THE EFFECTS OF THE CONSTRUCTION PROCESS ON THE LOCAL ECONOMY IN INDONESIA

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ABSTRAK

Industri jasa konstruksi memberikan kontribusi yang nyata serta signifikan terhadap proses pembangunan untuk negara sedang berkembang ataupun negara maju. Produk yang dihasilkan industri konstruksi seperti jalan, jembatan, waduk, saluran irigasi, sekolah, kantor serta bangunan gedung lainnya merupakan sarana dasar sebagai infrastruktur untuk proses berkembangnya kegiatan bisnis dan sosial bagi kepentingan publik dan swasta.

Industri jasa konstruksi tidak hanya berperan pada hasil atau produk yang dihasilkan, namun industri jasa konstruksi juga mampu menyediakan lapangan kerja bagi masyarakat baik secara langsung ataupun tidak langsung pada saat proses pelaksanaannya. Hal ini membuktikan bahwa industri konstruksi mempunyai efek terhadap perkembangan suatu pembangunan lokal ekonomi tidak hanya pada produk yang dihasilkan, namun juga saat proses berlangsungnya masa konstruksi pada suatu struktur bangunan.

Kajian pada penelitian ini mempelajari secara detail dan sistematis pengaruh dari investasi pada sektor konstruksi terhadap lokal ekonomi, khususnya pada jumlah tenaga kerja yang dapat diserap pada proyek dengan sifat "labour intensive atau equipment based method".

Surve dan kuestioner dilakukan di beberapa propinsi di Indonesia guna memperoleh data-data yang diperlukan, terutama aliran uang yang berlangsung dari investor hingg ke pihak-pihak yang terkait selama proses konstruksi. Secara tidak langsung, kajian ini juga mengamati adanya perbedaan waktu saat masing-masing pihak yang terlibat dalam proses konstruksi memperoleh pendapatan dari tagihan yang diajukan kepada pemilik proyek.

Hasil dari data yang telah dikumpulkan melalui surve dan kuestioner , serta dengan bantuan dari satu seri tabel input-output dari tahun 1985, 1990, 1995 dan 1998, dapat disimpulakan bahwa industri jasa konstruksi memberikan kontribusi yang cukup signifikan bagi proses pembangunan suatu daerah

Kata kunci : *industri jasa konstruksi, lokal ekonomi, makro dan mikro ekonomi, input-output table.*

INTRODUCTION

Output from the construction industry is a major and integral part of the national output, accounting for a sizeable proportion in the Gross Domestic Product (GDP) of both developed and underdeveloped countries (Tse and Ganesan 1997, Crosthwaite, 2000). Lowe (2003) further stated that the value added of construction is in the range of 7% to 10% for highly developed economies and around 3% to 6% for underdeveloped economies.

The estimates of construction value added in the developing countries could be higher as the figures may not include the informal

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sector, which could generate a significant casual employment in urban and rural areas (Ganesan 2000).

The construction outputs can be classified as a major component of investment and part of fixed capital. Both are essential factors for a continuous economic growth. Products of construction require a long period of gestation and are expected to supply services for a period of time. Investments in construction assume major importance since any expansion in the economy requires infrastructure investment as a precondition for potential economic growth (Ive and Gruneberg, 2000; Hillebrandt 2000).

The state of the construction industry will affect most common measures of a national economy, such as GDP as mentioned earlier. It will affect the availability of capital, the decisions a government makes and even the social health of the country. The construction industry also has significance interaction with other economics sector as multiplier effects through its backward and forward linkages.

The construction industry is frequently used as a tool by government to manage the local/national economy. For example, when it is recession and the number of unemployment is high, government uses the construction sector to increase the public expenditure (Ball and Wood, 1994). Therefore the detailed way in which the construction sector interacts with the national/local economy and wealth of people involved is not well understood. It needs methods to investigate the detail interaction between the construction industry and the national/local economy.

