demand in this market is derived from the expansions in productive capacity and forecasts of increased sales and expenditures on buildings and plants which are considered part of private capital investment in the economy. In the case of Thailand, specific factors affecting the demand for non-residential construction (NRES) includes the ratio of corporate savings to the construction cost index (CSI), which is a proxy for the index of profit expectations, industrial production index (MPI), value of exports (EXI), number of tourist arrivals (TOUR), and gross domestic product (GDP). The implicit demand function for non-residential construction is as follows (see also Cassimatis, 1975):

$$NRES = f(CSI, MPI, EXI, TOUR, GDP) \tag{2}$$

It is hypothesized that the demand for non-residential contruction will increase with increases in the ratio of corporate savings to the construction cost index, industrial production index, exports, tourist arrivals, and gross domestic product.

Demand for 'other' construction

All 'other' construction consists mainly of construction in public utilities and public works. The demand for this sector is mainly dependent on public policy as well as the availability of government revenue. Since the early 1960s, the government of Thailand has deliberately invested in the public infrastructure as a means to realize development objectives. In the case of Thailand, the specific factors affecting other construction (OTH) includes the ratio of government revenue to the construction cost index (GRI), value added by public utilities (VAI), and value of government expenditure (GEI). The implicit demand function for other construction is as follows (see also Cassimatis, 1975):

$$OTH = f(GRI, VAI, GEI) \tag{3}$$

The hypotheses made are that 'other' construction demand will increase with increases in the value added of public utilities and government revenue; but will decrease with increases

in government expenditures due to the fact that as government has to spend more, less resources will be available for construction, which is only one activity among numerous others that the state has to undertake.

Sign of coefficients

The hypothesized signs of the different coefficients are summarized in Table 2.

Table 2. Summary of hypothesized sign of coefficients

Variables	Expected sign
National income per capita	(+)
Relative price index	(+)
Population	(+)
Interest rate	(−)
Housing formation	(+)
Corporate savings	(+)
Industrial production index	(+)
Number of tourists	(+)
Gross Domestic Product	(+)
Exports	(+)
Government revenue	(+)
Value added from public utilities	(+)
Government expenditure	(−)

Results and discussions

The construction demand function for residential, non-residential and 'other' sectors were estimated using the stepwise regression technique. The demand functions were estimated with different combinations of the independent variables (see equations 1, 2 and 3), and some of the variables were eventually found not to be significant at the 20% confidence level.

Residential construction demand

The final results for residential construction demand are shown in Table 3.

The demand for residential construction is found to be a function of per capita income, price index, interest rate and the size of population. Household formation does not seem to have a significant effect on demand. The high value of R^2 (0.9591) indicates that over 95% of the variations between the observed and estimated values of the dependent variable can be explained by the independent variables. The respective sign of each coefficient is as hypothesized and, for both population and price index, also found to be significant at the 20% confidence level.

Table 3. Estimated demand function for residential construction

RES = c + a NPCI + b POP + d PI + e INT								
	c	a (NPCI)	b (POP)	d (PI)	e (INT)	R^2	DW	F-test
Coef.	−734.4	1.75	10.79	2.61	−2.92	0.9591	1.84	29.35
SEE	97.1	1.63	5.38	1.21	3.46			
t-value	−7.57	1.07	2.00	2.15	−0.84			

where
RES = value of residential construction in 1976 (Baht, million)
NPCI = national income per capita in 1976 (Baht)
POP = population (millions)
PI = relative price index, ratio of consumer price index to construction cost index (1976 = 100)
INT = interest rate (%)
(For details see Tachopiyagoon, 1988.)

Non-residential construction demand

The final results for non-residential construction demand are shown in Table 4.

The demand for non-residential construction is found to be a function of the industrial production index and index of profit expectation (proxied by using the ratio of corporate savings to the index of construction costs). Exports do not appear to have any significant effect on the demand for non-residential construction. The fairly high R^2 (0.73) indicates that over 70% of the variations between the observed and estimated values of the dependent variable can be explained by the independent variables. The respective sign of each of the coefficients is as hypothesized, and the estimates are found to be significant at the 20% confidence level.