This paper elucidates study, which is an attempt to integrate a variety of aspects in order to model the construction industry and its effect on the local economy in a developing economy especially on the type of construction method used (labour intensive and equipment based construction). This study used a survey and questionnaire that was done in Indonesia. A series of Indonesian input-output tables and system theory is applied in order to build a soft and hard system model.

THE CONTRIBUTION OF THE CONSTRUCTION INDUSTRY TO THE ECONOMY

The formation of the fixed capital investment is a vital concern for the state of the nation as it represents investment in the future of the economy of the country. Fixed investment usually consists of houses and infrastructures in both public and private sectors, as well as the business investment in plant and machinery of all industries.

The concept of the gross capital stock is useful in measuring the productive capacity of the economy. The underlying idea is that a machine or building continues to yield the same contribution to output each year regardless of its age, until it reaches the limit of its useful life, when this contribution falls to zero and it is scrapped (Ive and Gruneberg, 2000).

Investment in theconstruction sector can be defined as construction-related to the Gross Fixed Capital Formation (GFCF). GFCF is an expenditure on fixed assets (buildings, vehicles, machineries, etc) either for replacing or adding to the stock of fixed assets. These fixed assets are repeatedly or continuously used in the production process (Ganesan, 2000).

The construction sector constitutes about 40%-60% of GFCF in most developing countries. The proportion of investment that goes to entirely new construction is likely to be higher than that which goes to repair and maintenance (Ganesan, 2000). In developed countries, the construction industry accounts for approximately one third of the total investment in physical assets in the economy. This is about the same as the investment in plant and machinery (Ashworth, 2002).

The construction investment can be an important public policy tool that is often used by central and local government to accelerate development and create employment. This decision is not the result of consumers' expenditure on goods and services, but as an investment decision, which has an effect on money injection into the economy (Ive and Gruneberg, 2000).

The multiplier effect demonstrates the impact of a change in investment on the levels of income and employment in an economy. The main concept of the multiplier is based on the recognition that the various sectors that make up the economy are interdependent.

The construction industry has significant interactions with the other economic sectors as a backward and forward linkage (Bon, 2000;Ganesan, 2000). The backward linkages show the relationship of inter-industry purchases to total input, while the forward linkages show the relationships of inter-industry sales to total output.

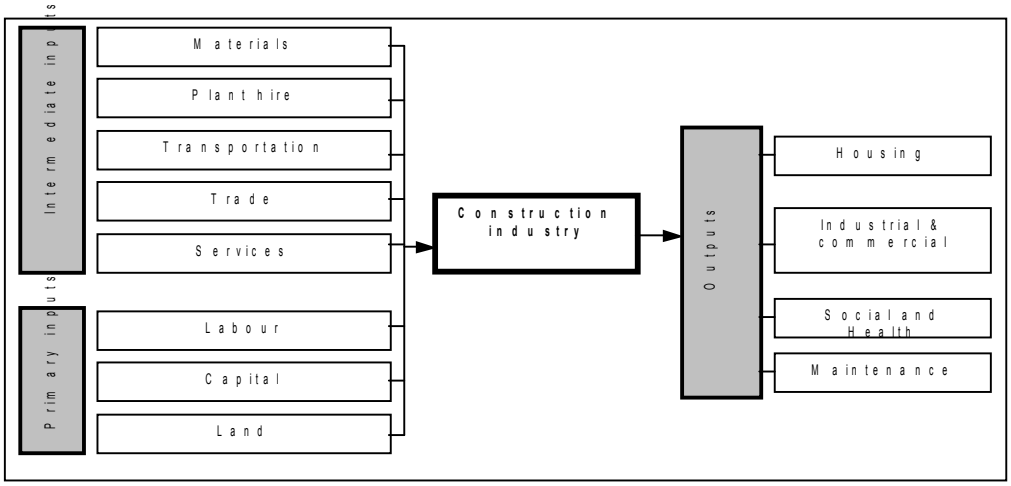

Figure 1: Construction as an input-output process (Lowe, 2003)

Figure 1 shows that construction needs inputs which come from other industries and production factors (land, labour and capital). On the other hand, the products of construction are used by the society to run their social, commercial and business activities.

MODELLING APPROACH

Using an input-output table

An input-output table of the national account is applied to examine the role of the construction industry on the macroeconomic aspects. The input-output model is mostly used to gauge the backward and forward linkages between industries in the economy (Lean, 2001). This technique is very common in the economic studies. The standard input-output model, and its extension to regional economic interaction, concentrates on the flows of productive economic sectors or industries.

The concept of input-output analysis originated from the work by Leontief in 1957. He invented this concept as a tool to examine the interaction between industries in an economy as part of a national economic account system. This technique has proven to be a very useful modelling

system that can be used for assessing linkages between sectors in the economy concern (Lean, 2001).

An input output table consists of transactions for industrial inputs and outputs, which are represented by the rows and columns of a matrix. The elements of the rows show the distribution of outputs from a particular industry across sectors in the economy, while the elements of the columns represent the inputs of a particular industry.

An extensive explanation of the input-output structure is provided by Miernyck, 1965, Miller, 1985, Lowe, 1993, and Bon, 2000. A brief outline of an input-output table is shown in Figure 2. This is for an economy which consists of:

- 4 production sectors (to simplify the explanation) as intermediate inputs and outputs;
- Final demand (Y) includes:
  - Consumption (C);
  - Investment (I);
  - Government (G);
  - Exports (E);
- Value added (V) consists of:
  - Employee compensation (L) (e.g. labour services)
  - Other value added aspects (N) (e.g. government services (paid for in taxes), capital, profit;

The structure of the input-output table consist of four quadrants (see Figure 2), as follows:

- Quadrant I:
  Quadrant I shows transactions for intermediate inputs to produce outputs. The intermediate inputs are those, which are required for the production of consumer and capital goods rather than for their final user. As it is assumed that one sector produces only one good, Quadrant I is therefore represented by a square matrix, which is the number of rows and column are equal. Total number of rows and columns (i.e. the dimension of matrix) used depends on the data collected. Each element in the matrix represents an expenditure of a sector which corresponds to an income for the receiving sector. The diagonal elements of matrix show transactions within an industry.

- Quadrant II:
  Quadrant II contains final demands for goods and services. The total amount of this quadrant corresponds to the gross national expenditure in a national income accounting. Each column represents a category of spending in a national economy, for example consumer expenditure, investment in fixed assets and stock building (gross fixed capital formation), government spending and exports.

- Quadrant III:
  Quadrant III of the input-output table deals with the value added by each sector that is represented by a column. The rows represent the primary inputs and value added that consist of labour wages, profits, payment to the self-employed, rents and government services, which are equal to gross national income.

- Quadrant IV:
  Quadrant IV represents the value added aspects that go to directly to the final demand.

		Intermediate inputs				Final Demand (Y)				Gross output
		1	2	3	4	Consumption	Investment	Government	Export	
		QUADRANT I				QUADRANT II				
Intermediate outputs	1	X11	X12	X13	X14	Y1C	Y1I	Y1G	Y1E	X1
	2	X21	X22	X23	X24	Y2C	Y2I	Y2G	Y2E	X2
	3	X31	X32	X33	X34	Y3C	Y3I	Y3G	Y3E	X3
	4	X41	X42	X43	X44	Y4C	Y4I	Y4G	Y4E	X4
		QUADRANT III				QUADRANT IV				
value added	L	VL1	VL2	VL3	VL4	VLC	VLI	VLG	VLE	L
	N	VN1	VN2	VN3	VN4	V2C	V2I	V2G	V2E	N
Gross input		X1	X2	X3	X4	C	I	G	E	X