'Other' construction demand

The final results for 'other' construction demand are shown in Table 5.

All demand for 'other' construction is found to be a function of the ratio of government revenues to the construction cost index and the value added by public utilities. Government expenditure does not appear to have a significant effect on the demand for 'other' construction. The high value of R^2 (0.9586) indicates that over 95% of the variations between the observed and estimated values of the dependent variable can be explained by the independent variables. The respective sign of each coefficient is as hypothesized. The estimated coefficient of the value added variable is also found to be significant at the 20% confidence level.

Summary of results

Although a lack of adequate data and other limitations do not permit a more precise formulation of the model for the Thai construction industry, the results obtained are interesting and sufficient to present an economic analysis of the economic factors affecting

Table 4. Estimated demand function for non-residential construction

LNRES = f + g LCSI + h LMPI						
	f	g (LCSI)	h (LMPI)	R^2	DW	F-test
Coef.	−1.50	0.77	1.76	0.7324	1.51	9.58
SEE	3.95	0.44	0.48			
t-value	−3.37	1.73	3.63			

where
LNRES = natural logarithm of value of non-residential construction in 1976 (Baht, millions)
LCSI = natural logarithm of ratio of corporate savings (Baht, millions) to the construction cost index (1976 = 100)
LMPI = natural logarithm of industrial production index (1976 = 100)
(For details see Tachopiyagoon, 1988.)

Table 5. Estimated demand function for all 'other' construction

OTH = k + m GRI (−1) + n VAI (−1)						
	k	m (GRI)	n (VAI)	R^2	DW	F-test
Coef.	−78.51	0.57	0.68	0.9586	1.90	57.86
SEE	29.46	0.61	0.11			
t-value	−2.67	0.93	6.47			

where
OTH = value of all 'other' construction in 1976 (Baht, millions)
GRI(−1) = ratio of government revenue (Baht, millions) to the construction cost index (1976 = 100) lagged one year
VAI(−1) = value added from public utilities (Baht, millions) lagged one year
(For details see Tachopiyagoon, 1988.)

the demand for construction activities in Thailand from 1976 to 1985. The analysis shows that rising per capita income, the ratio of consumer price index to the construction cost index, and population are the major determinants of demand for residential construction. The expansion of industrial productive capacity (expressed by the industrial production index) and the ratio of corporate savings to the construction cost index are the most significant factors affecting the demand for non-residential building construction. The demand of 'other' construction is largely a function of rising revenues of government and of public utilities.

Projection of total construction demand

Total demand (TOT) for construction in Thailand is then a summation of demand for residential, non-residential and 'other' construction. To project the total demand for construction in Thailand, three scenarios were looked into, each with different assumptions