Figure 2: An example of input-output table

The role of the Indonesian construction industry can be seen from Figure 3. These data were developed from a series of input-output tables produced by the Indonesian Statistical Bureau. This shows that the inputs of the construction sector come from other industries (intermediate inputs) and value added (labour and capital). It can be seen that the construction industry had a stable composition between intermediate and primary inputs between 1985 and 1995. However, it was clear that the proportion of the intermediate and primary inputs changed in 1998 where the primary inputs was greater compared to previous. It was obvious that the proportion of labour was also greater compared to the proportion of capital. These circumstances could be explained by the change in the industry in order to survive when the economic crisis that hit Indonesia in 1997. It means that more labour and less capital was employed in the construction sector after the economic crisis.

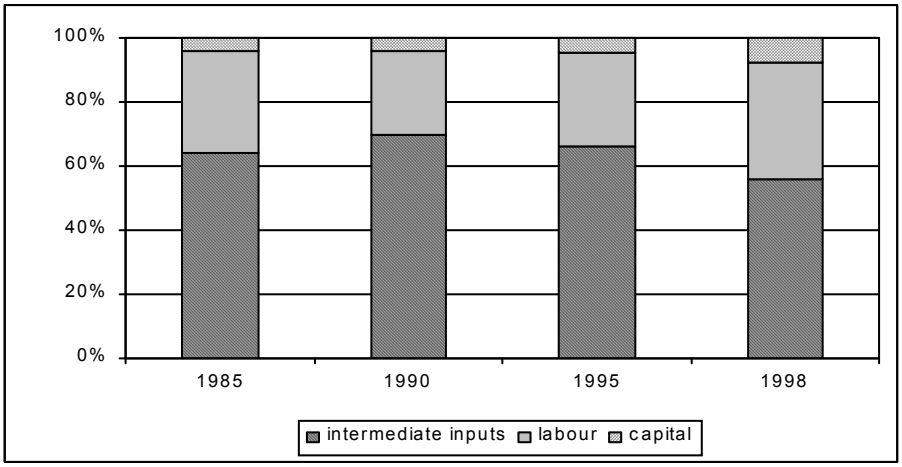

Figure 3: Indonesian construction inputs

The contribution of each industrial economy can be examined through its backward linkage and output multiplier indicators. The backward linkage indicator measures the intermediate inputs to the total input ratio of the sector under consideration. The output multiplier which is also known as total backward linkages indicator, it measures the total effect of a monetary unit change in final demand for the goods and services of the sector under consideration on the total output of all other sectors.

Figure 4 shows sectoral backward linkage indicators. It can be seen that the construction sector is considered to be one of the industries which has a highest direct backward linkage indicator together with manufacturing. This finding means that the construction sector needs many different products purchased from a large number of other industries.

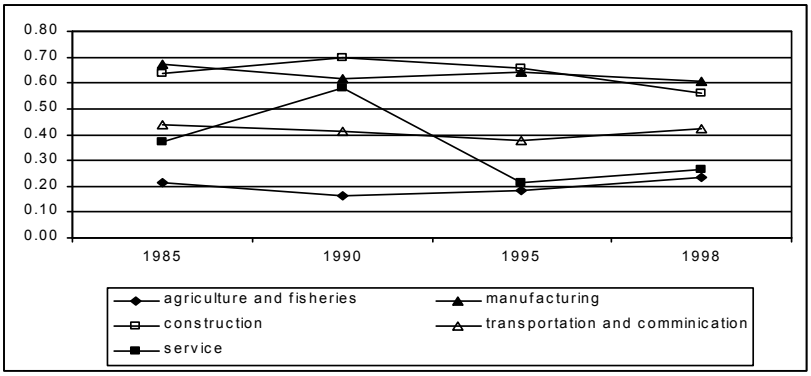

Figure 4: Sectoral direct-backward linkage indicators

Figure 5 exhibits the sectoral output multiplier indicator. The highest sectoral output multiplier indicator that the industry has reflects the significance role of an industry in the process of the economic development. It can be seen from Figure 5 that the construction sector and the manufacturing industry have the highest output multiplier indicator compared with other industries. These findings are in line with Ganesan's study in 2000. He stated that each job in construction sector could create one or two jobs for other related industries.

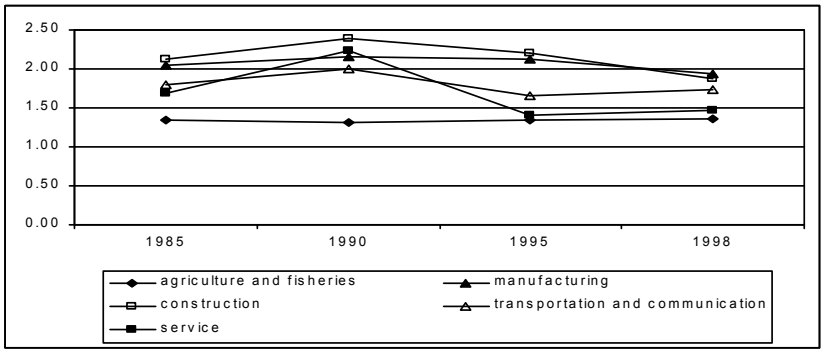

Figure 5: Setoral output multiplier

Applying systems theory

Systems theory is applied to examine the role of construction investment into the economy from a microeconomic perspective. The term of system is a vague word. In practice, people use this term for such common thing such as computer system, heater system, water system, political system, social system, industrial system and economic system. It seems that the word of system could be applied whether from a social or technical aspect.

Checkland (1981) has defined a system as:

"A set of elements connected together which form a whole, this showing properties which are properties of the whole, rather than properties of its component part."

Systems have particular aspects. These are (Wibowo and Mawdesley, 2002):
- A set of elements;
- Connected together;
- Forming a whole;
- Addressing a special purpose.

Checkland (1981) suggested that systems have been grouped into four categories:
- Natural systems (e.g. galaxy and biological systems);
- Designed physical systems (e.g. rocket and computer systems);
- Design abstract systems (e.g. mathematics and philosophy systems);
- Human activity systems (e.g. nerve systems).

Or two categories (Checkland, 1981; Checkland and Scholes, 1990 and Qambar.S, 1999):
- Hard systems that tackle well-defined problems and usually produce quantitative predictions to their behaviour (Walker.A, 1996). They rely on quantitative data. The hard system is oriented to goal seeking (Checkland, 1985).
- Soft systems that tackle messy and unstructured problems (Checkland and Scholes, 1990). The soft systems approach is often concerned with human behaviour problems (Walker.A, 1996). The orientation of this method is to learning, optimising, or satisfying rather than solutions (Checkland, 1985).

Systems methods have been proposed as a suitable approach to complex and unstructured problems. By applying systems theory, it means that the interrelationships of the parts and their influence upon the effectiveness of the total processes could be understood, analysed and improved (Checkland, 1981).

A systems model was developed from the interaction between the construction industry and the economy in Indonesia. The processes used in the development are, as follows (Wibowo and Mawdesley, 2003):

- ❑ Determine what systems models were available for the construction industry;
- ❑ Examine their usefulness for modelling the integration between the construction and the economy;
- ❑ Develop a new model;
- ❑ Use the model to determine what data were required;
- ❑ Analysis of the data obtained using statistical method;
- ❑ Translation of the data analysis into mathematical formula;
- ❑ Development of the model using entity relationship diagram;
- ❑ Examination of the links in the entity relationship diagram;
- ❑ Formulation of a spreadsheet model of the system;
- ❑ Verification of the model;

The data required for the model were collected using a structured questionnaire survey in Indonesia. The survey research was conducted to ascertain the money flow and the interaction between parties involved in a construction project and other industries in the national economic system. The data analysed were translated into a mathematical formulae. These formulae provide a quantitative model of the links

between elements in terms of the money flow.