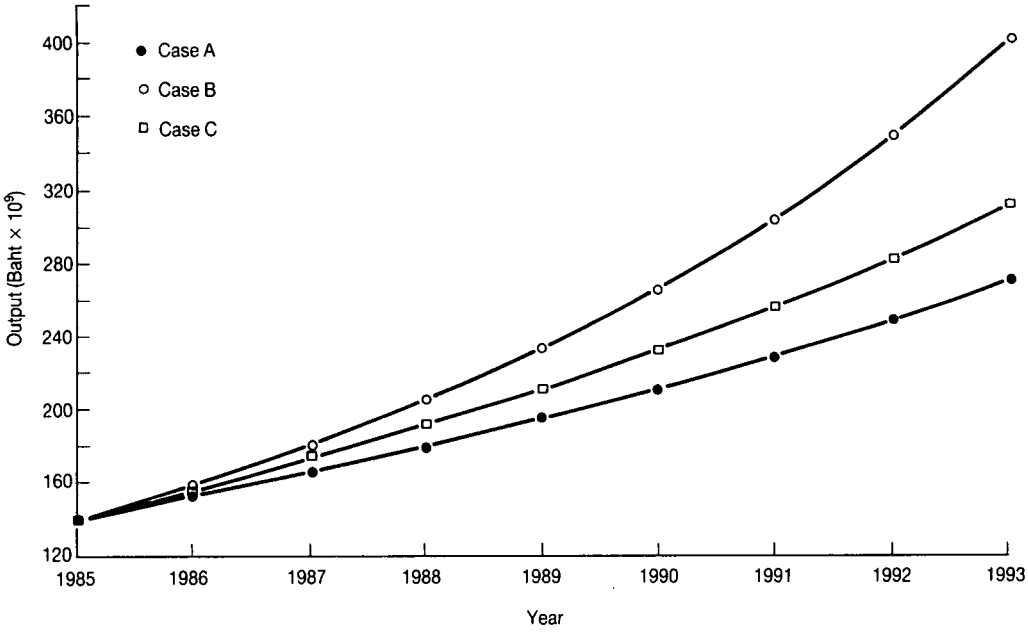

Fig. 1. Projected total demand for construction in Thailand to 1993 (for details see Tachopiyagoon, 1988)

Table 6. Projected construction output by type: Case A (Baht, millions)

Year	Residential	Non-residential	All other construction	Total construction
1986	47 163	35 820	69 650	152 833
1987	49 949	35 422	80 197	165 568
1988	52 337	35 223	91 739	179 299
1989	53 929	35 024	104 873	193 826
1990	55 720	34 825	119 599	210 144
1991	57 511	34 026	136 116	227 653
1992	59 302	34 427	154 623	248 352
1993	61 093	34 228	175 319	270 640

regarding the growth rates of the social and economic factors used in estimating the demand functions.

Scenario A

Growth rates are assumed to follow past trends. National income per capita is assumed to continue to increase at 5% per year; population at 1% per year; interest rates at 5% per year; investment in the industrial sector at 1.5% per year; consumer price index and construction cost index at 2.5% per year; corporate savings at 1.5% per year; value added from public utilities and government revenues at 15% per year.

Table 7. Projected construction output by type: Case B (Baht, millions)

Year	Residential	Non-residential	All other construction	Total construction
1986	43 780	39 004	69 650	152 434
1987	54 128	42 188	83 779	180 095
1988	58 705	45 770	100 694	205 169
1989	62 085	49 551	120 894	232 530
1990	67 262	53 531	144 673	265 466
1991	71 839	58 108	173 727	303 674
1992	76 615	62 884	208 751	348 250
1993	81 590	68 058	251 735	401 383

Table 8. Projected construction output by type: Case C (Baht, millions)

Year	Residential	Non-residential	All other construction	Total construction
1986	47 362	37 411	69 650	152 423
1987	51 143	39 004	83 978	174 125
1988	53 730	40 379	96 913	191 022
1989	56 317	42 188	111 639	210 144
1990	59 302	43 780	128 554	231 636
1991	62 088	45 571	147 459	255 118
1992	65 073	47 362	169 349	281 784
1993	68 257	49 352	194 025	311 634

Scenario B

Forecasts by economists reflect the general consensus that the Thai economy is rapidly expanding and these translate into higher growth rates on key economic indicators that are used to project the total demand for construction. Under this scenario, national income per capita is assumed to increase at 10% per year; population remaining at 1%; interest rates at 5%; investment in the industrial sector at 5%; consumer price index and construction cost index at 4.5 and 2.5%, respectively; corporate savings at 5%; value added from public utilities at 4%; and government revenues at 20%.

Scenario C

Average growth rates of scenarios A and B will be used in this scenario to provide an intermediate projection of the total demand for construction.

Results

The projected total demand for construction in Thailand to 1993 for different scenarios is shown in Fig. 1. The results indicate that construction activities in Thailand appear to have a bright future. The projected values range from an average of 230 481 million Baht per year

for the next 5 years (Scenario A) to a high average of 310 599 million Baht per year over the same period (Scenario B). Detailed projections of construction output by type are shown in Tables 6, 7 and 8. From these results, it is interesting to note too that 'other' construction (public projects) will continue to play a significant and dominant role in the growing Thai economy, accounting for over half of the total construction projected for each year to 1993.

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