Figure 6 shows the entity relationship diagram developed for these steps (Wibowo and Mawdesley, 2003). It shows all the elements and the links between them. Various surveys were undertaken to enable equations to be developed to model each of the relationships. A simple example of this is shown in Figure 7. The percentages of income paid for construction were developed from information gathered through the surveys. These equations were converted into a spreadsheet model which can be used to predict the behaviour of the real system, currently, the research is in the model verification phase. A spreadsheet was chosen for its almost universality and simplicity of use.

Figures 8 and 9 illustrate how the system can be used to predict behaviour in the real world. They have been produced to demonstrate the effect of change in client investment on the spending of a typical household in a labour intensive construction market (Wibowo and Mawdesley, 2003). Figure 8 shows a client investment increasing from approximately 1500 to 5000 units (> 200% increase) at week 10. This lead to an increased payment to the contractor 16 weeks later. The increase is only in the region of 60%. Similarly, Figure 9 shows the effects on the household income and expenditure for a typical labourer living away from his family. The amount sent back to the family increase by 60-70%, the amount spent on food by 50% and the amount family spent on non-food increase by 100% although this remains very small. The system might also be used to model rates of changes of variables by suitable alteration of the variables.

Such analysis, if repeated for equipment based construction, can help government decide on what policies to adopt to achieve its aims.

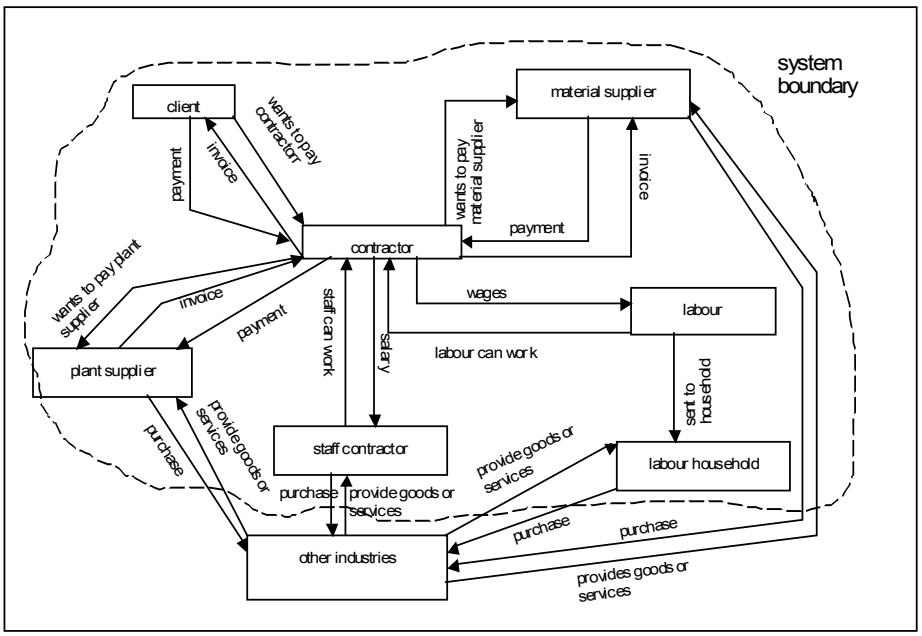

Figure 6: Entity relationship diagram

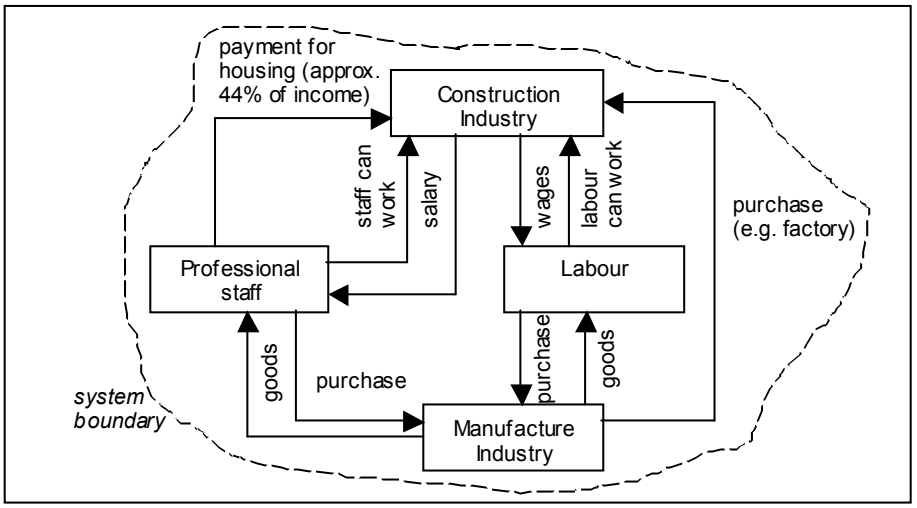

Figure 7: Entity relationship diagram

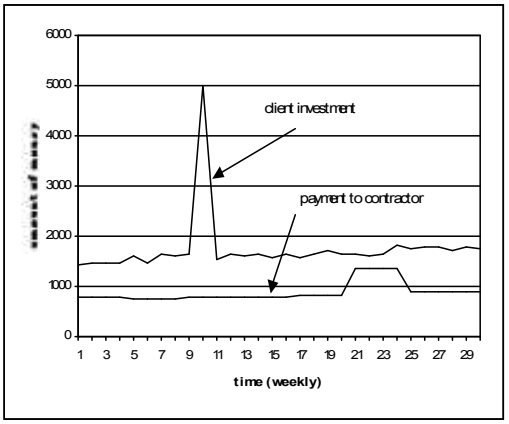

Figure 8: Client investment and payment to contractor

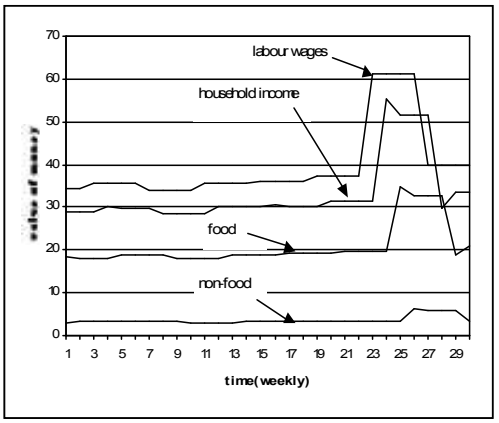

Figure 9: Labour wages and household income and expenditure

CONCLUSION

The construction industry provides a very important contribution to the national/local economy through its job generating ability for unskilled, semi-skilled and skilled labour. The construction process needs inputs from other industries and production factors (labour, land and capital). This could generate considerable employment through multiplier effects.

The study has examined the actual mechanism of the role of the construction industry in the economy particularly in term of the different construction methods used. The series of the input-output tables were used to investigate the effect of the final demand change of the construction industry

to other sectors whether as direct or multiplier effects at macroeconomic level.

A system methodology has been applied to model the role of the industry from the microeconomic perspective. It has been show that the model developed is able to predict the effects of changes in policy in expenditure on the micro level. It also shows the time-lag effect of the construction investment to parties involved. A worrying trend is the proportion of money allocated or paid to labour is significantly small in comparison with the total amount invested. This trend has a direct effect on income and expenditure of labour household. The authors are hopeful that the policy makers are aware of this problem and try and alleviate it in order to improve the role of the construction industry in the economy.

The validation of models such as this is difficult and on going. This particular model, once completed will be able to support relevant decisions makers in devising policies with regards to the construction sector.

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